THE DECADE AHEAD

Lord Baltimore Hotel

20 West Baltimore Street

10TH CONFERENCE ON

UNDERSTANDING INTERVENTIONS

That Broaden Participation in Science Careers

THE DECADE AHEAD

March 2-4, 2018

The Lord Baltimore Hotel

Baltimore, Maryland

Daryl E. Chubin & Anthony L. DePass, Co-chairs

www.understanding-interventions.org

FUNDING AND SUPPORT

Understanding Interventions that Broaden Participation in Science Careers has benefited from generous support from the National Institutes of Health, the National Science Foundation, the Alfred P. Sloan Foundation, Howard Hughes Medical Institute, and Educational Testing Service, along with productive collaborations with the National Academies of Sciences, Engineering and Medicine, the American Society for Cell Biology, the American Society of Plant Biologists, American Association for the Advancement of Science, and Long Island University.

In September 2013, an NIGMS T36 MARC grant from the National Institutes of Health (Grant No.1 T36 GM 102000) was awarded to Long Island University and it currently provides long-term support for the following:

Organization of conferences that will provide: a) venues for dissemination of interventions research and related training; b) opportunities for researchers/practitioners to interact and collaborate; and c) a mechanism for discourse on research-based interventions' implementation across modalities, stages, and venues.

An enhanced and interactive Understanding Interventions website that will: a) facilitate linkages among members of the Understanding Interventions (UI) community; and b) feature an accessible and searchable internet-based annotated database of Interventions articles and other resources. This will expand the dissemination of broadening participation research.

An online/email-based publication that distills and disseminates research findings, development opportunities, and general announcements to provide an additional platform for growth of the Understanding Interventions community.

We would like to extend our sincere appreciation to the National Institutes of Health for considerable investment that has been made in providing a stable base for our operations.

To all our collaborators, and participants, thank you for your generous contributions to this very important work.

UI's 10th Anniversary is a Charm

Welcome to UI 2018! This is the 10th anniversary Conference on Understanding Interventions that Broaden Participation in Science Careers. For returnees, thank you for the sustained support; for newcomers, you are in for a treat. Prepare to be overwhelmed with ideas, energy, and an assembly pledged to inclusion and excellence in STEM education and careers.

We return to the Charm City of Baltimore, which has hosted two previous UI conferences. Our principal sponsor, the National Institute of General Medical Sciences, and local colleagues at the University of Maryland, Baltimore, have helped make these next 2.5 days possible.

We number around 300 this special year. Once again, we come from across the United States and a diversity of STEM and institutions across the educational spectrum. We received 160 abstracts this year, the most ever. There are 18 workshops on the first day; and for days 2 and 3, concurrent symposia and deeper dive sessions—numbering 4-5 choices per time block—should start conversations that will continue throughout the two networking receptions. The posters reflect a growing sophistication of data on outcomes, and of movement beyond single institutions and short time frames. All of these complement the plenary sessions that feature both individuals and teams interacting on cross-cutting topics with the assembly as a whole.

We are privileged to make our two awards, the Intervenor (Lifetime Achievement) and the Tol (a team award named for NIH mentor Augustus Toliver), on Saturday at lunch. We will also at that time engage members of the UI Advisory Committee in reflecting on the decade past and the one ahead. How does Understanding Interventions continue to grow as a force in STEM, higher education, and American society?

These are fraught times. We are reminded daily that the values of diversity, equity, and inclusion are not shared by all. Our intervention work thus requires extraordinary dedication to the next generation. Thank you for your efforts both to illuminate and facilitate pathways toward fulfilling science careers.

We are honored to persist with you on those pathways. This year, please take a moment to introduce yourself to us in person. We want to express our gratitude for what UI has become and how, in part because of you, it will flourish in the decade ahead.

Yours truly,

ACKNOWLEDGEMENTS

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CONFERENCE PLANNING

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10th Conference on

Understanding Interventions

That Broaden Participation in Science Careers

March 2-4, 2018

FRIDAY, March 2, 2018

8:00 am - 7:00 pm Registration Open

Calvert Ballroom Foyer

8:00 am - 7:00 pm Networking Lounge

Royale Boardroom and Foyer

9:00 am – 5:00 pm Concurrent Workshops

9:00 am – 11:00 am

W 20: Proposal Writing as a Tool for Deep Learning in the STEM Undergraduate Curriculum

Location: Salon A **Presenter**: Jill Keith **Institution**: Winston-Salem State University **Co-Authors**: Dr. Tyrone Mitchel

Innovative Writing in the Major (WIM) or Writing Across the Curriculum (WAC) Program initiatives assist in promoting cultures of writing within the university (Romberger, 2008). At Winston-Salem State University (WSSU) our WIM program has been selected to receive a Writing Program Certificate of Excellence from the Conference on College Composition and Communication (CCCC). Our WIM program has also allowed for the connection of faculty and students in various STEM disciplines by using innovative writing pedagogies to improve written communication. One strategy involved infusing proposal writing into the Senior Seminar course, specifically in biology and chemistry. Students wrote proposals with faculty in the departments of Biological Sciences, Chemistry, Exercise Science, and Wake Forest University School of Medicine. It should be noted that some proposals were interdisciplinary and allowed students to work with more than one professor or postdoctoral associate and experience how team science occurs. In this workshop, presenters will focus on the development, sustainability, and importance of having senior STEM majors write proposals to foster their development and that of their assigned faculty member and/or postdoctoral associate (Campbell, 1997). Informative handouts will help attendees implement this student and faculty development model at their home institution. Academic writing is a complex process (Petruzzi, 2008); hence, we will demonstrate how scaffolding assists students in clearly communicating their ideas as they continue to engage primary literature. We will also demonstrate how activities associated with synthesis and evaluation (educational objectives of Bloom's taxonomy), are leveraged to develop students' critical thinking skills (Bloom, 1956). Improving students' critical thinking skills and increasing their self- efficacy in science-related tasks serve to ensure STEM persistence. Finally, institutions are using proposal writing as a mechanism to assist students with their application to the Graduate Research Fellowship Program (GRFP), a fellowship awarded by the National Science Foundation (NSF). This session will show attendees how they can adopt this model at their institution and increase the number of students who apply for this prestigious award. *Objectives of the Session*: A. Present examples of how STEM faculty were engaged in the Writing in the Major Program. B. Illustrate how student efficacy beliefs have been impacted. C. Show how meaningful data has been collected to drive improvement. D. Present strategies on how to solicit faculty buy-in for STEM Courses. *Participants will be able to*: A. (Re) Design writing assignments so students have a proposal that can be implemented. B. Implement this model of infusing proposal writing at their home institution. *Active learning strategies or ways in which participants will be engaged*: A. Evaluate writing apprehension using the Daly Miller B.

Evaluate a GRFP application.

W2: Accelerating our Understanding of Interventions using RAPID, a Rubric to Assess Programs that Increase Diversity in STEM

Location: Salon B **Presenter**: Julie A. Reynolds **Institution**: Duke University **Co-Authors**: Dawayne Whittington, Sherri Fulp, and Devyn Gillette

Millions of dollars have been invested to create interventions designed to broaden participation in STEM, and yet most of us still have not created that magic combination of programs that level the playing field for students from traditionally underrepresented groups. We argue that it is not simply because specific interventions are ineffective at achieving their stated goals;; rather, a significant problem is the lack of systematic student support across three essential areas: academic, financial, and community support. The notion that students need academic and financial support is obvious, and when students have both types of support then they have access to higher education. However, community support -- which contributes to a sense of belonging, self-efficacy, and identity as a scientist -- is also essential for student persistence. Here, we present an evidence-based rubric for persistence that is organized around these major types of support, and built from a heuristic review of the literature. Our rubric, RAPID - a Rubric to Assess Programs that Increase Diversity in STEM, provides a comprehensive framework for assessing the range of support services that students need to persist in STEM. This rubric can be used by colleges, universities, and non-profits to design programs which systematically address all the needs of their targeted populations. Furthermore, funding agencies can use RAPID to evaluate the potential efficacy of new diversity programming initiatives. Although not every diversity program needs all elements covered within the rubric, students require support at all levels. Therefore, some programs may use the rubric to identify gaps in existing student support and coordinate with other resources on campus to address those specific gaps. By the end of this workshop, participants will not only have used RAPID to assess their own interventions (or interventions at their home institution), but they will also have identified gaps in student support, prioritized the order in which their institution should address those gaps, and have created a realistic action plan for creating a more comprehensive network of student support. This workshop is most appropriate for those who design and implement pre-doctoral interventions as well as administrators who address institutional readiness for broadening participation in STEM.

W 4: Beyond the GRE: Developing a New Model for Admission to STEM Doctoral Programs

Location: Salon D **Presenter**: Sandra L Petersen **Institution**: University of Massachusetts Amherst **Co-Authors**: Patricia B. Campbell

Growing evidence shows that the Graduate Record Examination (GRE) does not reliably predict STEM PhD completion. Additionally, of the U.S. students selected using the current system that relies heavily on GREs, only 50% complete their PhD programs. As we reported at the 2017 Understanding Interventions conference, men with GRE scores in the lowest quartile are significantly more likely to complete STEM PhD programs than those in the highest quartiles. For women, the GRE does not predict PhD completion at all. The question now becomes, what do we use instead of the GRE? In this interactive workshop, we will facilitate small-group discussions through which participants will identify qualities of successful STEM doctoral students, devise ways to assess those qualities and synthesize the group output into a new

model for graduate student admissions. We will share results of this workshop with participants and other interested faculty, students and administrators.

W26: The National Institute of General Medical Science (NIGMS) and the Science of Education Research Portfolios

Location: Salon E **Presenter**: Mercedes Rubio, PhD **Institution**: National Institute of General Medical Sciences (NIH), Division of Training, Workforce Development and Diversity **Co-Authors**: Darren Sledjeski, PhD, and Michael A Sesma, PhD

This workshop aims to update the community on two NIH scientific efforts that are part of NIGMS' science of education portfolios: The National Institute of Health's Common Fund National Research Mentoring Network Phase II and the Research on Interventions Portfolio. The National Institutes of Health's Office of Strategic Coordination (Common Fund) intends to publish three funding opportunity announcements (FOAs) to solicit applications for Phase II of the National Research Mentoring Network (NRMN), a component of the Enhancing the Diversity of the NIH-Funded Workforce Program. The NRMN FOAs will be an open competition to allow current awardees along with a variety of investigators from institutions and professional societies across the country to prepare applications to apply a scientific approach to measure the effectiveness of interventions designed to improve and enhance mentoring of individuals training for careers in biomedical research. The U01 component of NRMN Phase II will focus on interventions across three thematic areas: The Science of Mentorship, Professional Networking, and Navigating Critical Career Transition Points. Within these areas, applicants will propose individual projects to develop mentoring interventions using randomized control trial approaches, case controls, matched pair design, or other rigorous designs appropriate to the research questions that explore at least one of these three thematic areas. The purpose is to build the knowledge base to inform the scientific community about the science of mentoring, developing interventions focused on critical career transition points, and expanding the effectiveness of professional networks. Two other U24 grants will compliment and accompany this effort. The Research to Understand and Inform Interventions that Promote the Research Careers of Students in Biomedical and Behavior Sciences (R01) is a NIGMS portfolio that supports research to test hypotheses on training and mentoring interventions intended to increase interest, motivation and preparedness for careers in biomedical research. Program staff will discuss how NIGMS plans to continue support and stimulate new research in this area. In this workshop, we will discuss and provide technical assistance and updates to the community related to these efforts.

W19: Broadening Participation in STEM Innovation and Entrepreneurship

Location: Baltimore Theater **Presenter**: Chantel Fuqua **Institution**: American Association for the Advancement of Science **Co-Authors**: Gilda Barabino, Chinonye Nnakwe, Frances Carter-Johnson, Shermaine Mitchell-Ryan, and Tori Rhoulac Smith

Description: As observed in practice, initiatives that broaden participation in STEM disciplines in academic settings and efforts to promote innovation and entrepreneurship education towards the development of scalable businesses are likely to be carried out in isolation. However, there are several reasons for developing interventions that intentionally intersect

these efforts. First, while possession of an entrepreneurial mindset may be a metric of excellence for STEM professionals in professional settings, formal entrepreneurship training can be observed primarily in business schools and some engineering programs [1, 2]. Second, numerous articles and commentary from aspiring scientists and engineers from underrepresented populations indicate a disconnect between the pursuit of basic science research careers and its connection with their community [3]. Entrepreneurship education is an endeavor in which innovators and entrepreneurs from underrepresented groups may be able to give back to their communities [4] and connect basic science concepts to real world settings. Finally, addressing socially relevant problems through innovation and entrepreneurship may provide a cultural context for meaningful engagement of traditionally underrepresented students and promotes their persistence in STEM majors. Goals: The goal of this workshop is to provide the Understanding Interventions community with models, strategies and approaches for developing interventions that combine best practices in innovation training and entrepreneurship education with efforts to broaden participation in STEM disciplines and careers. Session Format and Learning Practices: The total workshop length will be 3 hrs. and feature 10 min speaker presentations with additional time for an engaging Q&A session with the audience. Panelists will give professional and personal insight into their expertise in STEM innovation and entrepreneurship in the context of broadening participation. The context for the discussion will be framed first by an overview of recommendations developed from a recent convening supported by NSF, the Forum on Inclusive Entrepreneurship, brief overviews of innovation and entrepreneurship resources available from private and federal programs and models for developing academic curriculums that encourage underrepresented students to consider entrepreneurship and increase their retention in STEM fields. Then, panelists will facilitate small group and interactive discussion regarding how academic researchers and students can become engaged in innovation training or entrepreneurship, efforts to build a movement around intersectionality in STEM entrepreneurship, along with discussing innovation and entrepreneurship resources available through academic institutions, federal agencies and the private sector. Outcomes from this workshop include: 1) informing the STEM broadening participation community about federal, academic and private sector resources available for innovation and entrepreneurship 2) offering strategies for disseminating information to stakeholders to facilitate broadened participation of underrepresented students in programs that promote innovation and entrepreneurship in the scientific workforce 3) building a greater understanding of the entrepreneurial mindset for scientists and the steps in the process of being a STEM innovator and/or entrepreneur 4) offering an opportunity to network and expand the learning community of scholars

W21: Systems Thinking: From Toast to an Institutional Research Curriculum

Location: Hanover Suite A **Presenter**: Paul Buonora **Institution**: California State University Long Beach **Co-Authors**: Alejandra Priede

Systems thinking is a set of tools that are used to address problems by integrating diverse points of view, and organizing and communicating ideas. California State University, Long Beach (CSULB) developed an institutional interdisciplinary undergraduate research curriculum using a systems thinking approach, which has been offered for five semesters. Systems thinking can be applied to a variety of complex challenges. In the workshop, we will apply a step-by-step

approach to provide attendees with an experience of applying systems thinking to the development of an institutional research curriculum at a teaching intensive institution. The presenters will cover an introduction to systems thinking and its relationship with logic models; the types of problems that a systems thinking approach can help address; how to apply systems thinking to identify goals, challenges, and opportunities to inform change and develop a plan of action; and identifying stakeholder participants. Participants will work together through discussions and hands-on activities to develop a research curriculum which will be compared with what was developed at CSULB. The presenters will share lessons learned from the months-long CSULB team curriculum development experience and evidence of institutionalization of the curriculum. Dr. Paul Buonora led the team that developed the CSULB research curriculum developed under the NIH-funded Building Interventions Leading to Diversity (BUILD) program and Dr. Alejandra Priede led the evaluation of the research curriculum.

11:00 am – 1:00 pm

W3: Mentoring Portfolio: Creating a Comprehensive Reflection of the Practice of Mentoring

Location: Salon A **Presenter**: Tiera S. Coston **Institution**: Xavier University of Louisiana **Co-Authors**: Maryam Foroozesh, and Karen N. Nichols

If one were to conduct a Google search for the term "mentoring portfolio (MP)," one would receive results that reflect a variety of ideas about what is considered a MP and approaches to developing such a document. In this workshop, the presenters will introduce a different idea of what is a MP and how to develop one. The concept for the MP presented here is closely modeled after the Educational Developer's Portfolio (EDP), which was designed by a diverse group of educational developers in Canada. The EDP is a "tool used to articulate, reflect upon, and provide evidence of an educational developer's beliefs, values, ethical principles, practices, approaches, development, and impact." Like an EDP, a MP is intended to be a carefully assembled collection of evidence integrated with thoughtful reflection that provides a comprehensive representation of the creator's mentoring experience. Strong mentorship has been demonstrated to enhance student self-efficacy and persistence, as well as the desire to pursue doctoral and professional degrees. The mentoring effect continues its positive impact in research productivity and the recruitment of underrepresented groups into biomedical research career paths. Because strong mentorship requires strong mentor training and support, Xavier University of Louisiana has developed Preparing Mentors and Advisors at Xavier (P-MAX). P-MAX is a mentor training program consisting of a series of modules that address topics such as mentor-mentee communication and stereotype threat (implicit bias). The P-MAX program will now include a module on developing a MP. Agencies like the National Institutes of Health (NIH) and the National Science Foundation (NSF) have demonstrated the importance of and their commitment to mentoring in achieving diversity in the scientific workforce through funding and program requirements. Consequently, the MP can be used not only as tool for personal growth or career advancement, but can also serve as a foundation for the mentoring plans that are often required as a part of the proposals submitted to many funding agencies. Virtually anyone can develop a MP based on any type of mentoring relationship or context. Presenters will use their experience and knowledge in mentoring and faculty development to meet three workshop objectives. Participants will be: 1) introduced to the concept of a mentoring portfolio;; 2) shown the foundational components of a MP and how

they work together to convey a mentoring experience;; and 3) guided in developing one component of the MP and encouraged to continue building their own. To assist in this goal, participants will be provided access to the resources for the P-MAX Program.

W8: The Change Dashboard: A Tool for Conceptualizing Change Projects to Advance Campus STEM Reforms

Location: Salon B **Presenter**: Charles Henderson **Institution**: Western Michigan University **Co-Authors**: Andrea Beach, Jaclyn K Rivard, Inese Berzina-Pitcher, Susan Elrod, and Maura Borrego

Institutionalization of effective instructional strategies and policies in undergraduate STEM education is a critical problem faced by most change initiatives (American Association for the Advancement of Science, 2014). Planning for successful institutionalization requires understanding the complexity of the system under consideration and purposefully coordinating the key change strategies. Infographics, dashboards, visual communication and data visualization may seem like a new trend, but these and other visual tools, such as the Business Model Canvas, developed by Osterwalder and Pigneur (2010) have been widely used for years to represent and communicate business strategies and objectives. These types of strategic planning, and decision-making aids have the potential to support faculty and administrators in achieving STEM reform. The Change Dashboard is one such tool. It enables change agents to organize and align information about their project goals with their change strategies, tactics, and project activities. The main objective of this workshop is to help campus change agents (e.g. faculty PIs, project directors, department chairs, provosts) understand how to use the Change Dashboard to plan for successful sustainable change. The Dashboard is appropriate for use with new or ongoing projects. It has been successfully used to guide team planning during the 2017-18 Accelerating Systemic Change Network's (ASCN) Systemic Change Institute (SCI), which involved teams from seven diverse campuses across the United States. The Change Dashboard takes a systems perspective of change, meaning that any successful change must consider multiple levels of an institution. It visually scaffolds change agents to articulate the gap between the desired state of the institution (structures and cultures at different institutional levels once the change has been enacted) and the current state of the institution. Once this gap has been articulated, strategies and tactics are introduced to bridge the gap. The Dashboard allows change agents to see whether strategies are sufficient, aligned, or in conflict. The Change Dashboard, unlike logic models often used to guide STEM improvement projects, is not a static image. It can and should be updated regularly to reflect the current state of the project. It can serve as visual artifact for the team, help team members to work towards a shared vision, and support structured conversations around project implementation activities. This workshop will open with a general overview of systemic change processes and then each element of the Change Dashboard will be explained in more detail by presenting a project case. Participants will have an opportunity to begin developing their own Change Dashboard and are encouraged to come prepared with a current project in mind. Alternatively, participants can consider a change project with which they are familiar to become acquainted with the Change Dashboard. This will be followed by a discussion about their initial use of the Change Dashboard, about what it helped them to learn about their project, and how they see themselves using it in their practice. The workshop will conclude by offering participants additional tools and resources to further support their decision making.

W25: Who Better Than a Peer? STEM Peer Teaching as an Academic Game Changer

Location: Salon E **Presenter**: Susan Carver **Institution**: Cleveland State University **Co-Authors**: Juan Amador

A student's colleagues often represent the least recognized, least used and possibly the most important of all the resources available to him or her. (Mackenzie et al., 1970). The models of student academic assistance such as Supplemental Instruction (SI), Peer Assisted Learning (PAL), Peer Led Team Led (PLTL), and Supplemental Learning Assistants (SLAs), to name a few, have been proven to increase student grades, reduce withdrawal rates and increase the eventual graduation rates of students in historically difficult courses (Burmeister, S. L., Kenney, P. A., & Nice, D. L. 1996) that become barriers to students achieving their STEM degrees. Relatively low pass rates for Precalculus and Calculus serve as a chokepoint for students pursuing STEM degrees and constitutes one of the main causes of switching majors or dropping out (Carver, S. et al., 2017). Engaging the model of peer teaching in these chokepoint classes has proven to increase pass rates and reduce withdrawals for undergraduate students enrolled in these math courses at Cleveland State University (CSU). CSU, located in downtown Cleveland, Ohio, is an urban campus comprised primarily of first generation commuter students who are under-resourced. The project, entitled Operation STEM (OpSTEM), is supported by an NSF STEM Talent Expansion Program (STEP) grant, (1161152.) Now in its fifth year, OpSTEM is one of CSU's highly regarded student success programs, supported additionally by University funding, math lab fees and Federal Work Study funds. Pass rates in Precalculus I and II, and Calculus I and II, have significantly increased in all four courses from a pre-OpSTEM 55% - 60% pass rate (prior to Fall 2013) to a 72% - 80% pass rate during the Fall 2013 - Fall 2017 academic years. Undergraduate, graduate or post-baccalaureate students who are either education, mathematics or engineering majors, and known as STEM Peer Teachers (SPTs), prepare and implement engaging, hands-on lessons to help students cement the precalculus and calculus concepts. The SPTs teach three, weekly 50-minute mandatory supplemental learning sessions, known as SPT Sessions, either prior to or following their 50-minute class period with the instructor. Learning Objectives: Participants will 1) learn about Cleveland State University's model of using STEM Peer Teachers in the Precalculus - Calculus course sequence; 2) ascertain transferability to other barrier courses, e.g., chemistry, biology, physics, etc.; and 3) identify necessary components to implement the model at two or four-year institutions. The hands-on aspect of the workshop will invite participants to work in pairs or small groups to explore the feasibility of implementing mandatory supplemental learning sessions in their own institution by brainstorming and identifying access to and/or availability of: 1) funding sources; 2) classroom space for the mandatory sessions; 3) online scheduling of mandatory supplemental learning sessions; 4) meeting space for peer teacher meetings, training and planning; 5) pass rate data of historically difficult science and math courses; and 6) a passionate, dedicated leader. Online and hard copy SPT Employee Manuals, job descriptions, training agendas, sample SPT Session schedules, lesson plans, engaged learning activities, formative assessments, and program evaluation surveys will be available.

W16: Planning for Diversity and Inclusive Excellence in Your Search: A Focused Conversation with UMBC STRIDE

Location: Hanover Suite A **Presenter**: Autumn M. Reed **Institution**: University of Maryland Baltimore County **Co-Authors**: Christopher Murphy, Elsa Garcin, Kevin Omland, Susan McDonough, Nilanjan Banerjee, and Wayne Lutters

In this 2 hour "workshop," members of the University of Maryland, Baltimore County's (UMBC) Strategies and Tactics to

Improve Diversity and Excellence (STRIDE) Committee (adapted from the University of Michigan STRIDE) will facilitate our focused conversation (Stanfield, 2000), Planning for Diversity and Inclusive Excellence in Your Search. This conversation highlights how to intentionally center diversity and inclusive excellence as the foundation of a search from the beginning of the process. The target participants for this conversation are university faculty and administrators, however, the topic is applicable to anyone involved in a search process. Our STRIDE facilitators are six distinguished faculty from across the institution, none of whom have a research focus on implicit bias, diversity and/or inclusive excellence in higher education. Instead, each fellow has a demonstrated commitment to these goals, which exemplifies our collective ownership of this work, regardless of our institutional roles. Our conversation will begin with us grounding and applying our work within the perspective of critical diversity (Herring & Henderson, 2011; Herring, 2013, 2015). We will then lead two active learning and flipped classroom activities, each followed by a debrief. In Activity 1, groups will imagine that they are part of an interdisciplinary search and must brainstorm three novel active recruitment approaches/outreach activities that will produce a more diverse applicant pool. In Activity 2, groups will assess the strengths, weaknesses and alternatives of a selection of faculty job ads as they relate to inclusive language. We will also consider the importance and possibilities of requesting from applicants a statement of their commitment to inclusive excellence in higher education. The conversation concludes with a call to action and participants' creation of action item plans for their own search. Afterwards, STRIDE will field questions about our peer education model. The learning objectives for this session are three-fold. First, we want to share with participants how the focused conversation approach, in lieu of a traditional workshop format, functions as powerful intervention model for empowering our faculty peers, often those from majority groups, with the knowledge and tangible actions they can implement in their own search processes to increase diversity and inclusion. Second, we hope that after partaking in this focused conversation participants will be able implement some of the tools and strategies we collectively shared in their own searches. Finally, and perhaps, the most significant outcome, is the role that this conversation can play in catalyzing future actions and conversations among our peer institutions/organizations about how this STRIDE intervention format might be adapted to improve diversity and inclusion in their own recruitment practices.

W17: Using Lean Launchpad to Promote Student Engagement and Persistence

Location: Hanover Suite B **Presenter**: Tori Rhoulac Smith **Institution**: National Science Foundation **Co-Authors**: Grant Warner, and Legand Burge

Proposed Workshop Overview: In this 1.5-hour, hands-on instructional interactive session, participants will be introduced to a model for broadening participation using the Lean Launchpad methodology for student engagement. Lean Launchpad, an approach to entrepreneurship that tests business models like scientific hypotheses, has been used to launch many successful business ventures, commercialize basic research, and prepare students for entrepreneurial pursuits. In 2015, Howard University (a historically Black university) and New Mexico State University (a Hispanic-serving institution) began piloting the Lean Launchpad methodology for student engagement. Investigators designed and

implemented a week-long summer program that brings together new transfer students in engineering and computer science majors to work collaboratively on developing and prototyping a solution to a real campus problem using Lean Launchpad for customer discovery and product value proposition. The project, funded by the Broadening Participation in Engineering program at the National Science Foundation (NSF), has demonstrated positive impact on persistence and this workshop will explore and encourage additional implementations of this intervention in undergraduate education. Facilitators will introduce the Lean Launchpad methodology and its ability to engage students around culturally relevant themes, discuss outcomes to date of the Lean Launchpad summer program, and guide participants in an activity modeled after the Lean Launchpad summer program. Participants will prototype a solution to a design problem and discuss potential adoption of the Lean Launchpad model for student engagement. Learning Objectives: Participants will 1) be introduced to fundamental concepts of the Lean Launchpad methodology; 2) apply the Lean Launchpad methodology in an interactive exercise; and 3) discuss opportunities to implement the Lean Launchpad methodology for student engagement in support of broadening participation goals in curricular and co/extra-curricular programs. Facilitators: Dr. Tori Rhoulac Smith is a Science Analyst in the Directorate for Education and Human Resources at NSF. Prior to joining NSF in 2017, she was Director of Undergraduate Studies in the College of Engineering, Architecture, and Computer Sciences at Howard University, where she helped lead an initiative to institutionalize innovation and entrepreneurship in engineering curricula, while also integrating high-impact educational practices in undergraduate coursework to enhance engagement and learning. Dr. Grant Warner is an Associate Professor of Mechanical Engineering at Howard University, entrepreneur, certified Lean Launchpad Educator, and nationally trained I-Corps Instructor. He leads the HowU Innovate interdisciplinary initiative, which provides campus-wide programming in innovation and entrepreneurship at Howard University. He also directs the Howard University - Hampton University I-Corps Site. Dr. Warner has a focused interest in increasing Black participation in technology startups. Dr. Legand Burge is a Professor of Computer Science at Howard University, a Fulbright Scholar, and former AAAS Fellow. Dr. Burge is Director of the Distributed Systems Research Group and Associate Director of the Center for Applied High Performance Computing at Howard University. He also works to advance computer science education and diversity, and tech innovation and entrepreneurship.

1:00 pm – 3:00 pm

W 20: Proposal Writing as a Tool for Deep Learning in the STEM Undergraduate Curriculum

Location: Salon A **Presenter**: Jill Keith **Institution**: Winston-Salem State University **Co-Authors**: Dr. Tyrone Mitchel

Innovative Writing in the Major (WIM) or Writing Across the Curriculum (WAC) Program initiatives assist in promoting cultures of writing within the university (Romberger, 2008). At Winston-Salem State University (WSSU) our WIM program has been selected to receive a Writing Program Certificate of Excellence from the Conference on College Composition and Communication (CCCC). Our WIM program has also allowed for the connection of faculty and students in various STEM disciplines by using innovative writing pedagogies to improve written communication. One strategy involved

infusing proposal writing into the Senior Seminar course, specifically in biology and chemistry. Students wrote proposals with faculty in the departments of Biological Sciences, Chemistry, Exercise Science, and Wake Forest University School of Medicine. It should be noted that some proposals were interdisciplinary and allowed students to work with more than one professor or postdoctoral associate and experience how team science occurs. In this workshop, presenters will focus on the development, sustainability, and importance of having senior STEM majors write proposals to foster their development and that of their assigned faculty member and/or postdoctoral associate (Campbell, 1997). Informative handouts will help attendees implement this student and faculty development model at their home institution. Academic writing is a complex process (Petruzzi, 2008); hence, we will demonstrate how scaffolding assists students in clearly communicating their ideas as they continue to engage primary literature. We will also demonstrate how activities associated with synthesis and evaluation (educational objectives of Bloom's taxonomy), are leveraged to develop students' critical thinking skills (Bloom, 1956). Improving students' critical thinking skills and increasing their self- efficacy in science-related tasks serve to ensure STEM persistence. Finally, institutions are using proposal writing as a mechanism to assist students with their application to the Graduate Research Fellowship Program (GRFP), a fellowship awarded by the National Science Foundation (NSF). This session will show attendees how they can adopt this model at their institution and increase the number of students who apply for this prestigious award. *Objectives of the Session*: A. Present examples of how STEM faculty were engaged in the Writing in the Major Program. B. Illustrate how student efficacy beliefs have been impacted. C. Show how meaningful data has been collected to drive improvement. D. Present strategies on how to solicit faculty buy-in for STEM Courses. *Participants will be able to*: A. (Re) Design writing assignments so students have a proposal that can be implemented. B. Implement this model of infusing proposal writing at their home institution. *Active learning strategies or ways in which participants will be engaged*: A. Evaluate writing apprehension using the Daly Miller B. Evaluate a GRFP application.

W 11: Do You Play Fair? A Workshop About Racial Bias in Academia

Location: Salon B Presenter: Christine M. Pribbenow **Institution**: University of Wisconsin-Madison **Co-Authors**: Donald Dantzler, and Percy Brown, Jr.

This session will introduce participants to Fair Play, an NIH-sponsored intervention to explore and address biases that impede student success in STEMM fields. Fair Play is a video game designed to raise awareness about stereotypes, microaggressions, and other racial biases in academia (Gutierrez et al., 2014). In the game, players step into the shoes of Jamal, an African-American graduate student who experiences bias incidents as he navigates through his academic career and interacts with faculty, staff, and students on a college campus. Fair Play enables attendees to experience and learn about many forms of racial biases firsthand, providing an engaging and dynamic environment for perspective-taking and increasing bias literacy (Kaatz et al., 2017). The content of Fair Play was developed and based on both the scientific literature on racial biases, and the personal experiences of minority students in postsecondary education institutions. The Fair Play game is situated as the central piece within a broader workshop about racial bias and how to address it. (Carnes et al., 2015). The first section of the workshop introduces attendees to the scientific literature about unintentional racial bias (i.e., "implicit bias");; where it comes from, how it operates, and how it can influence behavior despite our best intentions. In the second section, we share research on how video games impact learning, and specifically why video games like Fair Play are a particularly promising venue for addressing racial biases (Gee, 2007). Workshop participants

then play the game, after which they will participate in a group discussion about their experiences as Jamal, and their interactions with other primary characters. We then review literature on how to effectively address one's own implicit bias, teaching several evidence-based techniques that have been shown to yield long- term change in implicit bias (Devine et al., 2012). Finally, we discuss different ways Fair Play can be used in academic settings, and give workshop attendees the resources and tools they need to conduct Fair Play Workshops at their own institutions.

W 4: Beyond the GRE: Developing a New Model for Admission to STEM Doctoral Programs

Location: Salon D **Presenter**: Sandra L Petersen **Institution**: University of Massachusetts Amherst **Co-Authors**: Patricia B. Campbell

Growing evidence shows that the Graduate Record Examination (GRE) does not reliably predict STEM PhD completion. Additionally, of the U.S. students selected using the current system that relies heavily on GREs, only 50% complete their PhD programs. As we reported at the 2017 Understanding Interventions conference, men with GRE scores in the lowest quartile are significantly more likely to complete STEM PhD programs than those in the highest quartiles. For women, the GRE does not predict PhD completion at all. The question now becomes, what do we use instead of the GRE? In this interactive workshop, we will facilitate small-group discussions through which participants will identify qualities of successful STEM doctoral students, devise ways to assess those qualities and synthesize the group output into a new model for graduate student admissions. We will share results of this workshop with participants and other interested faculty, students and administrators.

W 18: Using Social Media to Broaden Participation in Science Careers: A Science Communication 101 Workshop

Location: Salon E **Presenter**: Alberto I. Roca, PhD **Institution**: DiverseScholar

Science communication is changing more rapidly than ever before. Social networks have allowed more diverse audiences to engage in science and the scientific process, although information access and engagement barriers still exist for underserved populations with regards to technological access, scientific literacy, and voice in the scientific community. Scientists, aspiring science writers, and academic scholars/practitioners should be aware of the exploding options for communicating science online as well as potential pitfalls of new media approaches to science communication. A SciComm 101 workshop would cover basic science communication principles, including knowing the audience and how to engage this audience with storytelling and value-centered framing or communication strategies. The workshop would guide science communicators, whether aspiring, amateur or professional, through evidence-based practices for teaching and engaging people in science in the age of social media. For example, workshop attendees will learn about what drives public use of online science media, motivations for science blog use, trends in public use of social media, storytelling tactics, drivers of public attitudes toward science, how to build trust among diverse sciences, the importance of incorporating diverse voices in science stories, and how to navigate communicating about potentially confusing and/or controversial scientific topics. Regarding broadening participation and diversity interventions, the millennial and digital-native student populations consume information, news, and media very differently than previous generations. Therefore, to publicize the availability of an intervention (fellowship, internship, training opportunity, etc.), current faculty and administrators need to learn about social media technologies. Tools such as Twitter, Instagram, and "traditional" blogging might reach students who may not be reading their email! Furthermore, scholars who wish to attract the attention of

press officers, journalists, and mainstream media for their scholarship and expertise also now need to use social media to create and curate their "brand". For both activities, challenges exist for reaching an audience of underrepresented minority individuals and communities. Our workshop will describe ways to connect with such diverse communities online especially using social media. For example, the #BLACKandSTEM and #LATISM communities hold semi-regular weekly Twitter chats for Blacks and Latinos, respectively. We will also review the social media footprint of communities such as SACNAS/ABRCMS as channels for engagement to disseminate, for example, lessons learned from the scholarship and practice of "understanding interventions."

W19: Broadening Participation in STEM Innovation and Entrepreneurship

Location: Baltimore Theater **Presenter**: Chantel Fuqua **Institution**: American Association for the Advancement of Science **Co-Authors**: Gilda Barabino, Chinonye Nnakwe, Frances Carter-Johnson, Shermaine Mitchell-Ryan, and Tori Rhoulac Smith

Description: As observed in practice, initiatives that broaden participation in STEM disciplines in academic settings and efforts to promote innovation and entrepreneurship education towards the development of scalable businesses are likely to be carried out in isolation. However, there are several reasons for developing interventions that intentionally intersect these efforts. First, while possession of an entrepreneurial mindset may be a metric of excellence for STEM professionals in professional settings, formal entrepreneurship training can be observed primarily in business schools and some engineering programs [1, 2]. Second, numerous articles and commentary from aspiring scientists and engineers from underrepresented populations indicate a disconnect between the pursuit of basic science research careers and its connection with their community [3]. Entrepreneurship education is an endeavor in which innovators and entrepreneurs from underrepresented groups may be able to give back to their communities [4] and connect basic science concepts to real world settings. Finally, addressing socially relevant problems through innovation and entrepreneurship may provide a cultural context for meaningful engagement of traditionally underrepresented students and promotes their persistence in STEM majors. Goals: The goal of this workshop is to provide the Understanding Interventions community with models, strategies and approaches for developing interventions that combine best practices in innovation training and entrepreneurship education with efforts to broaden participation in STEM disciplines and careers. Session Format and Learning Practices: The total workshop length will be 3 hrs. and feature 10 min speaker presentations with additional time for an engaging Q&A session with the audience. Panelists will give professional and personal insight into their expertise in STEM innovation and entrepreneurship in the context of broadening participation. The context for the discussion will be framed first by an overview of recommendations developed from a recent convening supported by NSF, the Forum on Inclusive Entrepreneurship, brief overviews of innovation and entrepreneurship resources available from private and federal programs and models for developing academic curriculums that encourage underrepresented students to consider entrepreneurship and increase their retention in STEM fields. Then, panelists will facilitate small group and interactive discussion in regards to how academic researchers and students can become engaged in innovation training or entrepreneurship, efforts to build a movement around intersectionality in STEM entrepreneurship, along with

discussing innovation and entrepreneurship resources available through academic institutions, federal agencies and the private sector. Outcomes from this workshop include: 1) informing the STEM broadening participation community about federal, academic and private sector resources available for innovation and entrepreneurship 2) offering strategies for disseminating information to stakeholders to facilitate broadened participation of underrepresented students in programs that promote innovation and entrepreneurship in the scientific workforce 3) building a greater understanding of the entrepreneurial mindset for scientists and the steps in the process of being a STEM innovator and/or entrepreneur 4) offering an opportunity to network and expand the learning community of scholars.

W21: Systems Thinking: From Toast to an Institutional Research Curriculum

Location: Hanover Suite A **Presenter**: Paul Buonora **Institution**: California State University Long Beach **Co-Authors**: Alejandra Priede

Systems thinking is a set of tools that are used to address problems by integrating diverse points of view, and organizing and communicating ideas. California State University, Long Beach (CSULB) developed an institutional interdisciplinary undergraduate research curriculum using a systems thinking approach, which has been offered for five semesters. Systems thinking can be applied to a variety of complex challenges. In the workshop, we will apply a step-by-step approach to provide attendees with an experience of applying systems thinking to the development of an institutional research curriculum at a teaching intensive institution. The presenters will cover an introduction to systems thinking and its relationship with logic models; the types of problems that a systems thinking approach can help address; how to apply systems thinking to identify goals, challenges, and opportunities to inform change and develop a plan of action; and identifying stakeholder participants. Participants will work together through discussions and hands-on activities to develop a research curriculum which will be compared with what was developed at CSULB. The presenters will share lessons learned from the months-long CSULB team curriculum development experience and evidence of institutionalization of the curriculum. Dr. Paul Buonora led the team that developed the CSULB research curriculum developed under the NIH-funded Building Interventions Leading to Diversity (BUILD) program and Dr. Alejandra Priede led the evaluation of the research curriculum.

W9: Is an Academic Bridge Program Right for Your Students?

Location: Hanover Suite B **Presenter**: Dr. Sheri Wischusen **Institution**: Louisiana State University **Co-Authors:** Dr. William Wischusen

Retaining college students in science disciplines is strongly linked to their experiences and success in introductory science courses, which are often referred to as "gateway courses" (Tinto, 2017, Cuseo, 2003, Upcraft, et al., 2005). This is especially true for students from underrepresented populations. The Biology Intensive Orientation for Students (BIOS) bridge program, a 5-day pre-freshman program at Louisiana State University, has consistently contributed to the success and graduation rates of science majors for the last 13 years (Wischusen & Wischusen, 2007, Wischusen, et al., 2010, Wheeler & Wischusen, 2014). We now show specific success gains for students in underrepresented groups in science - ethnic,

socio-economic and first generation college. Students who participate in BIOS immediately prior to their first semester at the university were more likely to remain in the College of Science, more likely to be successful in their major, and more likely to graduate in 4 years. The BIOS model will be of interest to college and university administrators and faculty who are tasked with broadening participation in science disciplines. The presenters, Drs. William and Sheri Wischusen, are the developers and co-directors of the LSU BIOS program. They have 13 years of experience running BIOS and have led over 20 workshops on the BIOS model at both national meetings and on individual campuses. To date, over 20 colleges and universities host a boot camp based on the BIOS model. In this workshop, you will explore why you might want to replicate this program on your campus, the details of how the program is structured, and results you can expect from replicating this program. You will engage in small group discussions and brainstorming sessions on topics ranging from retention concerns across campuses to what BIOS might look like for your campus.

3:00 pm – 5:00 pm

W1: Teaching Academics about Microaggressions: A Model Workshop Adaptable to Various Audiences

Location: Salon A Presenter: Eve Fine Institution: University of Wisconsin-Madison Co-Authors: Christine Fabian, Molly Carnes, Carmen Juniper Niemeko, Jennifer Sheridan, and Manuela Romero

The term "microaggression" is increasingly familiar on many university and college campuses where it is being recognized as a source of stress for members of minority groups, and as a detrimental factor in their success, retention, and the extent to which they feel welcome and included in the campus community. The term "microaggression" is not new. It was coined in 1970 by Chester M. Pierce, M.D, Professor of Education and Psychiatry at Harvard University. Its recently popularity is due to the work of Daryl Wing Sue, whose book Microaggressions in Everyday Life and subsequent works have given people examples and terminology they can use to identify, discuss, and understand their daily experiences with "brief and subtle comments, behaviors, or environmental cues that communicate hostile, derogatory, or unwelcoming messages" - with "microagressions." The prevalence of discussion around microaggressions on university and college campuses, which include campaigns on social media to highlight examples of microaggressions, has undoubtedly increased awareness of how frequently students from minority groups encounter microaggressions and has led to much advice on how to avoid or respond to microaggressions. Unfortunately - perhaps predictably - it has also led to a backlash. This backlash includes criticizing campuses for encouraging a culture of victimhood and questioning the impact of microaggressions. The nature of resistance or backlash to the concept and impact of microaggressions, however, suggests that lack of information or misinformation about microaggressions may be at play. Consequently, educational efforts that aim to inform academic audiences about the nature of microaggressions and their impact and provide them with strategies for avoiding and countering microaggressions may help reduce their incidence and the harm they cause to faculty and students from minority groups. We will present a 1.5 hour "hands-on instructional interactive session" demonstrating one educational approach to microaggressions that been successfully delivered to and well-

received by over 450 faculty and staff, and 150 students, primarily in the College of Engineering at the University of Wisconsin - Madison. We will present this educational module during the first hour on the interactive session. During the last half hour, we will share evaluation data for the intervention, provide participants with a template they can use to adapt this module for a variety of audiences (faculty, staff, students) and engage in discussions about how to implement this module in their home institutions.

W8: The Change Dashboard: A Tool for Conceptualizing Change Projects to Advance Campus STEM Reforms

Location: Salon B **Presenter**: Charles Henderson **Institution**: Western Michigan University **Co-Authors**: Andrea Beach, Jaclyn K Rivard, Inese Berzina-Pitcher, Susan Elrod, and Maura Borrego

Institutionalization of effective instructional strategies and policies in undergraduate STEM education is a critical problem faced by most change initiatives (American Association for the Advancement of Science, 2014). Planning for successful institutionalization requires understanding the complexity of the system under consideration and purposefully coordinating the key change strategies. Infographics, dashboards, visual communication and data visualization may seem like a new trend, but these and other visual tools, such as the Business Model Canvas, developed by Osterwalder and Pigneur (2010) have been widely used for years to represent and communicate business strategies and objectives. These types of strategic planning, and decision-making aids have the potential to support faculty and administrators in achieving STEM reform. The Change Dashboard is one such tool. It enables change agents to organize and align information about their project goals with their change strategies, tactics, and project activities. The main objective of this workshop is to help campus change agents (e.g. faculty PIs, project directors, department chairs, provosts) understand how to use the Change Dashboard to plan for successful sustainable change. The Dashboard is appropriate for use with new or ongoing projects. It has been successfully used to guide team planning during the 2017-18 Accelerating Systemic Change Network's (ASCN) Systemic Change Institute (SCI), which involved teams from seven diverse campuses across the United States. The Change Dashboard takes a systems perspective of change, meaning that any successful change must consider multiple levels of an institution. It visually scaffolds change agents to articulate the gap between the desired state of the institution (structures and cultures at different institutional levels once the change has been enacted) and the current state of the institution. Once this gap has been articulated, strategies and tactics are introduced to bridge the gap. The Dashboard allows change agents to see whether strategies are sufficient, aligned, or in conflict. The Change Dashboard, unlike logic models often used to guide STEM improvement projects, is not a static image. It can and should be updated regularly to reflect the current state of the project. It can serve as visual artifact for the team, help team members to work towards a shared vision, and support structured conversations around project implementation activities. This workshop will open with a general overview of systemic change processes and then each element of the Change Dashboard will be explained in more detail by presenting a project case. Participants will have an opportunity to begin developing their own Change Dashboard and are encouraged to come prepared with a current project in mind. Alternatively, participants can consider a change project with which they are familiar to become acquainted with the

Change Dashboard. This will be followed by a discussion about their initial use of the Change Dashboard, about what it helped them to learn about their project, and how they see themselves using it in their practice. The workshop will conclude by offering participants additional tools and resources to further support their decision making.

W10: Skillful Listening: A Critical Intervention for Enabling Student Career Development

Location: Salon D **Presenter**: Christine Wood **Institution**: Northwestern University Feinberg School of Medicine **Co-Authors**: Anne Caliendo, Rick McGee, Robin Remich, and Toni Gutierrez

Background and workshop aims. As qualitative researchers, we use in-depth interviewing because we want to understand "the experience of other people and the meaning they make of that experience" (Seidman, 3). This workshop draws on our 8-yearlong research study, which utilizes annual one-on-one interviews with a diverse group of biomedical PhD students. We have followed our students from the beginning of their PhD through graduation and their first post-PhD appointment. From our data, we will discuss the prevalence of stories of change and share specific interviewing techniques which can invite students to actively reflect on their experiences. Our perspectives as researchers and program directors will inform the practices of researchers, program personnel, and mentors who want to guide and study young scientists. At this workshop, we will share insights and strategies from our research, including case examples of students, to prepare workshop participants to support student success and decision-making. Using anonymized excerpts from our interviews, participants will see how skillful listening promotes reflection and leads students to share intricate details about their career thinking without feeling judged. Through interactive methods, workshop participants will learn skillful listening strategies to guide their students to take ownership and control of their decisions. The longitudinal design of our study allows us to capture in-depth information about students' interactions with mentors, advisors, and other sources of support which can facilitate or inhibit their success. Each year students describe subtleties of their decision-making, reflect on their development as scientists, and reveal complexity in career thinking. The broad goal of our research is to understand how students make critical decisions, including decisions to pursue a PhD, PhD school choices, lab choices, and thinking and planning for careers. A more specific goal is to understand change and persistence towards various career choices in science. Two things are apparent: (1) change in career planning occurs frequently, and (2) students appreciate speaking with an interested outsider about their experiences. Listening for and understanding change. We have learned that change and evolution in career thinking is much more a norm than an exception. Even among students with relatively consistent career interests, ideas about what motivates them towards specific careers tend to change over time. By listening for change and displaying openness towards the evolution of interests, faculty and those in student support roles will gain more insight into how to guide students towards success as each student defines it. Enabling students to become experts of their own stories. Students are the experts of their own narratives; the way we ask questions can open or close opportunities for students to expand their thinking and reflect on their life in graduate school. We can ask questions in ways that allow students to guide the narrative while also capturing key information. By listening actively and anticipating change, mentors and those in support roles are better able to guide students towards

available resources that allow them to pursue their own path and guide them in making decisions that will improve their graduate school experience and set them up for success.

W25: Who Better Than a Peer? STEM Peer Teaching as an Academic Game Changer

Location: Salon E **Presenter**: Susan Carver **Institution**: Cleveland State University **Co-Authors**: Juan Amador

A student's colleagues often represent the least recognized, least used and possibly the most important of all the resources available to him or her. (Mackenzie et al., 1970). The models of student academic assistance such as Supplemental Instruction (SI), Peer Assisted Learning (PAL), Peer Led Team Led (PLTL), and Supplemental Learning Assistants (SLAs), to name a few, have been proven to increase student grades, reduce withdrawal rates and increase the eventual graduation rates of students in historically difficult courses (Burmeister, S. L., Kenney, P. A., & Nice, D. L. 1996) that become barriers to students achieving their STEM degrees. Relatively low pass rates for Precalculus and Calculus serve as a chokepoint for students pursuing STEM degrees and constitutes one of the main causes of switching majors or dropping out (Carver, S. et al., 2017). Engaging the model of peer teaching in these chokepoint classes has proven to increase pass rates and reduce withdrawals for undergraduate students enrolled in these math courses at Cleveland State University (CSU). CSU, located in downtown Cleveland, Ohio, is an urban campus comprised primarily of first generation commuter students who are under-resourced. The project, entitled Operation STEM (OpSTEM), is supported by an NSF STEM Talent Expansion Program (STEP) grant, (1161152.) Now in its fifth year, OpSTEM is one of CSU's highly regarded student success programs, supported additionally by University funding, math lab fees and Federal Work Study funds. Pass rates in Precalculus I and II, and Calculus I and II, have significantly increased in all four courses from a pre-OpSTEM 55% - 60% pass rate (prior to Fall 2013) to a 72% - 80% pass rate during the Fall 2013 - Fall 2017 academic years. Undergraduate, graduate or post-baccalaureate students who are either education, mathematics or engineering majors, and known as STEM Peer Teachers (SPTs), prepare and implement engaging, hands-on lessons to help students cement the precalculus and calculus concepts. The SPTs teach three, weekly 50-minute mandatory supplemental learning sessions, known as SPT Sessions, either prior to or following their 50-minute class period with the instructor. Learning Objectives: Participants will 1) learn about Cleveland State University's model of using STEM Peer Teachers in the Precalculus - Calculus course sequence; 2) ascertain transferability to other barrier courses, e.g., chemistry, biology, physics, etc.; and 3) identify necessary components to implement the model at two or four-year institutions. The hands-on aspect of the workshop will invite participants to work in pairs or small groups to explore the feasibility of implementing mandatory supplemental learning sessions in their own institution by brainstorming and identifying access to and/or availability of: 1) funding sources; 2) classroom space for the mandatory sessions; 3) online scheduling of mandatory supplemental learning sessions; 4) meeting space for peer teacher meetings, training and planning; 5) pass rate data of historically difficult science and math courses; and 6) a passionate, dedicated leader. Online and hard copy SPT Employee Manuals, job descriptions, training agendas, sample SPT Session schedules, lesson plans, engaged learning activities, formative assessments, and program evaluation surveys will be available.

W5: Translating Research to Actionable Practices to Accomplish Parity in Research Careers

Location: Hanover Suite A **Presenter**: Lecia Barker **Institution**: University of Colorado Boulder

There's a reason that the Royal Society, the national academy of science in the U.K., awards the prestigious Winton prize to authors of science books for popular audiences: writing for non-specialists is hard. Yet to widely promote the use of research-based practices, it must be written without jargon, use language that the target audience can easily interpret, and clearly outline what to do and what not to do in a way that demonstrates an understanding of the reader's situation and goals. The National Center for Women & Information Technology (NCWIT) develops resources for reforming women's low participation in IT, including several aimed at overcoming underrepresentation in research careers. NCWIT does not work directly with girls and women, but instead builds capacity for others to accomplish their organizations' goals by producing evidence-based and theoretically sound resources that are attractive, easy-to-use, and free. The NCWIT Social Science Team identifies strategies demonstrated by research and evaluation to produce outcomes, then translate social science into actionable practices for dissemination and adoption to our constituencies. NCWIT graphic designers make the resources attractive. This workshop will discuss the steps NCWIT has taken to translate from social science into everyday practice, in the context of different broadening participation in research goals. The 1.5-hour workshop will provide an overview of the translation process, including identifying the form of a resource, analyzing the needs and existing understanding of the audience (including when more than one audience is likely to use a resource), and writing and graphic strategies for supporting quick understanding and visualization of processes. The workshop will use as examples several NCWIT resources for broadening participation in STEM careers, such as a "practice sheet" persuading faculty to work with undergraduates by appealing to what is important to faculty; resources describing how to conduct research experiences, including how to manage groups and the REU-in-a-Box end-to-end process; how to retain academic faculty through mentoring (Faculty Mentoring-in-a-Box); how to write letters of recommendation without implicit bias; and the roles of admissions policies and advisors in attracting and retaining graduate students.

W9: Is an Academic Bridge Program Right for Your Students?

Location: Hanover Suite B **Presenter**: Dr. Sheri Wischusen **Institution**: Louisiana State University **Co-Authors:** Dr. William Wischusen

Retaining college students in science disciplines is strongly linked to their experiences and success in introductory science courses, which are often referred to as "gateway courses" (Tinto, 2017, Cuseo, 2003, Upcraft, et al., 2005). This is especially true for students from underrepresented populations. The Biology Intensive Orientation for Students (BIOS) bridge program, a 5-day pre-freshman program at Louisiana State University, has consistently contributed to the success and graduation rates of science majors for the last 13 years (Wischusen & Wischusen, 2007, Wischusen, et al., 2010, Wheeler & Wischusen, 2014). We now show specific success gains for students in underrepresented groups in science - ethnic, socio-economic and first generation college. Students who participate in BIOS immediately prior to their first semester at the university were more likely to remain in the College of Science, more likely to be successful in their major, and more

likely to graduate in 4 years. The BIOS model will be of interest to college and university administrators and faculty who are tasked with broadening participation in science disciplines. The presenters, Drs. William and Sheri Wischusen, are the developers and co-directors of the LSU BIOS program. They have 13 years of experience running BIOS and have led over 20 workshops on the BIOS model at both national meetings and on individual campuses. To date, over 20 colleges and universities host a boot camp based on the BIOS model. In this workshop, you will explore why you might want to replicate this program on your campus, the details of how the program is structured, and results you can expect from replicating this program. You will engage in small group discussions and brainstorming sessions on topics ranging from retention concerns across campuses to what BIOS might look like for your campus.

5:00 pm **Welcome and Opening Plenary**
Calvert Ballroom Salon C

Welcome
Daryl E. Chubin & Anthony DePass

Plenary I
Enhancing Scientific Workforce Diversity through Work with Deaf Scholars: A New Lens to Inform

Presenter: Peter C. Hauser, Ph.D. **Institution**: Rochester Institute of Technology

Underrepresented individuals in the nation's scientific workforce face barriers to success, and a disproportionate number "dropout" as the training level increases. Federal agencies and other funders recognize the need to diversify the nation's biomedical, behavioral, clinical and translational research enterprise, and offer support through a variety of research education and training grant opportunities. Deaf and Hard of Hearing (DHH) individuals comprise language and cultural minority populations and are underrepresented in research training and careers. Most research education programs are inadequately prepared to work with DHH people. The University of Rochester and Rochester Institute of Technology are collaborative partners on two NIH/NIGMS- funded research training programs with a goal to increase the number of researchers who are DHH. Our programs provide academic and research career training activities tailored for use with aspiring DHH scientists. The purpose of our programs is to prepare our scholars for successful entry into academic, industry, government and private sector careers in research and science teaching, and to build a community of accomplished role models to attract more DHH students to careers in the biomedical, behavioral, clinical and translational sciences. To accomplish this, we also develop programs to prepare faculty, staff, and institutions to work with DHH students and scientists. This plenary presentation will share best practices and recommendations based on personal experiences of DHH scientists, mentors, teachers and trainees, and the experiences of collaborators who work with DHH scientists and trainees. Hallmarks of success are associated with approaches informed by one or more of these key concepts:

1) Deaf Community Capital (situated knowledge, cultural intuitions, and language)
2) Advocating for and creating truly equal access

3) Access to the "informal curricula" of research and research training

4) The Rochester Mentorship Model and Deaf-Aware Mentors

5) "Mentor-the-Mentor" training to provide Deaf cultural awareness and skills to hearing mentors, lab personnel and staff

6) The importance of institutional commitment and change to increase the number of qualified DHH individuals at all stages of the academic career trajectory and scientific workforce enterprise.

There are commonalities in the research training experiences of students and scientists from underrepresented groups. Some of the experiences and key concepts in this plenary will resonate with individuals who work with and are from other underrepresented groups. This plenary provides a new lens for some of those experiences. This new lens will spark new ideas and collaborations to enhance our work with individuals from other underrepresented groups as we continue to work toward our shared goals related to scientific workforce diversity.

7:00 pm-9:00 pm **Reception**

French Kitchen

Saturday, March 3, 2018

7:00 am - 5:00 pm **Registration Open**

Calvert Ballroom Foyer

8:00 am - 7:00 pm **Networking Lounge**

Royale Boardroom and Foyer

7:30 am – 8:30 am **Breakfast Buffet**

Calvert Ballroom Foyer

8:30 am – 10:15 am **Plenary II**

Calvert Ballroom Salon C

Plenary II

URM students, GREs, Holistic Admissions to Biomed Research Training....but where are all the Minority Faculty?

Presenter: Roger Chalkley, D. Phil. **Institution**: Vanderbilt University

Over the last several years my colleagues and I have spent a great deal of time studying aspects of biomedical research training where certain commonly and strongly held beliefs did not seem to fit with our own experiences. First, with almost everyone I talked about graduate admissions into STEM areas, a really high GRE score was felt to be a certain guide to success. I do not have to point out to this group that this belief tends to work against the interests of URM applicants. We, and others, have now shown that (at least in biomedical research) the GRE predicts absolutely nothing about success in Graduate school. Because of

this observation, we shifted to 100% holistic admissions for 27 IMSD (an NIH funded program for diversity support) students admitted since 2013. The GRE scores covered the waterfront (and were totally ignored). The outcomes were truly phenomenal, with less that 5% attrition and all are in postdocs or in career positions. Looking at national data, we see that URM students who graduate with a BS in biological sciences are just as likely as a majority student to seek a PhD in their discipline. We have recently reported on the participation of URM students in biomedical graduate programs at a level comparable to the award of BS degrees in undergraduate school. These students are graduating to the highest degree ever, and moving on to postdoctoral fellowships at an unprecedented rate. Evidently the support of the NIH and NSF over the past two decades is yielding remarkable results at the graduate level. Thus, the pool of URM postdocs is sufficient to provide a competitive cohort to apply for faculty positions across the country. However, almost uniformly we hear that faculty search committees are complaining that they get virtually no applications from minority applicants and they surmise that there simply are not many URM postdocs out there. This is simply not true. However, minorities do not apply, that is definitely true. The question we need to address is, why not? I will present data indicating that for underrepresented students, negative perceptions of a faculty career are already developing early on in graduate school!

10:30 am-12:00 pm Concurrent Symposia and Deeper Dives

Curricular Experiments in 4-Year Institutions I

Location: Salon A

S28: Promoting undergraduate persistence in STEM: Teaching students to communicate science, build effective mentoring relationships and navigate scientific culture.

Presenter: Bruce Birren **Institution**: Broad Institute of MIT and Harvard **Co-Authors**: Diedra Wrighting, Adan Colon-Carmona, Michael Walker, Jamie Dombach, Jenene Cook, Gisselle Valez-Ruiz, and Marlina Duncan

The historic underrepresentation of certain groups from research careers in science, technology, engineering and math (STEM) reflects, among other factors, a disproportionate exit of individuals in these groups from STEM programs. To persist in higher education and transition successfully from classroom-based learning to research, students must acquire various forms of capital that are rarely described in formal curricula. We have developed and piloted a semester-long course for undergraduates engaged in research that makes explicit concepts and skills tied to success in a research environment. The course teaches: 1) skills for communicating about research; 2) skills to maximize the effectiveness of research mentoring relationships; and, 3) how some identities influence performance and acceptance within the research community. The course was taught for three semesters at the University of Massachusetts, Boston. The 33 students represented diverse backgrounds, academic majors and educational experiences. To assess student learning, we developed and refined rubrics that we applied to draft and final versions of the students' work. Student work from all semesters was evaluated at the same time using the final version of the rubrics. All work was scored independently by multiple randomly-assigned evaluators. Students showed significant improvement in their ability to create research abstracts ($p = 0.01$), to create slides for presentations ($p = 0.001$) and to deliver effective oral presentations ($p = 0.001$). At course completion students reported increased comfort in their interactions with their mentors, specifically in the ability to convey their goals to, their ability to navigate difficult conversations with, and receive critical feedback from, their research mentors relative to responses in pre-course surveys. Students

demonstrated statistically significant increases in familiarity with concepts pertaining to the interplay of identity with the culture of science, specifically implicit bias ($p = 0.001$), imposter syndrome ($p = 0.000001$) and stereotype threat ($p = 3.2736E-10$). This increased familiarity was corroborated by student's ability to define these terms on the post-survey, but not the pre-survey. In addition, to assess which aspects of the course had the maximum impact, once each week students anonymously reported a list of three things they were "taking away" from that week's material. Over the three semesters this produced 655 responses that closely aligned with our stated learning objectives and corresponded to topics in all three main areas of the curriculum. Common student responses included both high level concepts, such as the "importance of communication in science" (22) and "self-advocacy and mentoring up" (29) to specific skills such as "making effective slides" (25). The most frequently reported learning was "making use of feedback" (78), which was one of the most consistently reinforced themes. Qualitative data gathered through post-course surveys revealed additional positive influences of the course. While we will assess the long-term impact of the course in subsequent years, it is clear that students have significantly improved skills that are critical to success in research careers, indicating the curriculum can contribute to increasing diversity in STEM research.

S59: Developing an Inclusive and Intentional Culture of Mentoring to Advance Diversity and Equity

Presenter: Levon T. Esters, Ph.D. **Institution:** Purdue University **Co-Authors:** Neil A. Knobloch. Ph.D. & Quintana M. Clark

Developing an institutional culture that reflects a commitment to inclusion, diversity and equity is key to helping enhance student transition, academic achievement, academic adjustment, persistence, retention, and degree completion among undergraduate and graduate students, especially those from underrepresented minority (URM) groups, economically disadvantaged backgrounds, gendered disparaged, and first-generation college students. The primary goal of this symposium presentation will be to discuss some of the challenges and barriers associated with developing a college-wide culture using culturally relevant and learner-centered strategies for psychosocial and instrumental support of students. The presenters will also discuss viable strategies and best practices tied to an innovative program focused on inclusive and intentional mentoring, which has helped promote a college-wide culture of inclusion and equity. The program that will serve as the focus of the symposium is the Mentoring@Purdue program that was established in 2013 at Purdue University and was designed with the primary goal of improving the quality of graduate school experiences for women and URMs by offering best practices and advice to utilize in their mentoring relationships. A secondary goal of the M@P program is to increase the number of women and URMs pursuing post- secondary STEM-based agricultural and life science degrees in the College of Agriculture at Purdue University. To conclude the symposium presentation, the presenters will share how the M@P program has made a significant impact in the retention and recruitment of women and URM graduate students in the College of Agriculture. Additionally, the presenters will also share how the M@P program provides opportunities for women and URMs to develop as leader-scholars through their engagement in inclusive and intentional mentoring practices.

S30: Fair Play: A National Sample of Science Faculty, Grad Students, and Administrators' Experience Playing a Video Game and Attending a Workshop on Racial Bias.

Presenter: Anna Kaatz **Institution**: University of Wisconsin-Madison **Co-Authors**: Molly Carnes, Kimberly Kile, Donald Dantzler, CHRISTINE MAIDL PRIBBENOW, TYLER HOOK, Kate S. McCleary, and Percy Brown, Jr.

Explicit and subtle racial bias drives talented racial/ethnic minorities out of science, technology, engineering, mathematics, and medicine (STEMM) fields, consequently blocking innovation and disadvantaging the U.S. in the global economy for science and technology. A growing body of work shows that becoming bias literate—that is knowledgeable about different forms of bias, their

impact, and ways to mitigate bias; and perspective taking—imagining the experience of a member of a negatively stereotyped-group, can reduce negative intergroup bias and behaviors. Importantly, one of the most effective ways to develop literacy and engage in perspective taking is through video game play. In games, players take on the role of an avatar, and quickly learn new knowledge and skills to reach a final win-state. Combing these two research streams, we developed Fair Play, an avatar-based role-playing video game, where players become Jamal Davis, a Black graduate student at a large research university who must learn to navigate increasingly difficult explicit and subtle forms of racial bias in order to reach the win-state of earning a PhD and becoming a professor. The current version of the game is combined with an interactive workshop where players discuss their experiences and learn bias reduction strategies. In this symposium presentation, we will present results from the first evaluation of the game and workshop by a national sample of STEMM faculty, graduate students, and administrators. These 218 participants came from three large national conferences, and five different universities spanning geographic regions, size, prestige, and public/private status. Most were white (50% [n=101] vs. 8% [n=18] Black, 6% [n=12] Hispanic, 5% [n=10] Asian, and 30% [n=77] didn't respond); and female (50% [n=109] vs. 20% male [n=77], and 30% [n=66] unidentified gender). Participants answered five questions, using Likert-like scales ranging from 1-strongly disagree to 5-strongly agree that they would 1) recommend the workshop, 2) thought it was effective, 3) learned a lot, 4) had increased understanding of bias, and 5) thought bias was portrayed accurately. Participants also answered one open-ended question to describe Jamal's experience. Quantitative scale data were analyzed using mixed-effects regression models for differences due to participant gender (M vs. F), and race (white vs. nonwhite), with workshop location as a random effect to account for group-level correlation in response items. Qualitative responses were content-analyzed. Quantitative results showed that most participants agreed or strongly agreed with the five questions, but there were two significant differences by participant race. Non-white participants indicated that they would be more likely to recommend the workshop to a colleague (P=.037), and rated the game as more accurate than white participants (P=.020). In qualitative responses, most players described Jamal's experience as "frustrating", but "enlightening" suggesting that they were able to take his perspective and simultaneously learn about bias. Black and Hispanic participants, in particular, also described Jamal's experience as "typical", and "representative"—which suggests that game content is accurate. Broadly, results show that faculty, students, and staff across institutions benefit from the Fair Play workshop intervention in ways that will help reduce racial bias in STEMM.

Minority Faculty in Academic Medicine: National Analyses

Location: Salon B

S5: Predictors of Full-time, Academic-medicine Faculty Appointment among Underrepresented Racial/Ethnic Minorities in Biomedical Research: A National Study

Presenter: Donna B. Jeffe Institution: Washington University in St. Louis, School of Medicine Co-Authors: Dorothy A Andriole, and Devasmita Chakraverty

Significance to the UI community: Increasing the diversity of the federally funded physician-scientist workforce is a national priority.(1) Many physician-scientists are employed as academic-medicine faculty conducting research in the basic and clinical sciences. Research experience has been shown to be positively associated both with faculty appointment(2,3) and promotion,(4) but to our knowledge, no studies have examined factors associated with faculty appointment among specific underrepresented racial/ethnic minority ([URM], including Black, Hispanic, and Native American/Alaska Native [NA/AN]) groups. We hypothesized that factors associated with faculty

appointment might vary for different URM groups. Study population: In this national study, there were 104,117 U.S. medical-school graduates in 1998-2004, of whom 14,562 (14%) were URM graduates (7234 Black, 6621 Hispanic, and 707 NA/AN). Our study sample included 11,243 URM graduates who had complete data for analysis: 5448 (48.5%) Black, 5249 (46.7%) Hispanic, and 546 (4.9%) NA/AN. Contextual factors: In stratified, multivariable logistic regression models for each URM group, we examined several variables in relation to full-time academic-medicine faculty appointment: age at matriculation, gender, attendance at a top-40 NIH-funded medical-school, four research experiences (college laboratory research apprenticeship, medical-school research elective and authorship of a paper submitted for publication, and ≥1 year of research during residency), academic performance, and the level of importance attributed to factors that influenced matriculating students' decisions to study medicine. We obtained follow-up data for faculty appointment in 2014, allowing for at least 9 years of follow-up after graduation. We report selected adjusted odds ratios (AOR) and 95% confidence intervals (CI) significant at P<.05. Outcomes: For all three URM groups, older matriculants were less likely to receive faculty appointments (Black: AOR=0.95, 95% CI=0.93-0.98; Hispanic: AOR=0.94, 95% CI=0.92-0.97; NA/AN:AOR=0.93, 95% CI=0.87-0.99), whereas graduates who participated in ≥1 year of research during residency (Black: AOR=2.01, 95% CI=1.66-2.44; Hispanic: AOR=1.86, 95% CI=1.54-2.26; NA/AN: AOR=2.08, 95% CI=1.02-4.26) were more likely to receive faculty appointments. Women were more likely than men to receive faculty appointments among Black (AOR=1.16, 95% CI=1.005-1.35) and Hispanic (AOR=1.26, 95% CI=1.09-1.45) graduates. Only among Black graduates were top-40 NIH-funded medical-school attendees more likely to receive faculty appointments (AOR=1.48, 95% CI= 1.28-1.71). Only among Hispanic graduates were participants in college laboratory research apprenticeships (AOR=1.21, 95% CI=1.05-1.38) and medical-school research electives (AOR=1.18, 95% CI=1.005-1.38) more likely to receive faculty appointments. Only among NA/AN graduates were authors of a paper during medical school more likely to receive faculty appointments (AOR=1.77, 95% CI=1.003-3.12). Unmeasured variables, e.g., students' perceptions of their medical-school climate,(5) could be associated with faculty appointment; and as an observational study, causality cannot be inferred. Interventions to increase academic-medicine and biomedical-research workforce diversity may differentially impact students from different URM groups who might consider academic-medicine careers. Findings suggest the need for tailored interventions for specific URM student groups.

S8: Competing-risks Analysis of Junior Faculty Promotion and Attrition in Academic Medicine: A National Study of U.S. Medical-school Graduates

Presenter: Donna B. Jeffe **Institution**: Washington University in St. Louis, School of Medicine **Co-Authors**: Dorothy A Andriole, and Yan Yan

Significance to the UI community: Recruitment and retention of a more diverse physician-scientist workforce are issues of national concern.[1] As many physician-scientists are academic-medicine faculty, and junior faculty are simultaneously "at risk" for both promotion and attrition, we used competing-risk methodology to examine promotion and attrition as competing events. To our knowledge, this is the first study to examine academic-medicine faculty career trajectories using competing-risk methodology.[2] Study population: Of 119,906 U.S. medical-school graduates in calendar years 1997-2004, 27,219 (95.5% of all 28,502 new faculty from 2000 through 2012) received initial, full-time faculty appointments as instructor (n=10,470) or assistant professor (n=16,749). Of these 27,219, 6,753 (24.8%) were promoted, 7,676 (28.2%) left academic medicine without promotion, and 12,790 (47.0%) were retained without promotion by 12/31/2013. Contextual and other factors: We analyzed de-identified data from the Association of American Medical Colleges and National Institutes of Health (NIH) IMPAC II grants database (for mentored-K and research project grant [RPG] awards, including R01 and other RPG awards) for these 1997-2004 graduates who were initially appointed to full-time junior faculty

positions. Using multivariable proportional subdistribution hazards models with promotion and attrition as two competing events,[2] adjusted proportional subdistribution hazard ratios (aSHRs) measured the effects of demographic, educational, research-experiential, and institutional variables on 10-year probabilities of promotion and attrition. We report selected aSHRs significant at P<.05. We recognize that, by including only U.S. medical-school graduates and junior faculty, the generalizability of our findings to faculty holding other degrees, initially appointed at other ranks, or employed at other types of academic institutions is limited. Outcomes of the intervention: Higher aSHRs of promotion were observed for research-intensive medical-school graduates (1.11; vs. non-research-intensive medical-school graduates), mentored-K (1.32) and RPG (1.69) awardees (each vs. non-awardees), and instructors (7.47; vs. assistant professors). Lower aSHRs of promotion were observed for women (0.90; vs. men), underrepresented minority (URM, including Black, Hispanic and Native American/Alaska Native), and Asian/Pacific Islander (PI) appointees (URM: 0.79 and Asian/PI: 0.93; each vs. white), and appointees who reported non-faculty career intentions at graduation (0.75; vs. full-time faculty career intentions). Higher aSHRs of attrition were observed for URM (1.19) and Asian/PI (1.10) appointees, faculty who reported $1-$99,999 or greater than or equal to $100,000 debt at graduation (1.09 and 1.14, respectively; each vs. no debt), instructors (1.38), and appointees who reported non-faculty career intentions at graduation (1.50; vs. full-time faculty career intentions). Lower aSHRs of attrition were observed for mentored-K (0.23) and RPG (0.23) awardees. Continued efforts are warranted to support women, URM, and Asian/PI faculty career development to increase workforce diversity, and the salience of research experiences for promotion merits emphasis.[3] Our findings also suggest a potential role for debt-reduction programs and underscore the importance of medical-school programs that inform diverse groups of students about and encourage them to pursue academic-medicine careers.[4]

S13: Research during Residency and Mentored-K Awards to U.S. Medical Graduates in Internal Medicine

Presenter: Dorothy A Andriole **Institution**: Washington University in St. Louis, School of Medicine **Co-Authors**: Donna B. Jeffe

Significance to the UI community: Physician-scientist workforce diversity is an issue of national concern.(1) Strategies to address these concerns include increased funding for physicians' participation in research during graduate medical education (GME) and participation in mentored-K award programs.(2,3) We sought to identify variables associated with GME-research participation and mentored-K award receipt among U.S. medical graduates who planned internal medicine (IM) careers. IM is the most frequent specialty choice of U.S. medical-school graduates(4) and the most prevalent departmental affiliation of mentored-K applicants(3) and awardees.(3,5) Study population: With individualized data from the Association of American Medical Colleges and the National Institutes of Health IMPAC II grants database for a national cohort study of U.S. medical-school matriculants, we analyzed data for 15,209 graduates from 1998-2004 who chose IM specialties and entered GME. Of these graduates, 14,091 (92.6%) had complete data for analysis with follow-up through August 2014. Contextual and other factors: We used multivariable logistic regression models to identify predictors of ≥1 year of GME-research participation and of mentored-K-award receipt from among demographic, academic, research-experiential, and career-intention variables. We report adjusted odds ratios (AOR) and 95% confidence intervals (CI) significant at p<.05. We cannot infer causation from our observational study, and findings may not be generalizable to graduates without MD degrees. Outcomes: Of the 14,091 graduates in our sample, 3,051 (21.7%) participated in ≥1 year of GME research. Graduates who participated in a college laboratory research apprenticeship (AOR=1.13, 95% CI=1.04-1.23) and medical-school research elective (AOR=1.21, 95% CI=1.10-1.34), who were authors on papers submitted for publication during medical school (AOR=1.16, 95% CI=1.06-1.29) and who had research-related (vs. full-time clinical practice) career intentions at graduation (AOR=2.01, 95% CI=1.82-2.22) were each more likely, whereas graduates from underrepresented racial/ethnic minority groups (URM; Black, Hispanic, and Native

American/Alaska Native) were less likely (vs. white) to have participated in ≥1 year of GME research (AOR=0.78, 95% CI=0.68-0.91). Neither gender nor debt at graduation was associated with GME-research participation. Of the 14,091 graduates, 507 (3.6%) were mentored-K awardees, including 314 (10.3%) of 3,051 GME-research participants and 193 (1.7%) of 11,040 non-participants. Graduates who participated in GME research (AOR 3.77, 95% CI=3.10-4.59), medical-school research elective (AOR=1.52, 95% CI=1.18-1.97), medical-school authorship (AOR=1.51, 95% CI=1.21-1.88), and had research-related career intentions at graduation (AOR=4.22, 95% CI=3.08-5.80) were more likely to receive mentored-K awards. Race/ethnicity, gender, and debt were not independently associated with mentored-K award receipt. Findings suggest that interventions to increase physician-scientist workforce diversity are needed at multiple points along the medical-education continuum, before, during and after medical school, to promote and sustain interest in research-related careers among diverse groups of students. We re-iterate the value of interventions during medical school (5,6) to promote greater participation of URM graduates in research during and after GME.

S15: How Graduate School Climate Perpetuates Impostor Syndrome in STEM

Presenter: Devasmita Chakraverty Institution: Washington State University Co-Authors: Donna B. Jeffe

Significance to the UI community: PhD training is complex, time-intensive, and requires significant psychosocial transformation and scientific skill development. Many doctoral students experience feelings of intellectual inadequacy and impostorism (1,2), often manifested as stress, anxiety, self-doubt and an irrational fear of failing. This study aimed to understand how graduate school climate in STEM fields contributes to competent individuals experiencing "intellectual phoniness" (2) or the impostor syndrome. Study population: In this qualitative study, 40 individuals in STEM fields at U.S. academic institutions were interviewed about their experiences of impostorism in graduate school. The sample included 26 women and 14 men (8 Hispanic, 6 Black, 4 Asian, 22 White; 22 PhD students, 10 postdoctoral researchers, 8 faculty), who ranged in age from 20-49. Contextual factors: Following IRB approval, we used purposeful and snowball sampling to recruit participants for a one-on-one, 60-minute, semi-structured Skype interview. We asked open-ended questions about a variety of experiences relating to impostorism. Interviews were audio-recorded and transcribed verbatim for inductive thematic analysis following in-vivo coding of narratives.(3-5) Bracketed comments in quotes were added by the authors to clarify meaning. Outcomes: Most participants first recognized feelings of impostorism during the first year of graduate school, transitioning from more "definable measures of success [in college] to something more undefined." First-generation college students and those without prior research experience developed anxiety because "everybody else starting in my program seemed much more accomplished and much smarter than me." The role of unsupportive advisors was discussed most extensively as a contributor to impostorism. Students felt mistreated by both male and female advisors, especially during periods of low productivity. For female students with children, both male and female PhD advisers blamed them for not making adequate research progress or setting their work priorities right, like it was "more important to get married and have a baby than it was to do research." This led to low confidence and even lack of ownership of one's achievements: "In both cases where I have been first author on a publication, I have felt like I cheated my way through the review process." Students perceived that some advisers were not invested in their success when they "did not stand up for me" during conflicts with other committee members. Female students felt alienated in male-dominated fields (e.g., physics and astronomy) and challenged working with the men. For example, "I barely knew how to code [referring to computer programming]. A lot of the boys already knew how..., and it felt embarrassing to ask for their help." Lastly, impostorism was heightened anytime students felt that they were the "only one" (e.g., the only female, only first-generation college student, or only Black student in the lab or program). Overall, impostor syndrome was attributed to feelings of inferiority that were rooted in explicit external cues and

experiences in graduate school. While qualitative findings are not generalizable, they can create awareness of the effects that graduate school climate can have on students' experiences, and help institutions to create more equitable professional-development opportunities and support for minority students in STEM fields.

Culturally-responsive Teaching & Learning

Location: Salon D

S21: AMP UP - Successful Interventions as Alternatives to Developmental Math

Presenter: Mary Ho **Institution**: Union County College **Co-Authors**: Liesl Jones, and Kessler Mccoy-simandle

Developmental math courses often cost students' time and money without contributing towards a degree. This problem is exaggerated for STEM majors as they have a long math sequence to complete for degree requirements. It has been estimated that approximately $1.3 billion is paid every year for college remediation across all 50 states and the District of Columbia (Jimenez, Sargrad, Morales, & Thompson, 2016). A study utilizing the Achieving the Dream database indicated that less than one half of the students who are referred to remediation actually complete the entire recommended sequence (Bailey, Jeong, & Cho, 2010). Additionally, a majority of states reported that less than 10% of students who entered as remedial students graduated within three years (Complete College America, 2012) - an outcome Union County College would like to prevent for its students. In Fall 2012, more than 59% of Union County College's First-Time Full-Time (FTFT) students were enrolled in at least one developmental (remedial) course. To address this Union County College designed AMP UP, a rigorous randomized controlled trial (RCT), to test alternate approaches to math remediation utilizing low-cost, effective methods. The study's goals are to increase students' college-level math completion rates, as well as retention, graduation and transfer rates. The treatment arm of the AMP UP study removes remedial math courses, but adds interventions to allow for success in college credit-bearing math courses. The participants consist of students who do not meet the college-level math requirements, which traditionally leads to one or two semesters of remedial math courses before entrance into a college-level math course. AMP UP allows students to skip the remedial math courses and take college-level math courses with two specific interventions. These interventions include a weekly tutoring requirement and access to Cengage's MindTap Math Foundations program. All students consenting to AMP UP participation were randomly assigned to control or treatment arms. Control arm participants received no intervention and took developmental math classes. Treatment arm participants were given permission to skip developmental math classes and take a credit-bearing college-level math course on the condition that they attend weekly tutoring sessions. As the study is ongoing, one measure of student success is to compare participants against non-participants, students who were enrolled using traditional pathways. To date, the control participants performed similarly to nonparticipants indicating little to no effect for consenting to participate in the study. Treatment participants who complied with tutoring passed a four-credit college-level math course at similar rates to students assessed as ready for college-level Math. However, treatment participants who did not comply with tutoring had a lower pass rate then non-participating college-ready students. So far, the collected cohorts of AMP UP data demonstrate that students who score low on the Accuplacer (placement criteria for Developmental Math) can succeed in college-level math without taking developmental math courses, if they are provided with and use additional supports. AMP UP strives to create new viable, low cost pathways for assisting under-prepared students towards successful completion of college-level mathematics.

S24: Faculty Identity Development for Culturally Responsive Teaching

Presenter: Tara L.S. Kishbaugh **Institution**: Eastern Mennonite University **Co-Authors**: Lori Leaman

Our STEM programs at Eastern Mennonite University already have features deemed necessary for under-represented minorities (URM) success including: research or internships for all students, small class size, engaged faculty, active learning, yet our programs still suffer from lower retention of URM students. While we don't discount other barriers to success, there appears to be an elusive factor, which we suspect to be related to cultural discomfort that many URM and first-generation students experience when encountering the largely white, western culture or the null curriculum implicit in STEM. Aikenhead and others describe this as multiple border crossings into the culture of our university, the 'micro-culture' of the first-year large-enrollment STEM classroom, and a culture of a reductionist and materialist Western science worldview. To address this issue, faculty must name the implicit, dominant cultures, and invite students to navigate these cultural borders, while honoring their intact cultural identities. Research in STEM pedagogies, as well as the affective experience of STEM students, continues to emerge. Yet few studies examine the intersection of these two aspects: the cultural border crossing that both faculty and students navigate as a vulnerable journey of identity development. Faculty, though experts in their disciplines, are developing an identity as teachers, while students are developing a professional STEM identity. Ironically, both may experience a temporary loss of self-efficacy as they discover what they don't know. Teacher identity development theory is often grounded in the concept of reflective practice, which by nature is a transformative process that includes a willingness to examine one's own assumptions in order to gain new knowledge over time (Borrego& Henderson). Our mixed methods research study outlines a year-long learning experience for faculty, that utilizes a combination of diversity awareness (being) tools and exposure to diversity responsive teaching (doing) practices to assist faculty in envisioning and enacting safe STEM border crossings for their URM students in the classroom. Thus, as part of a NSF-IUSE grant, a cohort of thirteen faculty formed a professional learning community (PLC) which served as the primary reflective intervention: monthly modules provided readings, examples of learning strategies, and an "assignment". We hypothesized that the monthly coffeehouse would provide the reflective space for faculty to iteratively move their focus from teacher-centered to student-centered concerns. In this presentation, we will describe interventions and the data collected and examined from a variety of sources including written reflections and teaching artifacts in order to identify not only changes in instructional practice but also faculty shifts in attitudes, beliefs and views toward the URM student. Preliminary analysis of results from year 1, indicate a shift in faculty perspectives from PLEs (perfectly logical explanations of why students don't succeed) to a more nuanced understanding of the dynamic of culture, beliefs and relationship as a key variable in the success of URM students in the university STEM classroom. The development of a PLC dedicated to diversity responsive teaching is adaptable to many university contexts; it requires faculty willingness to be openly self-reflective with colleagues and an expert facilitator for both cultural and teacher identity development.

S60: Culturally Responsive Assessments of Diverse Students' Skills and Abilities

Presenter: Fahad Suliman Alfaiz **Institution:** University of Arizona **Co-Authors:** Randal Pease, Robert Zimmerman, Uwe Hilgert, and C. June Maker

Identifying creative people from ALL demographic backgrounds who can find solutions to problems we encounter in our world is essential. In addition, STEM competencies are central to contemporary work and life, and students need mastery of these subjects and skills. Academic achievement gaps between various demographic groups continue to persist, and the percentage of students from non-dominant groups who participate in different education programs and pursue STEM careers is not proportional (Carter & Darling-Hammond, 2016). For example, White students consisted of 49% of the overall student population and 57% of the students served in programs for exceptionally talented students, while Hispanic and African American students made up 42% of the student population

and 28% of students in programs for the exceptionally talented.

Traditional methods used to assess students' abilities and identify them for special programs are not appropriate for students from different ethnicities and socioeconomic levels for several reasons, including a heavy emphasis on standardized achievement and aptitude tests; the use of only one assessment method; limitation to a narrow range of cognitive abilities (Gardner, 1992); and omission of factors such as motivation, effort, and creativity (Maker, 2005). Science educators recognize these limitations and agree that performance-based assessments are more effective in measuring high level thinking skills such as applying, evaluating, and synthesizing information to solve complex problems (The National Center for Fair and Open Testing, 2007). Moreover, students of color often have lower scores than White students on multiple-choice tests. Therefore, development and use of new methods that are fair to culturally and linguistically diverse students and students from other underrepresented groups are essential.

The *Cultivating Diverse Talent in STEM* (*CDTIS*) project developed assessments to measure students' abilities and skills in STEM that were considered to be appropriate for culturally and linguistically diverse students and other underrepresented groups. These assessments included performance-based assessments and concept maps to measure students' first and second order knowledge. The assessments included a variety of types of problems to assess both domain specific knowledge and skills and creativity-relevant processes and skills (Amabile, 1983; 2013).

Five high schools in the southwestern United States were the settings for field tests and implementation. The assessments served multiple purposes, such as identifying exceptionally talented students in various groups (e.g., White, Hispanic, Native American, and African American), evaluating STEM curricula, finding strengths and talents of all students, and measuring students' academic growth. Analyses are ongoing, but current results include the following: (a) existing methods limited the diversity of students identified as exceptionally talented and invited to participate in the program; (b) significant differences were found between students identified by the new methods and existing methods in GPA and ethnicity; and (c) the factor structure of the new assessments and their intercorrelations was evidence for their construct validity. Ethnicity differences may have been due to the ethnic makeup of the partner schools where the assessments were being conducted, but GPA differences cannot be attributed to the location of schools. Further research is suggested to (a) examine the capacity of these assessments to predict student performance in college, and (b) investigate the predictive, construct, and concurrent validity of the new assessments to identify exceptionally talented students in STEM.

URM Students and Educators I (Deeper Dive)

Location: Salon E

W22: A Psychosocial Approach to STEM Persistence in an Academic Intervention at an HBCU

Presenter: Cheryl Talley **Institution**: Virginia State University **Co-Authors**: Kara Morrison, Leslie Y. Whiteman, Brian Sayre, and Victoria Davis

Academic stress in college can be daunting for students from under-resourced high schools who choose to major in STEM. A majority of students attending Virginia State University, an HBCU, receive federal financial aid and represent a target population for broadening participation in STEM. Previous findings from VSU suggest that activities that foster resilience, build academic identity, and increase positive academic habits, are useful tools for under-prepared students (Talley et al., 2013). Our intervention, Project Knowledge (PK), has confirmed the heterogeneous nature of HBCU students. High achieving students are more likely to be resilient, practice good academic habits, and have mental/emotional skills to overcome academic challenges (Scherer et al., 2017). PK is effective in increasing course grades by targeting these affective factors and delivering material primarily through academic near-peer mentors (1:5 ratio). PK mentor training consists of a 6-week online program that builds cultural identity, communalism, and servant leadership skills. The training occurs before school starts with additional training provided throughout the school year. The purpose of this study was to use findings from PK research to inform Supplemental Instruction (SI). SI is an internationally recognized academic intervention that uses

collaborative group study to focus on course-specific learning and strategies. The SI program/training materials have been validated by the Department of Education (USDE, 2007) and is utilized on over 3500 college campuses across the U.S. (UKMC, SI, 2017). However, early proponents of SI reported situations in which SI would be less effective (Arendale,1994). One limitation is the need for students who are seeking SI for a particular course to have a pre-requisite skill level. Hence, SI may be less effective for students who do not have prior experience with the content or effective study skills. The PK-SI model uses the relationship with the SI peer leader to help 1st year students adopt academic habits in a supportive environment. The goal is to reduce the stress students may feel in having to learn academic skills and course content simultaneously. In addition, the peer-leaders, who have successfully passed the course, provide validation of the value of the course and the value of learning transferable skills for future course study. Preliminary results indicate that SI Peer Leaders who were previously PK students were better able to use servant leadership components in their SI sessions, increasing the chance of their students self-identifying as successful and capable. When combined with evidence that PK-informed strategies within a co-requisite course helped students outperform non-Biology STEM majors who did not take the co-requisite course; these findings support a model in which both mentors (SI peer leaders) and mentees (1st year students in intro STEM classes) benefit from training that targets affective factors. Current research will help us understand how HBCU's consistently produce an unequal number of STEM graduates. While less than 9% of African American (AA) college students attend HBCUs, 18% of AA STEM majors obtain their degrees from HBCU's. In addition, HBCUs represent 9/10 top institutions that graduate AA students who later earn PhDs. This could be due to the attention given to relationships and the implicit/explicit messages that give students reason to believe they can succeed.

P10: Bias Toward Non-White Primary Care Physicians from Their White Patients: A Systematic Review.

Presenter: Amarette Filut **Institution**: University of Wisconsin-Madison **Co-Authors**: Madelyn Alvarez, and Molly Carnes

A diverse healthcare workforce fosters culturally sensitive providers, greater access to healthcare for the underserved, and a broader research agenda[1]. Currently, 31.4% of physicians described themselves as non-White, including 17.1% Asian, 5.2% Hispanic/Latino, and 3.6% Black/African American[2], and nearly one quarter of the current physician workforce is made up of international medical graduates (IMGs)[3]. The patient-physician interaction is fundamental to an individual's healthcare. Research on patient-physician race discordance has focused almost exclusively on non-White patients being cared for by White physicians, examining quality of care and communication style[4]. Even in the absence of physicians' explicit race bias, the presence of physicians' "implicit bias" in this body of research has been found to adversely influence patient-physician communication and patient trust. Due to efforts to train more physicians from historically underrepresented ethnic/racial minority groups in the U.S., and because the physician shortage is being filled by IMGs, a growing proportion of primary care physicians will be non-White. The experiences and perspectives of non-White physicians caring for White patients has yet to be explored as a potentially relevant factor in physician-patient interactions, patients' health outcomes, or physician well-being. The high prevalence of race bias across the U.S. would predict that White patients hold implicit (or even explicit) bias against racial groups of which their non-White physician may be a member. We conducted a systematic review of the published research on non-White physicians caring for White patients. We searched six databases and authors AF and MA performed independent reviews of the results to determine study eligibility, extract data from the included studies, and assess the quality of the studies. When necessary, author MC served as mediator for any disagreement between AF and MA. We identified 15 studies that examined the experiences of non-White physicians with patients, with 13 of these reporting biased experiences with White patients. These 15 studies assessed perceptions or observations of the patient-physician interaction, however, none assessed clinical outcomes of these interactions between a non-White physician and a white patient. Commentaries cite the need for healthcare systems to develop protocols to guide non-White physicians' response to patients that express explicit race bias, but remain silent on the issue of more subtle implicit bias[5]. We conclude that research is needed on whether non-White physicians experience race bias from their White patients given the growing likelihood that White patients will receive primary care from non-White physician, and if so, how this impacts the patient-physician interaction, clinical outcomes, and physician well-being.

Program Interventions: Mathletics, Role-modeling, & Community Mentoring

Location: Baltimore Theater

D2: Programmatic Mentoring: Providing Mentoring as a Community, Going Beyond Mentor/Protégé Pairs

Presenter: Alan R. Peterfreund **Institution**: SageFox Consulting Group **Co-Authors**: Frank Bayliss, and Kenneth Rath

There is a great deal of evidence to suggest that mentoring, when done right, can make a tremendous difference in promoting the success of underrepresented students in STEM. Because of this, many programs, such as the NIH-funded Training and Workforce Development grants, are based on the model of mentoring provided in the context of a research experience. But it is also the case that these mentoring relationships have their limitations. Mentors can only provide mentoring based on what they know, which may or may not coincide with the needs of their **Protégé**, and some mentors are more accomplished than others. When mentoring is only provided in individual mentor/ **Protégé** pairings, some **Protégé** do not receive the full set of benefits that mentoring has the potential to confer. In this deeper dive, we present a model of mentoring that we have empirically defined, based on programs at San Francisco State University, that takes a broader view of the array of interactions and relationships at an institution that contribute to what we are calling programmatic mentoring. By this, we mean mentoring that is provided synergistically from multiple sources within a training program with a shared goal around student success in research, skills, academic performance, career planning and development and personal growth. We have identified at least six core elements of programmatic mentoring: 1) a mutual trust-based relationship where the program invests in the student and, in turn, the student strives to meet the goals of the program; 2) a program structure that offers numerous opportunities for mentoring to occur with different people representing different expertise; 3) common goals around supporting student success; 4) mentoring activities and experiences are synergistic such that they build upon each other: 5) a community expectation develops that all, including the students, will be called upon to be mentors; and 6) mentoring that occurs beyond the period of the program participation. Our presentation will review the framework we have proposed and the evidence from student, alumni and faculty/research advisor surveys that led to this framework. During the deeper dive discussion, we will promote a discussion centered on the following questions: 1) What are the various manifestations of programmatic mentoring? We have focused on only one case, although we are aware these conditions are present at many other institutions. 2) How does successful programmatic mentoring affect faculty members and departments? And 3) What is the role of the community and how does the community fit into supporting the individual and helping them succeed?

D5: Role Modeling: A viable retention strategy for undergraduate women in STEM

Presenter: Paul R. Hernandez **Institution**: West Virginia University

There is increasing recognition that the U.S. can only meet its national scientific innovation goals by developing a diverse and inclusive science, technology, engineering, and mathematics (STEM) workforce. However, a number of STEM disciplines, including Earth Systems

and Environmental Sciences (ESES) have shown a persistent gender gap over the last decade. The current study examines the impact of PROmoting Geoscience Research, Education, and SuccesS (PROGRESS), a novel theory-driven role modeling and mentoring program aimed at supporting first- and second-year college women interested in ESES-related degree and career pathways. We use a longitudinal prospective multi-site quasi-experimental design to compare female STEM majors in PROGRESS to a propensity score matched control group (N = 380). Consistent with the study design, PROGRESS members identified more female STEM career role models than controls (60% vs. 42%, respectively). A multilevel modeling analysis revealed that the number of female STEM career role models supported persistence in ESES-related majors at follow-up. In addition, the analysis revealed that holding an ESES-related major at baseline moderated the impact of PROGRESS. Among participants with an ESES-related major at baseline, PROGRESS members exhibited significantly higher rates of persistence in an ESES-related major at follow-up compared to controls (95% vs. 73%). However, there was no difference between persistence rates of PROGRESS members and controls with nonESES-related STEM majors at baseline. The results have implications for role modeling and informal support programs for women in STEM.

D9: Making Mathematics Socially Relevant through a Sports Data Analytics Program

Presenter: Lawrence Clark **Institution**: University of Maryland **Co-Authors**: Stephanie Timmons Brown

Mathletics: Learning Statistics and Data Analytics through Sports Focus of Study--The collegiate and professional sports industries in the United States have complicated the social and academic identity development of America's youth by making athletes prominent symbols of American achievement and social status (Hoberman, 1997). African American and Hispanic students, in particular, receive the misguided message very early that, despite a few notable exceptions, individuals in their communities may excel in sports, but not in math and science. In response to this phenomenon, faculty at the University of Maryland designed, and implemented an intervention for middle school students titled Mathletics. Mathletics aims to explore the following two questions: â— How do coherent sets of experiences effectively and efficiently support student competency (e.g. knowledge, skills), motivation and persistence for productive participation in the STEM and STEM cognate workforce of today or in the future? â— Given the shifting demographics reflected in our current classrooms and in our country, what are effective and productive ways to ensure broadening participation by engaging diverse underrepresented populations in STEM programs and careers? Over a five-year period, Mathletics has engaged 175 African American and Hispanic middle school aged boys and girls in a series of summer activities that 1) build their knowledge of statistics concepts and the data science process, 2) increase their motivation and interest in advanced mathematics and statistics courses in high school and college, and 3) expose them to STEM careers, particularly in the cognate area of statistics and data analytics. Through a series of interactions with the UM Athletics Department, Mathletics participants are immersed in the rapidly-growing world of data-driven sports performance and decision management, and learn to use sports performance data analysis software and video analysis software throughout the MADAC experience. Methodology--We hypothesized that through engagement in Mathletics activities, participants will increase competency in basic statistics concepts and the design science process, increase interest, efficacy, and performance in future STEM courses, and come to see future STEM careers as congruent with their future identities. Mathletics instructors administered three pre- and post- measures assessing participants' understanding of statistical concepts and the application of statistical reasoning and attitudes toward STEM and STEM careers. The statistical concepts assessment consisted of 25 multiple choice questions covering the following topics: statistical testing, visualizing data, distinguishing between qualitative and quantitative data, the data science process, and making sense of graphs. Results Analyses revealed that, on average, students' post-test scores (M = 15.35, SD = 3.71) are statistically significantly higher than their pre-test scores (M=11.74, SD= 3.62), showing a large effect size (r = 0.83) (t = 6.92, p < 0.000). The most recent Mathletics data is currently under analysis. Questions/issues to be discussed: Camp structure and activities Focus group results Staff reflections Developing technological tools specifically for Mathletics Next steps.

12:00 pm – 2:00 pm Luncheon and Plenary III

Calvert Ballroom Salon C

Presentation of Intervenor and Adolphus "Tol" Toliver Awards

"The Decade Ahead:" Panel Discussion with Members of Understanding Interventions Advisory Committee -Calvin Briggs, Kelly Mack, John Matsui, Lydia Villa-Komaroff

Plenary III

Early Research and Mentoring Experiences: A Social Influence Model for Integrating First-Generation Students into STEM

Presenter: Michelle Williams **Institution**: University of Connecticut **Co-Authors**: Sharon Y. Lee, Paul R. Hernandez, Crystal Park, V. Bede Agocha, and Lauren M Carney

Considerable research has focused on understanding factors that predict and/or facilitate student success and persistence in STEM related fields, especially among underrepresented groups, such as women, minorities, and first generation students. The Tripartite Integration Model of Social Influence (TIMSI), has shown that three social influence processes (scientific efficacy, scientific identity, and internalization of scientific community values), predict minority student integration into the scientific community (Estrada, Woodcock, Hernandez, & Schultz, 2011; Kelman, 2006). Further, research and mentoring experiences predict the positive development of efficacy, identity, and values among minority STEM majors (Estrada, Hernandez, & Schultz, In press). In this study, we extend the TIMSI model to a diverse sample of incoming first-year STEM majors at a research intensive university in the northeastern U.S. A sample of 695 first year students in a STEM major was drawn from a larger study of student success - The UConn Success Study. The UConn Success Study is an ongoing longitudinal panel study of all first year students enrolling at the University of Connecticut in the fall of 2015. Analysis of demographics showed that the sample evenly split by gender (49% female), 13% self-identified as a racial or ethnic minority (e.g., African American), and 23% self-identified as first-generation college students. We sought to determine the degree to which first-year research experiences (measured in spring semester of year-1) predicted the development of science efficacy, identity, and values over the first two years of college (measured year-1 fall, year-1 spring, year-2 spring). We also examined the moderating effects of ethnic/racial minority status, female status, and first-generation status. Analyses were conducted in a two-level multilevel growth curve models. The present findings focus on science identity development. Growth curve analyses revealed a quadratic trend. For example, science identity declined over the year-1, with a small positive bounce back in year-2. However, the growth trend was moderated by mentoring, research experiences, and first-generation status. For all students, higher levels mentor support (measured by the size of the student's mentoring network), were associated with a stable science identity in year-1 (as opposed to decline) and positive growth in year-2. In addition, higher levels of research experiences (measured by the number of curricular and co-curricular research experiences over the first year) were associated with less decline in science identity in year-1. However, moderation analysis showed that research experiences were particularly beneficial for first-generation students, that is, first-generation STEM majors showed larger growth in science identity in year-2 due to research experiences. These findings extend research on the TISMI model to a diverse sample of college students over the first two year of college. The findings indicate that early interventions focused on mentoring and research experiences are important factors in slowing the steep decline in science identity in the first year of college. And early research experiences appear to be particularly important for integrating first-generation students into STEM disciplines.

2:15 pm-3:45 pm Concurrent Symposia and Deeper Dives

Removing Institutional Barriers at the Graduate Level

Location: Salon A

S33: Evolution Toward Holistic Review in the Ecology Graduate Program at UC Davis - Part I: Design and Implementation of a System to Evaluate Applicants

Presenter: Steven P Lee **Institution**: University of California, Davis **Co-Authors**: Jan Ng, Ash Theodore Zemenick, Mikaela M Provost, Carlos Abraham Ruvalcaba, Derek Jon Nies Young, Emilio Laca, Michael J Koontz, Jessica Rudnick, and Elizabeth J Sturdy

As the scientific and societal problems of today's world grow in complexity and scope, the demand for innovative thinking, collaborative partnerships, and diverse perspectives also grows. This simultaneous challenge and opportunity requires graduate science programs to think critically about how to recruit and train individuals who are prepared to take on these problems. While more diverse groups of scientists working on complex problems can contribute more creative solutions and achieve higher goals (Glazer and Bankston 2014), historic and structural biases in academia have restricted access and support for many underrepresented groups to engage fully in science. Traditional admissions processes for these programs also perpetuate this bias further, relying on outdated metrics that often demonstrate access to resources and opportunity, rather than true ability. Thus, it is essential to understand how admissions processes can be transformed to attract, measure, and value diversity in candidates applying to science graduate programs. We present a case study on the evolution of a holistic admissions review process in the Graduate Group in Ecology at the University of California, Davis. Holistic review is a process that permits inclusion of broader, sometimes non-traditional criteria identified as important by an institution. It encourages applicants to express their potential and desire to grow as scientists based on their full experiences, rather than simple numeric qualifiers. It likewise encourages admissions committees to reduce implicit biases and broaden the framework by which candidates are evaluated. Our ecology graduate program is in its third year of implementing a novel holistic review process for admitting PhD and Master's students. We share this with the UI community as an example of a collaborative admissions system, including a method for institutions to determine the relative weights of multiple holistic admissions criteria. We explain our process toward developing a holistic review approach, including these steps: (1) open collaborative work with faculty, graduate students and staff; and (2) the design and implementation of a new system to evaluate applicants. Faculty, graduate students and diversity officers worked together to modify the application review process. In the historic admissions process, a single 10-point score had been used to evaluate applicants, with criteria largely left to the subjective opinions of reviewers. In implementing holistic review, a detailed rubric for the 10-point score was added, as well as an explicit set of scores for eight traits. Traits were selected based on literature identifying personal qualities that correlate with success in graduate science education (McGee and Keller 2007; Moneta-Koehler et al. 2017; Hall et al. 2017). After all applications were reviewed, trait scores were weighted in their inclusion to an applicant's final score based on a model reflecting the cumulative scoring behavior of reviewers. We share early results of this process, finding that traits of research/work experience, academic marks, creativity, and diversity of experience were most highly valued by review committee members. This session is Part I of a two-part series. Part II will present an evaluation of the new system by application reviewers, and place the results of the admissions process in the context of previous years.

S34: The Evolution Toward Holistic Review in the Ecology Graduate Program at UC Davis - Part II: Methods for Evaluating Progress

Presenter: Jan Ng **Institution**: University of California, Davis **Co-Authors**: Michael J Koontz, Jessica Rudnick, Elizabeth J Sturdy, Ash Theodore Zemenick, Steven P Lee, Mikaela M Provost, Carlos Abraham Ruvalcaba, Derek Jon Nies Young, and Emilio Laca

We present two important components of implementing holistic review in the UC Davis graduate ecology program's admissions process as Part II of our case study: results from a survey of admissions reviewers responding to the new holistic review system, and results from an analysis of student demographics through time. These contextual pieces are a means of self-assessment on the part of

our graduate program, and are likely to be easily adaptable by other institutions. Designing a successful holistic review system is an exercise in balancing two potentially opposing forces: the selection of criteria to enable comprehensive and effective evaluation of applicants (which can lengthen the review process), and the selection of criteria that are clear, expedient, and feasible for reviewers on the admissions committee (which can shorten the review process) (Addams et al. 2010, Glazer and Bankston 2014). The former is addressed in Part I of our case study. The latter, regarding overall feasibility of the new system, is addressed here and is critical for acceptance by reviewers of a greater burden of effort. In order to assess reviewer reactions to this greater burden of effort, we solicited feedback on all aspects of the admissions process via a survey immediately following submission of admissions scores in winter-spring 2017. We found that some groups (students, new faculty reviewers, reviewers who attended trainings on implicit bias and holistic review) tended to have consistently positive impressions about the use of the newly-implemented holistic trait scores, whereas other groups (senior faculty reviewers, reviewers who did not attend workshops) had a more even spread of positive and negative impressions. For most reviewers, scoring using the holistic traits informed their decision of overall score for an applicant. The majority of reviewers also supported the continued use of holistic review. Although it is too early to assess the effects of holistic review on diversity in our graduate program, the components reported here allow us to evaluate, track, and aid our progress as well as to build on previous work spearheaded by current and former graduate students (Emam et al. 2013). We coded multiple variables of diversity for applicants to our program from 2004-2017, and have begun to track their change through time. Here, we present the results for one of our most visible variables: race and ethnicity. Evaluating the representation of applicants across three stages of admissions (application submitted, applicant admitted, decision to enroll) can help to identify areas of the recruitment and admissions process to be improved. We analyzed the representation of applicants from different racial and ethnic backgrounds across these three stages for the most recent 13 years to compare the proportion of individuals from underrepresented groups (URG) advancing from each stage. Historically, the representation of URG was more likely to decrease than increase across the three stages. The year involving the first full implementation of holistic review was substantially different, however, with representation of URGs across pools showing an increasing trend.

S58: Institutional Interventions that Remove Barriers to Recruit and Retain Diverse Biomedical PhD Students

Presenter: Marenda A. Wilson-Pham, PhD **Institution**: The University of Texas MD Anderson Cancer Center **Co-Authors**: Andrew Bean, PhD, and Anthony DePass, PhD

The national effort to address the issue of diversity in the scientific workforce has focused on leveraging the higher interest in science seen in underrepresented students at the K-12 levels to enhance participation and persistence levels of students as undergraduates. Research Intensive institutions, with support from funding agencies, have targeted recruitment and retention as the major targets for increasing the numbers of graduate and professional degrees awarded to underrepresented populations in the sciences (women, ethnically diverse groups, individuals with disabilities, cultural backgrounds) (Mervis, 2016; "Notice of NIH's Interest in Diversity," January 12, 2015; NSF, 2014; Valantine & Collins, 2015). However, the state of representation at these institutions suggests that these initiatives have failed to accomplish their objectives across underrepresented populations. Racial and ethnic underrepresented minorities (URMs) remain disproportionately low within the scientific workforce (13%), especially as faculty at research institutions (4%) (Gibbs et al., 2016; Gibbs, McGready, Bennett, & Griffin, 2014; Heggeness et al., 2016; Women, Minorities, and Persons with Disabilities in Science and Engineering: 2017, 2017). Furthermore, funding rates for URM scientists are significantly lower than funding for the research of well-represented scientists (Ginther et al., 2011). The decreased numbers of URMs represented in STEM and their disproportionally lower funding rates, along with their lower level of interest in pursuing faculty positions at academic research institutions (Gibbs et al., 2014),

presents a challenge to diversity in STEM and an opportunity for change. While models provide explanations for when and where URMs divert from the STEM academic pathway, there is a disconnect between these models and analyses of interventions that are thought to reduce attrition in STEM careers (Allen-Ramdial & Campbell, 2014) (Whittaker & Montgomery, 2012) (Koenig, 2009). Additionally, data measuring outcomes of URMs in STEM education generally lack a clear description of what, if any, interventions or barriers have played a role in the outcomes reported. These observations highlight the need for deliberate and detailed assessments of the effects of such interventions at the graduate level to allow scaling of successful interventions aimed at addressing three major challenges in the biomedical sciences. We have measured the effectiveness of specific interventions implemented in the recruitment, admissions, and retention processes at The University of Texas MD Anderson Cancer Center UT Health Graduate School of Biomedical Sciences (GSBS) on long-term URM student outcomes over a 10-year period. The data presented show that these interventions are successful at reducing the attrition rates of URMs at the graduate school, and moreover that these interventions have resulted in increased numbers of URM graduates that have remained in research and science-related careers. This strategy can also serve as a scalable and sustainable model to maximize efforts focused on increasing participation of URMs in the biomedical sciences by reducing attrition at key transition phases: pre-doctoral to doctoral, pre-candidacy to post-candidacy, and postdoctoral training to employment periods.

An Institutional Approach to STEM Student Success at The College of New Jersey: Barriers, Pedagogy, and Culture Change

Location: Salon B

S23: An Institutional Approach to Inclusion and Student Success in STEM at The College of New Jersey

Presenter: Jeffrey M. Osborn **Institution**: The College of New Jersey **Co-Authors**: J. Lynn Gazley, and Wendy L. Clement

The College of New Jersey (TCNJ) is a public, primarily undergraduate institution serving nearly 6,500 full-time undergraduate students, 30% of whom are self-described as members of groups traditionally underserved in STEM. The School of Science at TCNJ comprises five academic departments (Biology, Chemistry, Computer Science, Mathematics & Statistics, and Physics), which offer an array of interdisciplinary programs, serve approximately 1,200 undergraduate majors, and teach nearly 16,000 students annually in a broad range of major, support, and liberal learning courses. As a public institution, TCNJ has an inherent commitment to providing access and a pathway to success for all students. We strive to build a community composed of people with diverse backgrounds, perspectives, and abilities in order to promote learning and engagement. Achieving this goal requires that all students view TCNJ as a welcoming and inclusive learning community. It also means that quantitative measures of student success are strong and equitable across our student population. This symposium will provide an overview for how TCNJ has taken a holistic, institutional approach to inclusion and student success. The discussion will be framed by three presentations. The first presentation, "Barriers to Success: Understanding the Student Experience," will describe how we have worked to understand our students and our institutional barriers. The presentation will describe a mixed-method, longitudinal research project to learn how students identify, use, and deploy resources from their environment to inform their science identities and support healthy resilience strategies that help them succeed at TCNJ and as STEM majors. Next, in "Enhancing Learning for All: Reflection, Redesign, and Change in Our Biology Pedagogy and Course Goals," we will describe how we have worked to understand the impact of our pedagogy and course design on student success. This session will describe how we holistically redesigned our critically important first-semester biology course. This new course was backward-designed, focuses on discovery and the process of science, uses a pedagogy centered on scientific teaching and creating an inclusive classroom and laboratory environment, and employs both pre- and post-course assessments. The final session, "Becoming Student Ready: Transforming Institutional Structures and Cultures to Support Success for All Students," will describe how we have been working to holistically address the structural and cultural barriers that cut across the institution in order to close opportunity and achievement

gaps. We will describe efforts in an array of interconnected areas, including: course and curricular structure and design; pedagogy, assessment strategies, and student evaluation; mentoring and academic advising; research and scholarship; faculty recruitment, recognition, and reward; communications and interactive dialogue; and revisions to key documents. Each of the presentations will discuss what has worked, what has not, ongoing implementation opportunities and challenges, and lessons-learned from our experiences. Symposium participants will have ample time to engage with the presenters and to share their experiences and best practices from their own campuses.

S17: Enhancing learning for all: reflection, redesign and change in our biology pedagogy and course goals

Presenter: Tracy L. Kress **Institution**: The College of New Jersey **Co-Authors**: Wendy L. Clement

The College of New Jersey fits the national trend of increasing diversity in our classrooms, and we also have observed decreasing student success as measured by DFW rates among our biology students. The Department of Biology therefore recognized a need for change in our curriculum. We began with a process of self-reflection by utilizing the PULSE (Partnership for Undergraduate Life Science Education) Vision and Change rubrics (1,2) to assess coverage of the concepts and competencies put forth in Vision and Change in Undergraduate Biology Education. We identified areas for revision in our curriculum, and through a series of focused departmental discussions we proposed models for change. One substantial reform was the revision of our introductory biology course to better integrate concepts and competencies identified by our self-assessment, and to incorporate best practices in scientific teaching. The student-centered, evidence-based pedagogies in scientific teaching are a well-established means to enhance student learning and retention, and they incorporate strategies that improve learning gains for students from diverse backgrounds (3). The course was backward-designed starting with the entire department defining a set of learning goals through iterative faculty discussion. Once the learning goals were fully endorsed by the department, the initial two instructors developed the specific learning objectives and designed the course activities and assessments to meet the learning goals and objectives. The redesigned course includes "class meeting" periods that minimize lecturing and instead focus on student-centered activities and the use of primary literature to drive student learning. The activities are tied to clearly communicated learning objectives, with frequent informal, in-class, formative assessments that allow the instructors and students to detect and correct misconceptions. Summative assessments (e.g., quizzes, exams) are closely aligned with the objectives and mirror the classroom learning activities. The laboratory portion of the course, which we call a "focus group", is comprised of several multi-week, hypothesis-driven research projects in which students develop skills in formulating hypotheses, designing and implementing experiments, and communicating science. Two additional key aspects of course redesign are continual faculty development and the use of undergraduate course assistants to enhance student learning in focus group. To assess the effectiveness of the new course, we use the CURE (Classroom Undergraduate Research Experience) student experience survey (4) and the EDAT (Experimental Design Ability Test; 5), which measures student gains in scientific thinking and experimental design. We also continue to monitor the DFW rates of our biology students and are examining benefits from the use of course assistants in the classroom. Given the success of the new course, other faculty members are now incorporating scientific teaching into other biology courses and we are working with other STEM departments at TCNJ to share best practices and our lessons learned.

S18: Barriers to Success: Understanding the Student Experience

Presenter: J. Lynn Gazley **Institution**: The College of New Jersey **Co-Authors**: Suriza Van der Sandt, Sudhir Nayak, S. Monisha Pulimood, and Benny C. Chan

At The College of New Jersey, faculty from the School of Science have partnered with the institutional Educational Opportunity Fund

(EOF) program to revitalize the existing STEM Summer Scholars bridge program in order to increase the success rates of students coming from low-income backgrounds. With funding from the National Science Foundation (Award # 1525109), TCNJ's FIRSTS project (Foundation for Increasing & Retaining STEM Students) allowed the team to enhance the summer curriculum and conduct a mixed method, longitudinal research project to both evaluate the program and conduct basic, transferable research on how students persist and succeed in STEM majors. The Summer Scholars program design builds on national best practices through a theory-driven approach, drawing on social science research that suggests a robust "science identity" plays an important role in STEM persistence, particularly when taking into account the ways that gender, race, and ethnicity can shape students' engagement and aspirations (Chang et al. 2011; Tonso 2006). A science identity comprises multiple domains that develop at different rates depending on individual experiences and access to resources (Gazley et al. 2014). Such resources for identity formation include cultural capital—the knowledge and ways of being that people use to thrive in different social arenas—and may be cultivated through appropriately designed and executed interventions that provide a "practice space" where students can exercise new skills (or new uses of old skills) (Ovink and Veazey 2010). Our data collection focuses on how students identify, use, and deploy resources from their environment to inform their science identities and support healthy resilience strategies that help them succeed in college and as STEM majors. This rich dataset allows us to compare "thriving" (GPA >3.25 in a STEM major) and "persisting" (GPA <3.0 in a STEM major) students, rather than simply focusing on students who have transferred out of STEM. For this presentation, we use qualitative analysis of interviews with students at the beginning and end of their first years to identify the barriers students face and successful (and unsuccessful) resilience strategies students employ to navigate these barriers. We then contextualize student experiences within the broader pattern of student success at the College using quantitative data and interviews with non-program students who have left STEM majors.

S20: Becoming Student Ready: Transforming Institutional Structures and Cultures to Support Success for All Students

Presenter: Jeffrey M. Osborn **Institution**: The College of New Jersey **Co-Authors**: Wendy L. Clement, Mosen Auryan, Angela M. Capece, LaMont Rouse, Janet A. Morrison, Laurel Leonard, Jennifer Sizoo, Donald J. Hirsh, Erin Jo Tiedeken, S. Monisha Pulimood, J. Lynn Gazley, Kerri T. Tillett, Karen Clark, and Benny C. Chan

With initial funding from the National Science Foundation, we have created new programs to provide scholarships, mentored research experiences, and coordinated support programs to undergraduates who are typically underrepresented in STEM. For example, the graduation rate for our PERSIST Scholars rose to 88%, with especially significant gains for African-American students (49% to 95%) and Hispanic students (71% to 100%). Despite the successes of these cohort-focused programs, all of our students do not benefit from these interventions. This session will describe how we have been working holistically across The College of New Jersey (TCNJ) to address our institution's structural and cultural barriers to student success, and to close opportunity and achievement gaps. We will describe efforts in an array of interconnected areas, including: course and curricular structure and design; pedagogy, assessment strategies, and student evaluation; mentoring and academic advising; research and scholarship; faculty recruitment, recognition, and reward; communications and interactive dialogue; and revisions to key documents. To better identify and develop an understanding of barriers within the School of Science, we created a Task Force focused on equity, inclusion, and changes in demographics and learning styles. The Task Force is charged with distilling the locally tested and tailored best practices identified through program-level and course-level innovations into recommendations for both focused interventions and sustained structural changes that help reduce outcome gaps. The recommendations focus on three domains: (a) Our role in course design and delivery, (b) Our interactions with students, and (c) Our understanding of students and their whole selves. For example, we have holistically redesigned our first-semester biology course. This foundational course was backward-designed, focuses on discovery and the process of science, uses a pedagogy centered on scientific teaching and creating an inclusive classroom and laboratory environment, and employs both pre- and post-course assessments. We are working to expand this model across all of our first- and second-year courses in a coordinated way across the School of Science. Through significant recruitment efforts and new hiring protocols, we have increased the percentage of women

faculty in the School of Science to 43%. To help further diversify our faculty, all our School of Science advertisements for faculty positions now require submission of a "Statement of Commitment to Inclusivity and Diversity" from each applicant. We have also worked to sustain, scale, and create new and expanded programs for our faculty. Among other mechanisms for substantive dialogue, we have a coordinated meeting schedule across the institution, and we use monthly School-wide and departmental meetings for interactive discussions and speakers focused on student success. We have updated our institutional mission, vision, core values, and strategic plan to emphasize TCNJ's commitment to inclusiveness and diversity, and to bring these front-and-center within our pivotal institutional documents. Moreover, we have included new language in our institutional tenure & promotion document to articulate how TCNJ values, recognizes, and rewards inclusion and diversity in these critically important processes for our faculty. We have also created a campus-wide Diversity Council within TCNJ's formal governance system.

Comparison of Mentor Training Efforts across the Diversity Program Consortium (Deeper Dive)

Location: Salon E

D16: Comparison of Mentor Training Efforts across the Diversity Program Consortium

Presenter: Lourdes R. Guerrero **Institution**: University of California, Los Angeles (UCLA)

Overview Abstract: The National Institute of Health's Diversity Program Consortium (DPC) is developing and implementing innovative approaches to strengthen institutional capacity to engage individuals from diverse backgrounds and help them prepare for and succeed in biomedical research careers. The DPC is determining the effectiveness of these approaches for implementation and dissemination at a variety of post-secondary institutions. These novel experiments move beyond existing programs and paradigms to support transformative approaches to student engagement, research training, mentoring, faculty development, and infrastructure development. Considering the important role of mentoring to the above-described goal, implementation of effective mentor training across diverse institutions is key to establishing and sustaining solid mentoring relationships. The NIH/DPC currently supports ten BUILD programs around the country attempting to affect the persistence of diverse scholars in biomedicine through, among other approaches, effective mentoring. Of those ten sites, seven are participating in this proposal to compare and contrast the nature of their mentor training activities as they relate to their unique institutional environments. These schools represent a wide range of institutions. The goal of the proposed deeper dive session is to highlight and compare effective approaches to mentor preparation among the diverse BUILD institutions and to understand the contextual factors that influence their effectiveness. Descriptions and results shared in the session will allow others to make informed decisions about implementing particular mentoring practices at their institutions. The three presentations that comprise this deeper dive are: Comparison of Mentor Training Efforts across the Diversity Program Consortium (presenters: Lourdes Guerrero and Avis Jackson), Comparison of Mentor Training Methods across the Diversity Program Consortium (presenters: Tiera Coston, Andrew Feig and Kelly Young) and Comparison of Mentor Training Assessment Models across the Diversity

Program Consortium (presenters: Christine Pfund and Alejandra Priede)

D7: Comparison of Mentor Training Models across the Diversity Program Consortium

Presenter: Lourdes R. Guerrero **Institution**: University of California, Los Angeles (UCLA) **Co-Authors**: Alejandra Priede, Christine Pfund, Tiera S. Coston, and Kelly Young

The National Institute of Health's Diversity Program Consortium (DPC) is developing and implementing innovative approaches to strengthen institutional capacity to engage individuals from diverse backgrounds and help them prepare for and succeed in biomedical research careers. The DPC is determining the effectiveness of these approaches for implementation and dissemination at a variety of post-secondary institutions. These novel experiments move beyond existing programs and paradigms to support transformative approaches to student engagement, research training, mentoring, faculty development, and infrastructure development. Considering the important role of mentoring to the above-described goal, implementation of effective mentor training across diverse institutions is key to establishing and sustaining solid mentoring relationships. The NIH/DPC currently supports ten BUILD programs around the country attempting to affect the persistence of diverse scholars in biomedicine through, among other approaches, effective mentoring. Of those ten sites, seven are participating in this proposal to compare and contrast the nature of their mentor training activities as they relate to their unique institutional environments. These schools represent a wide range of institutions. The goal of the proposed deeper dive session is to highlight and compare effective approaches to mentor preparation among the diverse BUILD institutions and to understand the contextual factors that influence their effectiveness. Descriptions and results shared in the session will allow others to make informed decisions about implementing particular mentoring practices at their institutions. Participants will be presented with a descriptive comparison of the individual mentor training program components, including (1) identification, recruitment and selection of mentors; (2) mentor training approaches; and (3) methods for assessing the effectiveness of these activities. Preliminary analysis of the site-level programs show significant variation in the type of mentors engaged in mentoring (but we will focus on faculty mentoring of undergraduate students) and varying roles for those mentors, as well as different recruitment methods (with some programs requiring faculty researchers to undergo an application processes while others are sent individual invitations to participate). The training methods range from online coursework to full-day workshops. Assessment activities include post-program evaluations of various sorts. In light of the information presented, participants would be encouraged to consider and discuss: (1) Which components of the DPC approaches to improving mentoring can be incorporate into their institutional/programmatic efforts? (2) What long-term effects would/can be expected from mentor training efforts at their campus and what tracking (assessment) mechanisms should be implemented to show effectiveness of these efforts at their campus? (3) How can diversity and equity issues be addressed in their mentor training efforts? and (4) What aspects of the DPC training programs a) are most necessary at their campus and b) can be implemented within the next year? Participants will be provided with a worksheet that compares the individual mentors training programs across the DPC, lists best practices, and guides them to develop a 'Mentor Training Implementation' action plan.

D17: Comparison of Mentor Training Efforts across the Diversity Program Consortium

Presenter: Lourdes R. Guerrero **Institution**: University of California, Los Angeles (UCLA) **Co-Authors**: Avis Jackson

The National Institute of Health's Diversity Program Consortium (DPC) is developing and implementing innovative approaches to strengthen institutional capacity to engage individuals from diverse backgrounds and help them prepare for and succeed in biomedical

research careers. The DPC is determining the effectiveness of these approaches for implementation and dissemination at a variety of post-secondary institutions. These novel experiments move beyond existing programs and paradigms to support transformative approaches to student engagement, research training, mentoring, faculty development, and infrastructure development. Considering the important role of mentoring to the above-described goal, implementation of effective mentor training across diverse institutions is key to establishing and sustaining solid mentoring relationships. The NIH/DPC currently supports ten BUILD programs around the country attempting to affect the persistence of diverse scholars in biomedicine through, among other approaches, effective mentoring. Of those ten sites, seven are participating in this proposal to compare and contrast the nature of their mentor training activities as they relate to their unique institutional environments. These schools represent a wide range of institutions. The goal of the proposed deeper dive session is to highlight and compare effective approaches to mentor preparation among the diverse BUILD institutions and to understand the contextual factors that influence their effectiveness. Descriptions and results shared in the session will allow others to make informed decisions about implementing particular mentoring practices at their institutions. Through the Deeper Dive Part 1, we will share analyses of the site-level programs, showing how these programs can positively impact issues of equity and diversity, the variation in the type of mentors engaged in mentoring, followed by a discussion of the variety of mechanisms used to train faculty who mentor undergraduate students. In light of the information presented, participants would be encouraged to consider and discuss: (1) What aspects of the DPC training programs are most necessary at their campus? (2) How can diversity and equity issues be addressed in their mentor training efforts?

D18: Comparison of Mentor Training Methods across the Diversity Program Consortium

Presenter: Tiera S. Coston **Institution**: Xavier University of Louisiana **Co-Authors**: Kelly Young, and Andrew Feig

The National Institute of Health's Diversity Program Consortium (DPC) is developing and implementing innovative approaches to strengthen institutional capacity to engage individuals from diverse backgrounds and help them prepare for and succeed in biomedical research careers. The DPC is determining the effectiveness of these approaches for implementation and dissemination at a variety of post-secondary institutions. These novel experiments move beyond existing programs and paradigms to support transformative approaches to student engagement, research training, mentoring, faculty development, and infrastructure development. Considering the important role of mentoring to the above-described goal, implementation of effective mentor training across diverse institutions is key to establishing and sustaining solid mentoring relationships. The NIH/DPC currently supports ten BUILD programs around the country attempting to affect the persistence of diverse scholars in biomedicine through, among other approaches, effective mentoring. Of those ten sites, seven are participating in this proposal to compare and contrast the nature of their mentor training activities as they relate to their unique institutional environments. These schools represent a wide range of institutions. The goal of the proposed deeper dive session is to highlight and compare effective approaches to mentor preparation among the diverse BUILD institutions and to understand the contextual factors that influence their effectiveness. Descriptions and results shared in the session will allow others to make informed decisions about implementing particular mentoring practices at their institutions. Through the Deeper Dive Part 2, the participants will be presented with detailed descriptions of the individual mentor training approaches, including: (1) identification, recruitment and selection of mentors; (2) ideas for structural organization of larger scale mentor training programs, and (3) mechanisms to institutionalize training programs. In light of the information presented, participants would be encouraged to consider and discuss: (1) What aspects of the DPC mentor training programs can be implemented within the next year? (2) Which components of the DPC approaches to improving mentoring can be incorporated into their longer term institutional/programmatic efforts? (3) What challenges and opportunities exist at their campus to develop a large scale mentor training program. Participants will be provided with a worksheet that compares the individual mentors training programs across the DPC, lists best practices, and guides them to develop a 'Mentor Training Implementation' action plan.

D20: Comparison of Mentor Training Efforts across the Diversity Program Consortium - Different Approaches

Presenter: Christine Pfund **Institution**: University of Wisconsin-Madison

The National Institute of Health's Diversity Program Consortium (DPC) is developing and implementing innovative approaches to strengthen institutional capacity to engage individuals from diverse backgrounds and help them prepare for and succeed in biomedical research careers. The DPC is determining the effectiveness of these approaches for implementation and dissemination at a variety of post-secondary institutions. These novel experiments move beyond existing programs and paradigms to support transformative approaches to student engagement, research training, mentoring, faculty development, and infrastructure development. Considering the important role of mentoring to the above-described goal, implementation of effective mentor training across diverse institutions is key to establishing and sustaining solid mentoring relationships. The NIH/DPC currently supports ten BUILD programs around the country attempting to affect the persistence of diverse scholars in biomedicine through, among other approaches, effective mentoring. Of those ten sites, seven are participating in this proposal to compare and contrast the nature of their mentor training activities as they relate to their unique institutional environments. These schools represent a wide range of institutions. The goal of the proposed deeper dive session is to highlight and compare effective approaches to mentor preparation among the diverse BUILD institutions and to understand the contextual factors that influence their effectiveness. Descriptions and results shared in the session will allow others to make informed decisions about implementing particular mentoring practices at their institutions. Through the Deeper Dive Part 3, the participants will be presented with detailed descriptions of the methods for assessing the effectiveness of the mentor training activities. In light of the information presented, participants would be encouraged to consider and discuss: (1) What long-term effects would/can be expected from mentor training efforts at their campus (2) What tracking (assessment) mechanisms should be implemented to show effectiveness of these efforts at their campus?

Curricular Experiments in 4-Year Institutions II

Location: Baltimore Theater

S39: Developing a Model of Retention in the Biological Sciences: A Precursor to Creating Effective Interventions

Presenter: Daniel Baltz **Institution**: University of Minnesota - Twin Cities **Co-Authors**: Anita Schuchardt, Ph.D., Meaghan Stein, Robin Wright, Ph.D., and Laurie Parker, Ph.D.

In spite of significant investments, considerable progress still needs to be made in increasing the number and diversity of students who earn STEM baccalaureate degrees (Holdren & Lander, 2012). The HHMI Pathways to Advance Student Success grant, awarded in 2014 to the College of Biological Sciences (CBS) at the University of Minnesota, aims to increase the proportion of at-risk students who earn biological sciences degrees by at least ten percent by 2019. In order to design effective interventions to accomplish this goal, it is necessary to develop a model to understand the factors that enhance or inhibit the retention of biological sciences students. Prior research has identified performance on standardized tests and demographic factors as major predictors of retention (Westrick et al.,

2015) and psychosocial factors as contributing to college outcomes (Robbins et al., 2004). One institution, testing psychosocial trait complexes combined with GPA, revealed that two psychosocial trait complexes (Math/Science Self-Concept and Mastery/Organization) along with GPA provided the best model for STEM retention (Ackerman et al., 2013). However, these psychosocial trait complexes contain many psychological measures and are too broad to design targeted interventions. Designing effective interventions requires knowing the specific psychosocial factors that are associated with academic performance and retention. Incoming Freshman cohorts in the College of Biological Sciences from the years 2015 and 2016 (n = 1022) were surveyed on psychosocial factors shown in the literature to impact academic performance, including Persistence on Task, Academic Self-Efficacy, and Science Confidence. Using multiple regression analysis (MRA), we had shown that the biggest predictor of student retention in CBS is first semester GPA. One drawback of MRA is that it is difficult to evaluate the interactions of multiple factors on an outcome. Thus, in our current study, we used structural equation modeling (SEM) to test hypothesized models of the combined effect of demographics, psychosocial factors, and academic performance on first semester GPA. Our results reveal that students' self-reported tendency to persist at a task (e.g., "I finish whatever I begin.") is the most direct psychosocial predictor of first semester GPA ($p<.001$, CFI =.99, RMSEA=.03). This tendency is influenced by their sense of academic self-efficacy (e.g., "I expect to do well in all my courses.") ($p<.001$) and correlated with their confidence in performing science processes (e.g., "Please rate your confidence in your ability to design a well-controlled experiment to test a hypothesis.") ($p<.001$). Students' first generation and underrepresented minority status interact with these psychosocial factors, suggesting that intervening to increase persistence on task will have a greater relative impact on these students' academic performance. While the reported findings are specific to this context, the methodology demonstrates how SEM can reveal interactions and possible intervention targets that could be missed by regression analyses. This research provides an effective model for evaluating predictors of college academic success and retention in multiple contexts, along with the ability to evaluate the success of interventions.

P25: The Relationship of Grit, Sense of Program Community, Research Self-Efficacy, Science Identity and STEM PhD Entry among Meyerhoff Scholars

Presenter: Rupsha Singh **Institution**: University of Maryland Baltimore County **Co-Authors**: Mariano R. Sto. Domingo, Kenneth I. Maton, and Ishita Arora

Previous research has shown that having strong research self-efficacy and scientific identity are significant predictors of success in undergraduate Science, Technology, Engineering, and Mathematics (STEM) majors (Maton et al., 2016). However, there is a lack of research examining the mechanism by which students who initially enter colleges with low research self-efficacy and scientific identity later succeed in their STEM majors and pursue PhDs. Grit, broadly defined as perseverance and passion for long-term goals, has been predictive of greater academic adjustment, sense of belonging, college grades and GPA, college satisfaction, faculty-student interaction, and intent to persist (Akos & Kretchmar, 2017; Duckworth et al., 2007). Similarly, previous research has shown that sense of community is predictive of STEM students pursuing a STEM PhD (Maton et al., 2009). Thus, in the current study, we aim to examine whether grit and sense of community moderate the association among research self-efficacy, scientific identity, and pursuit of a STEM PhD among underrepresented minority (URM) students in the Meyerhoff Scholars Program at University of Maryland, Baltimore County. We hypothesize that grit and sense of community will be more strongly related to STEM PhD entry for students with low research self-efficacy and low scientific identity than for students with high levels of research self-efficacy and science identity. Participants will be students from two cohorts (entry year 2012, 2013) in the Meyerhoff Scholars Program (MSP). Research self-efficacy and scientific identity are measured using the Scientific Self-Efficacy Scale and the Scientific Identity Scale (Chemers et al., 2010), respectively, which assess the students' ability to function as a scientist in a variety of tasks, and the degree to which the students feel like they are scientists. Grit is

measured using the original Grit Scale (Grit-O; Duckworth et al., 2007), which assesses students' perseverance and passion for long-term goals. Lastly, sense of program community is measured using the MSP Sense of Community Scale that was created for the larger study. The measure assesses the degree to which the students feel like a part of the Meyerhoff Scholars community. Research self-efficacy, scientific identity, grit and program sense of community were assessed in spring 2015 and 2016, when the students were juniors and seniors, respectively. Information about STEM PhD entry was collected after the students graduated. The hypothesis will be tested using logistical regression analyses (analyses currently underway). If the hypothesis is supported, the study has the potential to inform the Meyerhoff Scholars Program, as well as other scholars' programs in the United States to facilitate an environment where students are encouraged to persevere (grit) and join together in program community, as well as supporting the development of research self-efficacy and scientific identity.

S43: Walking in My Shoes: What I Wish Others Understood About Learning and Attention Disorders

Presenter: Mei-Fang Lan **Institution**: University of Florida **Co-Authors**: Consuelo Kreider, and Chang-Yu Wu

Learning and attention disorders (L/AD) refer to a group of neurodevelopmental disorders that can negatively impact speaking, listening, reading, writing, spelling, computing, and/or attention, and therefore learning.[1] Students with L/AD comprise about fifty percent of students in postsecondary education who are diagnosed with a disability,[2] making it the largest subgroup of college students diagnosed with a disability. Students with L/AD very often struggle academically,[3] because classroom instructions are not always delivered in the ways that match their needs or learning styles. Students with L/AD also have to combat misunderstanding and negative perceptions[3] from instructors, peers, and even family members, thus adversely affecting their wellbeing, self-perceptions, and social lives. However, many people with L/AD can and do have a successful career if their needs are understood and accommodated, and their talents are nurtured. To understand and address these stressors and challenges, the University of Florida has been developing and testing a unique model of multifaceted supports and services for STEM (Science, Technology, Engineering and Mathematics) students with L/AD. This model aims to respond to the needs and diverse strengths of these students at the personal, interpersonal, and institutional levels to foster these students' success in their pursuits of their academic programs and ultimately their professional careers. In this presentation, the core stressors and challenges of these STEM students with L/AD will be reported and discussed, and their implications for educators, student service providers, peers, and family will also be addressed.

URM Students and Educators II (Deeper Dive)

Location: Salon D

D19: Encouraging a Growth Mindset toward positive nutrition in HBCU Student Teachers.

Presenter: Josetta Arnold **Institution**: Edward Waters College

The USDA documents the disparity in nutrition between students in Title One schools as compared to other schools. Findings from Hall, Chai, & Albrecht (2016) suggest that future nutrition interventions should focus on facilitating the improvement of children's self-efficacy. Results from their intervention demonstrate disparities in nutrition knowledge and behavior outcomes between students surveyed from Title I and non-Title I schools (Hall et al., 2016). Graduating teachers from Edward Waters College are hired into Title one

Schools. Many of these new teachers have not experienced positive nutrition habits in their personal development and therefore carry misconceptions of healthy eating into their classrooms. They also carry some misconceptions about teaching and learning of science at the elementary school level (Otero & Nathan, 2004). The College's Department of Teacher Education and Urban Studies developed a means of introducing healthy eating to pre-teachers through a Healthy Halloween Initiative. This intervention is on pre-service teachers beliefs about science through creative lesson planning using art and science objectives. Surveys were collected and analyzed from participants gaining viable feedback for pre-service teacher lesson planning conceptions about nutrition and scientific modeling (Nelson & Davis, 2009). The presentation will feature the development of the Healthy Halloween initiative, analysis of pilot data from two years of promoting this initiative. One of the end goals is to get pre-service teachers to attend to lesson plan elements of scientific modeling in their lesson plan (Nelson & Davis, 2009).

D25: Creating safe educational spaces for URM students through social interactions

Presenter: Whitney Gaskins Institution: University of Cincinnati

The intervention was designed to create a sense of belonging by providing safe spaces on campus for underrepresented minority groups that mimic cultural norms such as Sunday dinners. In addition to creating a safe space to socialize, the gathering also provided a venue for new students to work together in study groups and receive tutoring and mentoring from upperclassmen. This intervention is critical as sense of belonging is critical for first-year students. Research has shown that sense of belonging plays a significant role in the success of first year students. The research group conducted semi-structured interviews with students to assess programmatic success and to explore student perspective.

S11: OXIDE: A Top-down approach to increase Diversity and Inclusivity in research based chemistry departments in U.S.

Presenter: Srikant K Iyer Institution: Johns Hopkins University

Co-Authors: Dontarie Stallings, Rigoberto Hernanderz

Inequities in hiring, retention and promotion practices have historically led to disproportionate diversity representation of chemistry faculty. (1) The Open Chemistry Collaborative in Diversity Equity (OXIDE) conducts biennial workshops to change the infrastructure with a top-down approach (2) that provides a 'tool kit' for department chairs and administrations to address problems in chemistry departments. The participants for National Diversity Equity Workshop (NDEW) include chairs or thought leaders of the leading research-active chemistry departments, and experts from social and behavioral sciences. Through NDEWs, dissemination and direct correspondence, OXIDE facilitates discussions between participants regarding the latest research findings on diversity, biases and barriers and how they translate to the context of chemistry departments. (3) The outcomes of the workshop are implementable initiatives and policies i.e. diversity solutions, to improve climate towards inclusive excellence and move the demographics of the faculty towards parity with those of the available pool of doctorates. (4) The chairs work through many of these issues during breakout sessions and report-outs. We will also share the assessment data on the impact of the past NDEWs.

3: 45 pm - 4:00 pm Refreshment Break

Calvert Ballroom Foyer

4:00 pm-5:30 pm Concurrent Symposia and Deeper Dives

Research Experiences as Interventions: Summer, Peer-Assisted, & Grantsmanship

Location: Salon A

D10: Measuring and tracking grantsmanship self-efficacy in diverse early career research to tailor career development interventions

Presenter: Eileen Harwood **Institution**: University of Minnesota - Twin Cities

Significance - Research funding has become more competitive over time. New researchers typically have little to know exposure to or training in grantsmanship and grant writing skills. A short, 19-item version of a longer, 88-item validated professional development self-assessment instrument was used to measure levels of confidence in grantsmanship before and after early career researchers participated in coaching-based intervention programs. Participants were encouraged to submit the grant application they worked on through 3- to 12-month-long interventions by the end or soon after program completion. The shortened instrument could be used in academic research settings to tailor career development recommendations for early career research post-docs and faculty. Study population - A diverse (35% African American, 43% non-white) group of postdocs and early career researchers (190 of 242, 78% with complete data) who had completed one of 4 grantsmanship coaching model programs between August 1, 2015 and June 30, 2017. Contextual factors - Participant self-efficacy in grantsmanship confidence was measured up to 5 points in time: pre intervention, post intervention, and follow-up every six months (6, 12, and 18 months) after program completion. We validated the shortened version of the instrument in this study; tested a 3-factor solution to identify 3 underlying self-efficacy domains (conceptualizing, designing, and funding a research study); and analyzed the relationship between self-efficacy and early (6-month post intervention) grant submission. Outcomes - Findings from validating the abbreviated instrument with data from a diverse group of early career researchers showed that the instrument, implemented pre-, post-, and every six months' follow-up, efficiently tracks changes in individual-level confidence. The odds of submitting a grant 6 months post-training increased for this study group by 69% for every point increase in mean self-efficacy measured at post-intervention. Learning objectives To better understand the disparities in and benefits of pre-career grantsmanship training. To learn about a grantsmanship self-efficacy assessment tool that can be used by department heads and mentors to establish individual-level baseline metrics and track progress over time for new faculty hires by providing more targeted professional development recommendations. To learn more about promising professional development programs that provide intensive coaching, practice, and peer networking.

D21: Research Deep Dive: The Institute On Neuroscience (ION) Summer Research Program for Outstanding High School Students and Teachers

Presenter: Kyle J. Frantz **Institution**: Georgia State University **Co-Authors**: Christopher T. Goode

To recruit bright students into the scientific research community, we designed and have implemented the Institute On Neuroscience (ION) since 2003. This eight-week summer program provides introductory curriculum and research immersion for outstanding high school students, as well as middle and high school teachers. Program participants engage in authentic neuroscience research in working laboratories or clinics in the metro-Atlanta area (Georgia State University, Emory University, Georgia Institute of Technology, Morehouse College, or Spelman College). To examine program outcomes, we have used a variety of mixed-method, quantitative and qualitative approaches over the years. As with an undergraduate population (Frantz et al., 2017), we have tested the hypothesis that a summer research experience positively affects intent to persist in a science or research career, via improvements in scientific research

self-efficacy, science teaching self-efficacy, neuroscience content knowledge, science identity, and reductions in anxiety. With about 10 students and 2-5 teachers per summer, diverse groups totaling over 150 scholars have participated to date. Here, we report the results of pre-, mid- and post-program surveys from four cohorts in 2013-2017. Both students and teachers reported improved confidence with neuroscience concepts, scientific research self-efficacy, and science identity over the course of the summer. Students, but not teachers, reported reductions in research, neuroscience, and science anxiety. On the other hand, commitment to science, research, and teaching did not change, nor did teachers' science teaching self-efficacy. Regression models revealed that confidence with neuroscience concepts predicted intent to persist in a research career. Scientific research self-efficacy predicted intent to persist in science, but subsequent mediation analysis showed that this relationship was fully mediated by science identity, as others have shown (Chemers et al., 2011; Estrada et al., 2011, Frantz et al., 2017). Thus, some short-term benefits of a summer research immersion predict long-term benefits, such as retention in pathways toward research careers for students, and improvement of science teaching among teachers, which may in turn lead to improved science learning for students not directly involved in the program. On more qualitative assessments, such as evaluation of final research reports by students and lesson plan development among teachers, students met program expectations, while teachers did not. Future assessments with program alumni may provide insights about the challenges faced, particularly by teacher participants. Ultimately this program and its education research results contribute to preparation and diversity of the biomedical research workforce.

D6: Peer-Assisted Team Research (PATR): An Early Research Experience Model from Theory to Practice

Presenter: Lori Sims **Institution**: Albert Einstein College of Medicine, Hostos Community College of CUNY, Lehman College of CUNY

Peer-Assisted Team Research (PATR) is a flexible model designed to involve more community college and undergraduate students in authentic research earlier in college. PATR students design and carry out research plans, analyze data, and draw conclusions through a structured format that scaffolds an understanding of the research process in a team setting led by experienced upper-division peers. The PATR model is readily adaptable to various institutional settings, including general education and majors' courses, honors supplements to STEM classes, and extracurricular settings. A module consists of: an engaging popular media article on a STEM topic; a professional article on the same topic where students use the C.R.E.A.T.E. (Hoskins 2015) method to deconstruct and cartoon the experimental design; iterative open-ended experiment(s) and data analysis; and a discussion component encouraging students to think about the research's broader implications. Some topics that have been developed and tested include: Effects of Stress on Cortisol Levels; Fake Laughing in Established Friend Groups; Science of Junk Food; and Experimental Evolution of Multicellularity. PATR increases retention and persistence of underrepresented STEM students and prepares students for faculty-mentored research. This model has been especially effective in increasing science self-efficacy with underrepresented and women participants, contributing to increasing STEM diversity. Thus far, about 125 1st and 2nd year students have participated in PATR. Results from surveys find students positive and enthusiastic, reporting less apprehension about reading academic literature, feeling more comfortable in lab settings, and more confident and less nervous about progressing to faculty-mentored research. Most regard PATR as good training to build the skills, confidence, and credentials to move on to research in a faculty research lab, with results in proportion with the number of modules completed, as predicted. The junior and senior peer leaders also report benefitting from PATR. In evaluating the research products, we find that students at the novice and intermediate levels design experiments very similar to the ones they cartooned using the CREATE method. Advanced students, feeling more confident as researchers, design experiments which are tighter, cleaner, more thoughtful and very different from the ones in their first cartoons. Their written reports are also more accurate and more descriptive. This Deeper Dive will focus on why this model was created, how it has changed over time, how it can be adapted to fit different institutional needs, along with program outcomes. Some illustrative questions/issues to be discussed include: how this model can be adapted; pitfalls/challenges to avoid; evaluation strategies; and, what counts as authentic/innovative research.

Which Path to Choose? Trajectories of Doctoral and Postdoctoral Biomedical Research Trainees' Career Intentions

Location: Salon B

S46: Which path to choose? Trajectories of 4 classes of doctoral and post-doctoral biomedical research trainees' career intentions and the personal and contextual factors that characterize them

Presenter: Carrie Cameron **Institution**: The University of Texas MD Anderson Cancer Center **Co-Authors**: Jordan Trachtenberg, Cheryl B. Anderson, PhD., Shine Chang, and Hwa Young Lee, PhD.

Broadening participation in research careers entails not only attracting and welcoming students to research, but also retaining trainees who have already embarked on the research career path. The changing landscapes of research training, academia, and funding models introduce complexity over and above the familiar concerns of culture, climate, and bias, making the quest for targeted interventions even more challenging. This symposium will first present the rationale and methodology for recognizing four classes of trainee distinguished by career intent to become an independent investigator, examining how they evolve over time; then describe between-class personal characteristics of the trainees and other factors; and end with an outline of mentor characteristics associated with trainee class, highlighting alignment and misalignment between dyads. We conducted a national longitudinal survey of 185 matched mentor-trainee dyads in biomedical research over a 2-year time period, with particular emphasis on trainee development of scientific communication skills. We collected trainee data regarding Social Cognitive Career Theory constructs such as self-efficacy, outcome expectations, and career intent of trainees, and perceptions of their mentors, as well as mentor data indicating perceptions of and behaviors with their trainees in this process. The symposium will include three presentations: one describing our methods and analyses that resulted in a four-class model of trainee career intent to become a research leader or PI; one outlining the profiles of trainees belonging to each class, including demographics, associated social cognitive variables, and others; and one describing attitudinal and behavioral profiles of mentors associated with trainees of each of the four groups. These findings will be interpreted in light of their implications for possible interventions for trainees, mentors, training programs, and educational institutions to help nurture and sustain interest in research careers. Abstracts included for symposium: Abstract 1: Reaping the benefits of longitudinal data: Using Growth Mixture Modeling to identify subgroups in patterns of longitudinal change on career intent (Lee, Anderson, Trachtenberg, Cameron, Chang) Abstract 2: Research trainees in 4 different career-intention classes and their associated characteristics (Cameron, Lee, Anderson, Trachtenberg, Chang) Abstract 3: Trainee research career intent trajectories: Associations with mentor factors (Chang, Lee, Anderson, Trachtenberg, Cameron)

S48: Which Path to Choose? Symposium Abstract #2: Research trainees in 4 different career-intention classes and their associated characteristics

Presenter: Carrie Cameron **Institution**: The University of Texas MD Anderson Cancer Center **Co-Authors**: Jordan Trachtenberg, Cheryl B. Anderson, PhD., Shine Chang, and Hwa Young Lee, PhD.

Background: Recent research and commentary on the future of academic biomedical research have expressed concern about, on the one hand, diminishing academic career prospects for PhD's and on the other, about PhD's' apparently waning interest in academic careers. (1-3) These concerns have led to debate about whether the causes are primarily structural, sociocultural, generational, or

something else. Methods: After performing Growth Mixture Modeling to identify 4 classes of trainees by career intent over time, we conducted post-hoc analyses of multiple personal characteristics of 185 doctoral and postdoctoral trainees in four classes as they evolved over a 2-year period. We will present profiles of these four classes characterized by their longitudinal patterns of intention to pursue a career as an independent investigator: high and stable; increasing; decreasing; and low and stable intent. Profile characteristics included demographics, social-cognitive career factors, and scientific communication activities. Results: For US trainees, the only demographic characteristic that varied significantly among the four classes was trainee rank, with postdoctoral trainees more likely than doctoral students to intend to pursue a career as an independent investigator over time ($p<.001$). The frequency of meetings between mentor and trainee and the mentor's perceived availability to the trainee did not show significant association with career intent. Previous productivity in total number of manuscripts written, number of first-author manuscripts written, number of presentations given, and frequency of asking questions varied significantly by class, as did self-efficacy in research skills and self-efficacy in writing skills, with the high-stable group reporting significantly greater writing self-efficacy. Interestingly, regarding interest in engaging in scientific writing, the low-stable and decrease career groups reported a higher interest in writing than the high-stable and increase groups at Time 1, while their interest declined and converged with the other groups at Time 4 ($p<.05$). Interest in speaking (a combined category of conversing and presenting) was marginally associated with trainee class ($p=.07$). The increase and high-stable groups had significantly higher positive outcome expectations for scientific communication than the low-stable group; additionally, the low-stable group had marginally more negative outcome expectations than the other groups. In other words, trainees in the low-stable group perceive writing and/or SciComm in general to contribute to greater stress, decline in physical health, and decline in social relationships ($p<.05$). Significance and Implications: These findings provide insights about four classes of trainee career aspirations: high and stable, increasing, decreasing, and low and stable intentions to pursue a research career as an independent investigator. These insights may have implications for broader understanding of career choice at the doctoral and postdoctoral levels and for the design of interventions to reinforce the career intentions of trainees.

S50: Which Path to Choose? Symposium Abstract #1: Reaping the Benefits of Longitudinal Data: Using Growth Mixture Modeling to Identify Subgroups in Patterns of Longitudinal Change on Career Intent

Presenter: Hwa Young Lee, PhD. **Institution**: University of Texas MD Anderson Cancer Center, Houston TX (UT) **Co-Authors**: Jordan Trachtenberg, Cheryl B. Anderson, PhD., Shine Chang, and Carrie Cameron

Background: Previous studies have shown that pre- and post-doctoral students in biomedical science vary in their intention to pursue a research career and that their interest in a research career path can change over time (Roach & Sauermann, 2017; Fuhrmann et al., 2011). Longitudinal studies enable the study of developmental trends that may contribute important information in retaining trainees in a research career path. The array of statistical methods available to analyze longitudinal data continues to grow, to the delight of those who collect or have access to data from studies that follow individuals over periods of time. Conventional growth modeling approaches assume that the people who comprise the study sample come from a single population and that a single growth trajectory can adequately approximate the entire population. This can result in oversimplifying the complex growth patterns that describe continuity and change among members of different groups. Subgroups of individuals may exist whose growth trajectories have different patterns. Growth Mixture Modeling (GMM) identifies subgroups of individuals who report varying levels or patterns of change across time on a particular variable (Ram & Grimm, 2009). This methodology provides an ideal way to identify distinct subgroups of trainees that likely exist regarding career intention to conduct and lead their own research, i.e., become a research Principal Investigator (PI). Purpose: Following a brief, nontechnical overview of Growth Mixture Modeling, we present trainee data on career intention from our longitudinal study. Methods: GMM was used to identify distinct PI-intention career trajectories, or latent classes, across four time points over two years among a nation-wide sample of 185 pre- and post-doctoral trainees in biomedical science. After the optimal number of latent classes was determined (Nylund et al., 2007), we then used repeated measures ANOVA follow-up analyses to determine whether the

resulting classes had different patterns on two other career intention questions we also measured longitudinally: 1) intention to participate in conducting research, but not as the leader, and 2) intention to support science, but not conduct research. This allowed us some insight on trainees' possible career plans beyond the "PI decision". Results: Using Mplus 7.3 (MuthÃ©n LK & MuthÃ©n), GMM results indicated that a 4-class model provided the best fit to the data on PI-intent: a high-and-stable PI-intent class (54%), an increasing intent class (18%), a decreasing intent class (17%), and a low-and-stable intent class (11%). The follow-up analyses by PI-intent class indicated that the increasing group had higher desire than both the decreasing group (p=.06) and the high-and-stable group (p=.01) to still conduct research, but not as the leader. Follow-up analyses on the support science-no research variable, indicated that the low-and-stable, increasing, and decreasing groups had significantly higher intention to support science, but not conduct research than the high PI-intention group (p<.001). Overall, our analyses show that trainees who enter their training programs somewhat undecided about whether to pursue a research career as a PI, appear to struggle with this decision and can change their mind over time. On the other hand, trainees who enter with more clear, adamant decisions on whether to personally conduct research or not, appear to stay on course in their decision

S55: Which Path to Choose? Symposium Abstract #3: Trainee Research Career Trajectories: Associations with Mentor Factors

Presenter: Shine Chang Institution: The University of Texas MD Anderson Cancer Center Co-Authors: Carrie Cameron, Hwa Young Lee, PhD., Jordan Trachtenberg, and Cheryl B. Anderson, PhD.

Background: Understanding the mechanisms that underlie the recruitment and retention of emerging scientists in research careers, especially from groups historically underrepresented in science, remains an important goal for biomedical research workforce development. In particular, great interest exists for understanding the impact of mentors in the career development of scientists (1), as well as scientific communication (SciComm) mentoring, which plays a role in research career intent (2). Here, we describe the 175 faculty mentors paired with trainees from the 4-class Growth Mixture Model. Specifically, we describe mentor characteristics, barriers to SciComm mentoring, and alignment of mentor-trainee perceptions of mentoring practices. Mentor characteristics and barriers: Mentors from the four trainee classes did not differ by demographic characteristics or demandingness, a trait-like characteristic (3); however, mentors rated their own responsiveness to trainees higher than their trainees did (p<0.001). That said, trainees with an increasing pattern career intent perceived their mentors as significantly more responsive than did trainees with low-stable intent (p=0.02). Mentors reported relatively low barriers to SciComm mentoring related to their trainees (e.g., weak SciComm skills, denial of deficits) and to the environment (e.g., lack of SciComm resources, guidelines, and incentives), but that those barriers increased over time (p<0.05). Mentor-trainee alignment: With regard to mentoring practices, mentors generally reported increasing their efforts over time, but trainees did not generally report seeing increased efforts of their mentors over time. However, there were some trainee class differences reported for certain SciComm mentoring practices, which also changed over time (interaction for writing support p=0.06; for speaking support =0.01, respectively). Trainees with high-stable career intent perceived greater career development support from mentors than did either trainees with low-stable or decreasing career intent (p<0.05) in spite of their mentors reporting no differences in the amount of support they provided (p <0.05). While mentors reported providing significantly greater psychosocial support over time (p<0.05), trainees did not perceive this; high-stable trainees perceived more psychosocial support than did the decreasing group (p<0.05). Implications: In preliminary analysis, the findings represent novel and provocative associations between mentoring practices and trainee persistence in research careers; as such, these require further investigation. The incongruity of mentor and trainee responses reveals the powerful role of perception in the mentoring process and invites exploration of specific mentoring processes that may be key for interventions directed at mentor, at trainees, or both to improve research career persistence.

Mentoring Models I: Undergraduate

Location: Salon D

S25: STEM Persistence Program Involving Peer Mentoring of Over 1000 Freshmen Students: From Implementation to Assessment of Impact on Mentors and Mentees

Presenter: Wilfredo Colón **Institution**: Rensselaer Polytechnic Institute **Co-Authors**: Bruce Piper, Shanté Brown, Alexander Ma, Louis Trzepacz, Janelle P. Fayette, Paul Nooney, Jasmine Yang, Maya Kiehl, Dean Spaulding, Peter Persans, and Gerald Korenowski

Increasing the persistence of college students enrolled in STEM fields is a national goal. Evidence suggests that peer mentor programs may enhance student persistence by developing connections to students and faculty, and creating a small, peer supported, and content focused learning community. However, implementing peer mentors program to impact all freshmen students is very challenging and requires institutional commitment and involvement from various stakeholders. With support from a grant from the Howard Hughes Medical Institute (HHMI), we have developed a peer mentor program (I-PERSIST: Integrative Program of Education, Research, and Support Involving Science and Technology) for all freshmen students enrolled in Chemistry 1, Physics 1, or Calculus 1 in their first semester in college. The implementation of I-PERSIST is a unique collaboration of first-year faculty, the office of First-Year Experience (FYE), and the office for Institute Research and Assessment (IRA). Mentors are carefully selected based on academic skills and personal qualities, and are required to go through a vigorous training program. During the Fall semester, the mentors meet for 1 hour every week with 8-10 freshmen students to address content related and soft-skills topics. Mentors also meet in small groups with faculty and FYE staff each week to debrief and discuss topics for the following week. These meetings also help identify students that may need further academic and/or advising support. This program has been operating for the past three years, involving over 130 mentors and over 1000 freshmen students each year. Evaluations from mentors and mentees have shown excellent satisfaction with the program. The feedback suggests that I-PERSIST is having a positive impact on new student STEM majors, specifically, in their adjustment to college life and their perception of institutional support, belonging, and culture. This presentation will describe how we implement such a comprehensive program and the impact on mentors and mentees based on three years of program data and assessment results.

S45: Understanding the Network of Interventions Shaping Successful Scientists Through to the Doctorate in Biology Before and After the REU.

Presenter: Anne J. MacLachlan **Institution**: University of California Berkeley

SIGNIFICANCE TO THE UI COMMUNITY: This paper examines the network of "interventions" facilitating underrepresented success in Biology/STEM based on a longitudinal outcomes study of 125 participants over 12 years of a NSF REU Program in Biology 2006-2017 at UC Berkeley. It is one of the first such studies (McDevitt, et al., 2017). Students in the REU benefit from a network of interventions before and after participation. But program evaluation focuses on the immediate impact on student perception in self-confidence, toleration of failure and especially increased commitment to entering a Ph.D. program. Tracking is necessary to know whether a student earns a Ph.D. and enters the research workforce. Without detracting from the value added of REU participation, every student is exposed to other influences and interventions before and after the REU contributing to post-BS choices. The paper examines this network, its complexity and the multiple sources of success for the purpose of informing future intervention design. Study Population: The highly diverse undergraduate participants in this REU Program tracked through the present, many of whom have entered and/or completed doctoral and M.D. programs. CONTEXT: Underrepresented populations are neither significantly expanding their Ph.D. acquisition or scientific careers, proportionate to population growth; URM advancement has stagnated. The issue is ongoing despite decades of programs/interventions and many calls for different kinds of programs targeting the diversity of student backgrounds, values and ambitions (Campbell, et al. 2014, Fagan & Labov, 2007). Studies of successful programs such as the Biology Scholars Program at UCB or the Meyerhoff Program at UMBC are demonstrably successful because they address the complexities of an undergraduate student's life

and last for several years. This paper examines the events of a student life to identify influences which affect academic success and persistence. It weighs those by what participants themselves emphasize and compares these to the existing literature. The outcome contextualizes the impact of any specific program in relation to influences such as parents' belief in education, teacher mentoring in K-12, students' own ambition. The analysis provides understanding of the multiple factors influencing a student before and after a REU "intervention" contributing to student success by drawing on a network of support. It integrates existing studies and highlights areas for policy and program design. METHODOLOGY: This is a case study using a mixed methods longitudinal approach combining analysis of REU applications, annual surveys, entering and exit interviews and follow-up survey/interviews about life course after REU participation. This methodology draws on theories of integration beyond self-efficacy to broader social influences to shape scientific identity development--a network supporting scientific success (Estrada, 2011). A direct comparison group is from a study of success factors of URM STEM doctoral recipients from University of California earned 1980-1990 (n=158) when more students of color earned Ph.D.s proportionally than in any other decade (MacLachlan, 2006). Contextual data comes from related secondary literature, databases and this study. The results inform future undergraduate interventions providing a guide to how programs can intensify the positive impact of factors before and after participation.

D13: Entering Research: A research trainee curricular intervention to broaden participation in STEMM

Presenter: Janet L. Branchaw **Institution**: University of Wisconsin-Madison **Co-Authors**: Amber Smith, and Amanda R. Butz

Mentored research experiences are important to the success and persistence of novice trainees in STEMM, especially those from diverse backgrounds (e.g., Eagan et al. 2013). Recent interventions to improve the quality of research mentoring relationships have focused on training mentors (e.g., Pfund et al. 2015), while interventions focused on building the capacity of trainees to effectively navigate their research mentoring relationships and succeed in their research experiences have been less common. Entering Research (ER; Branchaw et al. 2010), a process-based curriculum designed to address this gap, has recently undergone a significant revision and expansion to better meet the needs of diverse populations of undergraduate and graduate trainees. In this Deeper Dive presentation, we will present the revised curriculum and evidence from a national sample of trainees which indicates its effectiveness. Pilot testing took place with undergraduate and graduate trainees in STEMM fields during Summer and Fall 2017 across 11 sites in 15 different implementations supported by the National Research Mentoring Network. Data from 148 trainees from Summer 2017 were used for the preliminary analysis included in this abstract. Of the trainees who provided demographic information (n = 75), 56% identified as White and 58% reported their gender as female. Facilitators primarily identified as White (79%) and 65% reported their gender as female. Descriptive statistics were used to examine overall participant satisfaction and participant and facilitator perceptions of the effectiveness of each activity in helping trainees to gain knowledge or improve their ability to do research. In addition, self-reports of skill gains in the seven areas of trainee development were examined using a new assessment tool. All Entering Research activities tested were rated as effective by both facilitators and trainees. More than 80% of trainees were likely or very likely to recommend the activities and found them to be a valuable use of their time. Over half of the trainees (52%) indicated that the research experience itself and participating in Entering Research activities equally contributed to their gains in research knowledge or ability. Trainees from three different institutions (N = 37) completed an assessment of trainee gains during Summer 2017 and reported gains in all areas, with the largest in Research Communication and Comprehension Skills and the smallest in Cultural Awareness and Skills. Gains in all areas were above 3.90 on a scale ranging from 1 (no gain) to 5 (great gain). These results provide evidence that facilitators and trainees perceive the Entering Research curriculum as effective at providing trainees with the knowledge and skills to be successful in their mentored research experiences. Importantly, the incorporation into the curriculum of activities focused on cultural awareness and skills appears to be a valuable addition to the curriculum, as evidenced by the perceived effectiveness of the activities; self-reported learning gains, and open-ended feedback from trainees. Future directions for dissemination, evaluation and research on this revised curricular intervention will be discussed.

Curricular Experiments in K-12 & Community College Settings

Location: Salon E

S32: Tailor-Made: Designing Interventions to Your Context

Presenter: David Silverman **Institution**: University of Virginia

Utility-value interventions, which prompt students to identify relevance in their coursework, are associated with performance and persistence (Hulleman et al., 2010). However, studies have largely been conducted at four-year colleges. Students at community colleges differ from four-year college students (Kane & Rouse, 1999) and may find different topics relevant to their lives. This presentation describes one study adapting intervention materials to community college developmental mathematics courses in Central Florida. We undertook two key modifications: replacing a low-relevance activity and identifying salient student topics to include throughout the intervention. To identify and replace low-relevance activities, we reviewed an assignment detailing how math can be used to solve real-world problems. In the activity, based on Hulleman et al. (2010), students read about a drought in California and were presented with fictitious student quotes about how math could be used to solve problems related to the drought. Two trained coders evaluated student responses about whether or not they found the quotes relevant and found that many students could not relate because they had never experienced a drought or simply did not live in California. Informed by local community college practitioners, we developed a new activity based around how math could be used to solve problems related to something on many of their students' minds: hurricanes. We implemented this adapted version of the utility-value intervention (with student quotes related to hurricanes rather than California droughts) with 227 students and will present these results at the conference. In order to investigate what kinds of connections students were making to their coursework, four independent coders analyzed over 2,500 responses to items asking students how they used math in their daily lives, careers, and hobbies in order to investigate what kinds of connections students were making to their coursework. Results indicated that students most frequently connected math to budgeting their money. Even when asked how math could be used in their hobbies, students still consistently tied their hobbies back to budgeting. This coincides with research indicating community college students are more likely to come from lower-socioeconomic backgrounds and be economically independent while in college, and therefore may place greater importance on budgeting, compared to students from four-year institutions (U.S. Department of Education, 2008). Again, it became clear that, because of the unique population we are working with, we had to adapt our intervention to our context. We are in the process of adjusting the fictitious quotes presented in our survey to reflect issues related to budgeting and will be able to present these adjustments at the conference. Interventions are not one-size-fits-all. Students at different schools often differ in their demands and interests, and therefore an intervention that works in one education context may not work in another. Through critically evaluating our intervention, we have been able to not only work toward improving the relevance of our materials to students at the community college, but also have gained many insights into how to better understand and adapt interventions to their context with an eye toward strengthening the effects of interventions.

D4: On-boarding Curriculum as an Intervention for Reducing New & Novice Teacher Attrition in Urban Schools

Presenter: Darrell Lewis Institution: Edward Waters College

This presentation focuses on an on-boarding curriculum as intervention designed to reduce the number of teachers leaving within first year of teaching by providing support utilizing an urban classroom management model and cultural relevant pedagogy. Mathematics and science teachers tend to have less teacher preparation than other subjects, have degrees in content areas verses education degrees, completed far less teaching methods courses and have less practice with classroom teaching (Ingersoll, Merrill, & May, 2014).

One implication for schools in the area of mathematics and sciences to help reduce teacher attrition is to ensure that new teachers has basic pedagogical training especially when they have not gone through teacher education programs or induction programs. The methodology is action research, the intervention is on-boarding curriculum modules for new and novice teachers, and the anticipated outcomes are (1) teachers build valuable experiences with the tools and strategies learned in classroom management, instruction, and assessment and (2) they collaborate with their peers and administrators as action researchers to inform the teaching practice and personal growth as teachers. Pilot data from one private K-12 school is used in this study.

P26: Stakeholder Perceptions of UMB CURE: A Middle School-University Partnership to Increase Diversity in STEM Careers

Presenter: Robin Saunders, Ed.D., M.S., Executive Director Institution: University of Maryland, Baltimore Co-Authors: Esther Kimani, PharmD Candidate, Aloysius Essien, M.S., Elsie Stines, D.N.P., C.R.N.P., Lauren Kareem, M.Ed., Assistant Director, Curriculum Coordin, Hannah Oseghale, PharmD Candidate, Bret Hassel, Ph.D., Brian C. Sturdivant, MSW, Christine Callahan, Ph.D., L.C.S.W.-C, Orrin Ware, M.S.W., M.P.H., Edana L. Jackson, B.S., Anthony Carter, B.S., Gregory B. Carey, Ph.D., TaShara C. Bailey, Ph.D., M.A., and Borndavid McCraw, B.S.

Background and Purpose: For healthcare providers to deliver individualized, patient-centered and culturally-sensitive care, provider training must build on cultural competence. Evidence-based studies have shown that many historically underrepresented minority (URM) and diverse patients prefer caregivers who either reflect, or, are appreciative of their personal and community cultures, values and experiences (Warda, 2000). In fact, the shortage of URM healthcare providers in the United States (U.S.) and the projected 50% increase in the URM population by the year 2043 necessitates more in- depth culturally responsive trainings (Carter et al., 2014). One initiative for responding to this trend, Continuing Umbrella of Research Experiences (CURE), is a National Cancer Institute (NCI)-funded training program focused on developing workforce diversity in the healthcare research and medical sciences. In this high-impact educational program, middle school scholars are actively engaged in cancer research at the University of Maryland, Baltimore (UMB). Based on this distinct UMB CURE model, we anticipate that middle school student engagement in cancer research will inspire and encourage scholars to pursue a broad range of careers in the biomedical and health science fields (Franco et al., 2011). The purpose of our research is to examine the data from interviews with scholars,
parents/families and mentors themselves to determine the potential for cultural competency training through the UMB CURE Scholars Program. Specifically, we explored how those experiences might be enhanced and implemented into the future expansion and enrichment of the program.
Methods: Data was collected through focus group interviews with mentors, scholars and parents/families. Each focus group was required to evaluate stakeholders' experiences with the CURE Scholars Program. The demographic makeup of the mentors was 51% Caucasian, 33% African American, and 11% Asian in AY2015-2016. Through flyers,
contacts, and outreach, mentors were recruited mainly from the UMB professional schools and included students, professors, and staff. Interviews with six mentors, and eight scholars and 15 parents/families were audiotaped, transcribed and thematic analysis was conducted (Creswell, 2003). The NCI Center to Reduce Cancer Health Disparities (CRCHD) CURE evaluation tool was used for formal tracking of the scholars in the contexts of their home- and school-environments so that mentors could better understand and address general issues affecting the scholars.
Results: Six themes emerged from the data: overall experience with the program; communication between mentors and program leaders; role expectations and confusion; learning about interactions with scholars and how best to work with scholars and families; rules for assignments; and learning about barriers the scholars' face. Data analysis revealed some of the mentors did not fully understand their role or what was expected of them. There was also confusion regarding consistent rules for implementing, supervising and evaluating curricula and activities. The

mentors felt that communication was lacking at the launch of the program and expressed that more emphasis and attention was placed on the scholars rather than on all program stakeholders. Interestingly, the mentors expressed that they had initial anxieties about being rejected by the scholars. However, ultimately, mentors realized that open communication between all parties strengthened their interactions to build trusting interpersonal relationships.

Conclusions and Implications: The implications of increased diversity in the healthcare workforce enables innovation and problem solving while incorporating diverse perspectives. CURE programs serve as an opportunity for mentors, URM scholars, and their parents/families to narrow the gap by increasing the number of culturally-competent professionals who examine health disparities grossly impacting underrepresented and underserved populations. We conclude that in order to better prepare the next-generation of healthcare providers and biomedical researchers, mentors for the UMB CURE Scholars Program should participate in cultural competency training before beginning their mentorship responsibilities. In addition, to minimize confusion regarding expectations, the roles of mentors should be clearly stated and explained to mentors, scholars and parents/families. Finally, the structure of the program should be explicitly laid out and available to the mentors for their personal and instructional benefits.

Course-based Research Experiences as an Intervention

Location: Baltimore Theater

S2: College-wide Course-Based-Research-Experience intervention as a Pathway towards Inclusive Excellence

Presenter: Lior Shamir **Institution**: Lawrence Technological University **Co-Authors**: Melinda Weinstein, Jessica Hearn, Franco Delogu, Shannon Timmons , and Hsiao-Ping Moore

Despite its proven impact on student success, undergraduate research seldom reaches non-traditional students. Students who work full-time often cannot to work in a professor's research laboratory, where most of the activities happen during the day. Commuter students and students who support themselves financially through part-time jobs may attend campus for part of the regular working day, but may not have time to work on extra-curricular projects. Students who are parents are frequently limited by child-care considerations. High school students enrolled in dual enrollment college classes, may only take evening courses because of the high school class schedule. Underserved students and transfer students find it difficult to compete for research assistantship positions. Finally, smaller universities may be limited in resources and often lack graduate student and postdoctoral fellow supervision, limiting undergraduate students' research options and making it difficult to align schedules with supervising professors. In our Inclusive Excellence intervention, we work on contrasting this trend by providing students with access to authentic research experiences while taking regular courses as part of their degree program. We proposed a comprehensive transformation of curricula in multiple disciplines such as biology, chemistry, psychology, computer science, and humanities, into course-based research experiences (CRE), providing part-time students, commuter students, high school students and working students with the opportunity to participate in authentic research. We design CRE modules in a culturally responsive manner, allowing students from all backgrounds to express their culture and ethnicity through research. Our program contemplates a systematic and progressive redesigning of courses within the CRE model and, ultimately, to provide a comprehensive college-wide pedagogical change. Instead of several small-scale initiatives, a large-scale comprehensive change involving a significant number of faculty and programs is leading to a cultural shift that will revolutionize the college's teaching philosophy. The 5-year project funded with a grant from the Howard Hughes Medical Institute (HHMI) started in October 2017 and plans the modification of most courses in the college. One of the most compelling aspects of our program is the heterogeneity of the intervention. Students in the College of Arts and Sciences take several CRE courses including both STEM and non-STEM disciplines. Such vast and diverse range of fields creates a fertile environment in which creativity, problem solving and

methodologies in one field can transferred into another field with a process of cross-fertilization and cross-pollination of ideas. Our CRE model already counts several instances of direct cross-disciplinary integration such as between computer science and art, psychology and philosophy, physics, biology, chemistry and figurative arts, English composition and design. Moreover, the vast range of our intervention also provides an indirect transfer effect from/to several apparently independent CRE courses, which fosters original thinking, ownership of ideas and student involvement. Assessment data from a previous smaller-scale intervention with CRE at LTU suggest that students embrace the CRE model and are excited to participate in CRE courses. Survey data also show that after CRE experience, students significantly increase their positive attitude towards research.

S3: Promoting creativity, problem solving and cultural sensitivity through original course-based research experiences in humanities and social sciences

Presenter: Franco Delogu **Institution**: Lawrence Technological University

Course-based research experience (CRE) appears to produce learning outcomes similar to those of apprentice-based research experience with the additional advantage of being accessible to all students enrolled in regular classes. Historically, CRE has been successfully implemented in STEM in several contexts and at different scales of intervention, but it has rarely been extended to the humanities and social sciences. Within the HHMI Inclusive Excellence program, we are redesigning a large number of courses with the goal to include CRE in most disciplines within the College of Arts and Sciences of Lawrence Technological University. Crucially, our intervention includes redesigning courses in non-STEM disciplines like Literature, Composition, Art, Philosophy and Psychology. Our first year of intervention produced several CRE interventions in non-STEM courses. In "English Composition: Thinking design and writing across the curriculum," students experimented with representing essay structure as material structure (made from cardboard, foam, and glue), and analyzed how abstract concepts such as design and form can take unique disciplinary shape while also translating across disciplines. In a psychology course on sensation and perception, students studied behavioral and physiological responses to affective touch as a measure of implicit bias in college students. A literature and art elective entitled "Cultural Representations of Violence" took a multi-disciplinary approach to early 20th-century gun culture, with individual teams of students researching the rise of guns in advertising, engineering, literature, film, and magazines. In a philosophy course on ethics, students worked in groups to design experiments that would expand our knowledge of the cognitive and affective structures that produce moral judgment. In "World Masterpieces I," a freshman-sophomore literature and art course, students collect digital paintings and use a software application to measure influence between painters. Based on these interventions, the implementation of the CRE model in non-STEM courses successfully promotes an environment where students produce original hypotheses for open-ended questions and work at their validation by means of rigorous methods of enquiry. CRE projects in the humanities and social sciences often include cross-disciplinary bridges between methods, approaches and knowledge on a specific subject of investigation, encouraging interdisciplinary collaborations. Moreover, the comprehensive nature of the CRE intervention at LTU creates a positive transfer effect of ideas, in which students train their problem-solving skills by means of several course-based research experiences in STEM and non-STEM contexts. We hypothesize that students who experience CRE in multiple courses develop an emergent sense of methodological self-reflection: they are not only able to follow methods of research, but actually understand how and why methods reflect discipline and subject matter. While this hypothesis will need to be tested through further longitudinal studies, preliminary assessment data suggest that effects of CRE in the humanities and social sciences can be as positive as the ones previously shown in STEM disciplines.

S47: Increasing self-efficacy and improving attitudes towards research through original course-based research experiences in the natural sciences

Presenter: Julie Zwiesler-Vollick **Institution**: Lawrence Technological University **Co-Authors**: Franco Delogu, George Moschelli, Hsiao-

Ping Moore, Meng Zhou, Lior Shamir, Jeffery Morrissette, and Shannon Timmons

The students who complete undergraduate degrees in STEM fields do not reflect the overall diversity present in the larger population. (NSF, National Center for Science and Engineering Statistics. 2017) This means that STEM fields are lacking in many experiences which could help provide solutions to some of society's most challenging problems. Research experiences have been shown to increase the likelihood that participants will complete a STEM degree (Lopatto, 2007). However, these research experiences have traditionally followed a costly and labor-intensive apprenticeship model which limited the number of students who could have such experiences. A new approach to make research experiences available to more students and more diverse groups of students has emerged. Course-based undergraduate research experiences (CURES) or course-based research experiences (CREs) aim to provide authentic research experiences in a classroom setting. These CREs must contain the use of scientific practices, discovery, broader relevance, collaboration, and iteration (Auchincloss et al, 2014). Evaluation of these CREs has shown similar impacts on students' attitudes about science, self-efficacy, and engagement. At Lawrence Technological University, we are a private, primarily undergraduate institution. We have a small number of faculty in an interdisciplinary Department of Natural Sciences. We are part of a larger initiative in the College of Arts and Sciences implementing CREs in many different disciplines which is now funded by the HHMI Inclusive Excellence program. Our initial assessment has shown that students who have participated in CREs in science courses have greater confidence in their future academic success and a positive attitude towards research. While CREs were initiated in biology laboratory courses, doing authentic research with larger groups of students does present real challenges. There can be increased requirements for funding, equipment, curricular time and faculty time. We have developed several strategies to keep these laboratory science CREs manageable for the faculty. One strategy is to focus the research around an available piece of equipment which can acquire data for analysis. This is the strategy utilized by a first-year introductory physics seminar and a sophomore/junior level anatomy and physiology lab. Another strategy is to require a prescribed experimental system, but allow students to choose their own variables. This is the strategy employed in several chemistry and biology labs. The benefits and disadvantages of both of these approaches will be discussed, along with specific examples. The emphasis within CREs on broader relevance is one of the characteristics which makes them unique but also challenging for implementation. However, we have found an unexpected benefit from emphasizing broader relevance as well as allowing students to influence the direction of the research. Students have been able to choose topics which address their social or cultural identities. This has forged a stronger connection between students and the research projects. In addition, students feel that science and research can have an impact on their lives and the lives of others.

S51: Reaching non-traditional students through a large-scale Course-Based-Research-Experience intervention in STEM and non-STEM fields

Presenter: Lior Shamir **Institution**: Lawrence Technological University **Co-Authors:** Franco Delogu, and Julie Zwiesler-Vollick

The overall objective of the symposium is to describe the HHMI-funded project Inclusive Excellence in which the course-based research experience (CRE) pedagogical model has been implemented in a large number and variety of courses in the College of Arts and Sciences at Lawrence Technological University (LTU). The CRE model makes research activity an integral, and in some cases, the focus, of a regular course, so all students enrolled in the course are included in original research activities. This eliminates the concern of self-selection, and makes a research experience accessible to students who have life commitments such as work or childcare. Thus, non-traditional students, who comprise a priority population for high-impact interventions, can obtain research experience like their peers who have fewer demands on their time. The CRE model at LTU is unique for several reasons. First, the scale of the intervention is much larger than most universities because it includes the transformation of the majority of courses in the entire college. Large-scale CRE implementation represents a new paradigm aimed at retaining students in STEM while providing an innovative curriculum that emphasizes independent thinking and real-world problem solving skills. Second, the intervention is heterogeneous in the sense that it

includes both STEM and non-STEM disciplines. The CRE model allows direct cross-disciplinary integration, such as between computer science and art, psychology and philosophy, chemistry and figurative arts, English composition and design. Moreover, the comprehensive nature of the program also provides for the indirect transfer of creative problem-solving skills from one field to another. Such a vast and diverse range of activities creates a fertile environment in which the creativity, problem solving and methodologies learned in one field can transfer into another field through a process of cross-pollination of ideas. Finally, cultural-sensitivity is a crucial aspect in the CRE activities. Since undergraduate research experiences have been shown to have greater impact on students from underrepresented minorities, many of LTU's courses also provide students with the opportunity to influence the research such that it is relevant to their social or cultural identity, which adds to the CRE model's focus on inclusion. The contribution "College-wide Course-Based-Research-Experience intervention as a Pathway towards Inclusive Excellence" by Shamir, Delogu, Timmons, Weinstein, Hearn & Moore will describe the project and its articulation in the five-years intervention. The contribution "Increasing self-efficacy and improving attitudes towards research through original course-based research experiences in the natural sciences" by Zwiesler-Vollick, Timmons, Morrissette, Moschelli, Zhou, Moore, Delogu & Shamir will describe the strategies implemented in the natural science department to scale up the CRE intervention to a large and heterogeneous number of courses and laboratories. The contribution "Promoting creativity, problem solving and cultural sensitivity through original course-based research experiences in humanities and social sciences" by Delogu, Kao, Weinstein, Jaussen, Shargel & Shamir will describe the CRE intervention in non-STEM fields like literature, philosophy, psychology and the arts.

5:30 pm -8:30 pm **Dinner Buffet**
French Kitchen

Poster Presentations
Maryland and International Rooms

5:30 pm – 6:30 pm **Poster Session A**

P2: Culturally responsive data and computational science through course-based research experience

Presenter: Lior Shamir **Institution**: Lawrence Technological University **Co-Authors**: Hsiao-Ping Moore, Melinda Weinstein, and Franco Delogu

Computer science is one of the least diverse disciplines in terms of the ethnicity and gender distribution of undergraduate student population, with no increase over the years, and even a sharp decline in gender diversity (CRA, 2012). Here we show how research-based pedagogy can be used to provide culturally-sensitive education that allows students to express their interests, culture, and identity through computing, shifting computer science education away from its stereotypical "geek culture". The intervention is applied to introductory level courses, advanced level courses, and also core-curriculum courses that are not computer science courses. In the advanced level the students are engaged in authentic research on a topic of their choice, based on their own interests, that does not necessarily need to be within a sub-field of computer science. Instead of serving as undergraduate research assistant in a certain lab or working on a research project within the interest of their mentor, the students choose the research topic of their own interest, and the instructor assists the student through all stages of the research. The model is unique in the sense that it allows students express their own interests, while leading to numerous scientific discoveries and peer-reviewed publications on which the student is a primary author (Shamir, 2017). These student discoveries are also often reported by the premier mainstream media. In the level of introductory courses we are experimenting with CRE courses that teach basic programming while studying research questions related to popular music,

namely analyzing lyrics of popular music of the student's preference. In core curriculum courses we changed humanities, psychology, and biology introductory courses to include computing research. For instance, in humanities courses the students address research questions of their choice within art history by applying computer analysis of the paintings (Shamir & Tarakhovsky, 2012; Burcoff & Shamir, 2017). These activities are combined into a larger initiative that aims at changing the climate in the discipline of computer science. The initiative is part of a college-wide transformation of turning the entire college into a college that is based on CRE. The project is funded by the Howard Hughes Medical Institute.

P4: Strategies for Multi-Institutional Cooperation for Career Advancement of Early Stage Investigators

Presenter: Nancy B. Schwartz **Institution**: University of Chicago **Co-Authors**: Rick McGee, Jeffrey Franke, Philip Clifford, Evelyn Erenrich, Laurie E. Risner, and Xenia Morin

The absence of supportive mentoring practices may have a significant impact on training environments and career trajectories of STEM trainees at all levels. These deficiencies are especially impactful on Early Stage Investigators (ESIs) from underrepresented (UR) populations who may be acutely sensitive to training environments that do not provide adequate mentored support, and in particular may lead to fewer UR postdocs entering the professoriate as well as lower success rates in their obtaining NIH research funding, etc. Educators and scientists have increasingly recognized the need for enhanced supportive mentoring, professional skill development, and especially, grantsmanship training. Unfortunately, with constricting institutional budgets and increased pressure on faculty time, it is often difficult for individual institutions to muster the resources and instructional talent to provide adequate training in all the areas needed to launch and sustain an academic career. Thus, a group (CIC/Big Ten) of prominent research universities has taken the approach of working collectively to leverage institutional resources and those of the NRMN community to introduce the following evidence-based interventions: professional development, mentor training and grant-writing experiences to Early Stage Investigators (i.e. postdocs and junior faculty), especially from groups under-represented in STEM; assist senior faculty in developing core competencies for mentoring and grantwriting and create inter-institutional mentoring and grantsmanship teams. As a result of the Grantwriting training, 137 ESIs (65% UR) and 35 Faculty coaches have received grantwriting training; 32 institutionally-based coaching groups have been formed; 33 ESIs from the first year have submitted 56 grants, resulting in 24 grants funded (83% to UR ESIs) including 9 NIH grants (37.5%), 8 foundation or other federal grants (33%) and 7 internal awards. As a result of mentor training, 47 ESIs and 67 faculty facilitators received mentor training; subsequent mentor training workshops have been held on at least 10 partner campuses; 9 postdocs (78% UR) have moved into faculty positions. In sum, through an NRMN Supplement, the Big Ten Academic Alliance has successfully 1) leveraged its individual institutional resources, 2) built multi-institutional cooperatives, 3) created inter-institutional mentoring and grantsmanship training teams, 4) and is continuing to track outcomes to measure change in institutional culture using these evidence-based interventions, all to the career benefit of ESIs (postdocs and faculty). This project has the overarching goal of achieving a more inclusive and diverse scientific community by enhancing the academic career path of individual aspiring scientists from underrepresented backgrounds, while concomitantly building institutional capacity and fostering sustainability by assisting senior faculty in developing core competencies for mentoring and grantwriting.

P6: A flipped classroom in two General Biology courses positively impacted student class preparation, engagement and course understanding. Authors: Tadakimi Tomita, Nelson Nunez Rodriguez, Carmen Inda

Presenter: Eric Chang **Institution**: Albert Einstein College of Medicine, Hostos Community College of CUNY, Lehman College of CUNY

This work evaluates a teaching approach undertaken by a postdoctoral scholar member of the NIH BETTR IRACDA program as part of

the required teaching-training component of this program. A flipping model was implemented in General Biology I at a community urban college and a 4-year urban college, both of which are minority-serving institutions. The 4-year college implementation took place during Spring 2017 in a 20-student lab course, and the community college experience was implemented in a 25-student lecture course during Fall 2017. Specifically, the postdoctoral scholar developed online materials based on videos and quizzes to flip a Biology curriculum at the two teaching-intensive institutions integral to the NIH BETTR program. The students were required to go over this online material before attending class. Then, face-to-face interaction was used to practice under the instructor guidance. Students were required to watch 2-4 short videos and solve one quiz linked to each video content before each face-to-face session. At the beginning of each class session, the professor developed several formative assessment practices to appraise if students understood online assigned material. Some of these evaluation tools were based on clicker use. Because students received the same clicker every course session, the instructor was able to track all student on-line and in-class performances throughout the semester and tailored each face-to-face session based on student previous understanding. Some class-time exercises were developed in groups and other ones individually. All class questions were crafted based on Bloom taxonomy. Thus students were exposed to knowledge, understanding, application and creation questions including problems derived from actual experimental procedures. Results based on course sessions observed by other faculty members working as program mentors and student survey answers showed that students arrived to class prepared and highly engaged in class practices. Furthermore, Bloom-taxonomy exam questions allowed evaluation of student progress during the semester. All together this approach illustrates the need to expand our teaching repertoire in science classes by taking risks and involving faculty and students in new ways to develop science knowledge and skills. This study also showed strategies suitable to be adopted for both lecture and lab sessions for Science majors at community and 4-year college institutions seeking to diversify the faculty teaching repertoire for Science courses. This is critical in higher education today as urban college classrooms and faculty receive students with a range of learning styles, dissimilar academic backgrounds and diverse linguistic and social realities.

P8: Effects of the Operation STEM Program on Underrepresented Minority Students

Presenter: Susan Carver **Institution**: Cleveland State University **Co-Authors**: Stephen Duffy, PhD, Elaine L. Barnes, Andrew Resnick, PhD, Candice M Quinn, John P. Holcomb, PhD, Jenna R. Van Sickle, PhD, Debbie Jackson, PhD, and Nigamanth Sridhar, PhD

Operation STEM (OpSTEM) is a NSF grant-funded program that seeks to improve retention and graduation among high-risk students seeking STEM degrees by supporting them through the precalculus-calculus sequence. OpSTEM focuses its attention on students from underrepresented minority (URM) groups, first-generation college students, and women. The OpSTEM program has two levels of treatment—one group receives supplemental instruction while another group receives a comprehensive program. This study considers URM students as compared with their non-URM counterparts and considers how well these groups fare in their precalculus courses. Both of the OpSTEM treatments show all groups making significant gains, with URM students making relatively greater gains. For non-URM students, the majority of the gains in pass rates are seen with supplemental instruction alone. For URM students, however, the comprehensive program increases the pass rates so much that URM students become difficult to distinguish from their non-URM counterparts. We conclude that for URM students in particular, a comprehensive program is necessary in order to narrow the achievement gap between these students and their peers.

P10: Bias Toward Non-White Primary Care Physicians from Their White Patients: A Systematic Review.

Presenter: Amarette Filut **Institution**: University of Wisconsin-Madison **Co-Authors**: Madelyn Alvarez, and Molly Carnes

A diverse healthcare workforce fosters culturally sensitive providers, greater access to healthcare for the underserved, and a broader research agenda[1]. Currently, 31.4% of physicians described themselves as non-White, including 17.1% Asian, 5.2% Hispanic/Latino, and

3.6% Black/African American[2], and nearly one quarter of the current physician workforce is made up of international medical graduates (IMGs)[3]. The patient-physician interaction is fundamental to an individual's healthcare. Research on patient-physician race discordance has focused almost exclusively on non-White patients being cared for by White physicians, examining quality of care and communication style[4]. Even in the absence of physicians' explicit race bias, the presence of physicians' "implicit bias" in this body of research has been found to adversely influence patient-physician communication and patient trust. Due to efforts to train more physicians from historically underrepresented ethnic/racial minority groups in the U.S., and because the physician shortage is being filled by IMGs, a growing proportion of primary care physicians will be non-White. The experiences and perspectives of non-White physicians caring for White patients has yet to be explored as a potentially relevant factor in physician-patient interactions, patients' health outcomes, or physician well-being. The high prevalence of race bias across the U.S. would predict that White patients hold implicit (or even explicit) bias against racial groups of which their non-White physician may be a member. We conducted a systematic review of the published research on non-White physicians caring for White patients. We searched six databases and authors AF and MA performed independent reviews of the results to determine study eligibility, extract data from the included studies, and assess the quality of the studies. When necessary, author MC served as mediator for any disagreement between AF and MA. We identified 15 studies that examined the experiences of non-White physicians with patients, with 13 of these reporting biased experiences with White patients. These 15 studies assessed perceptions or observations of the patient-physician interaction, however, none assessed clinical outcomes of these interactions between a non-White physician and a white patient. Commentaries cite the need for healthcare systems to develop protocols to guide non-White physicians' response to patients that express explicit race bias, but remain silent on the issue of more subtle implicit bias[5]. We conclude that research is needed on whether non-White physicians experience race bias from their White patients given the growing likelihood that White patients will receive primary care from non-White physician, and if so, how this impacts the patient-physician interaction, clinical outcomes, and physician well-being.

P12: Implementation of The Steps Toward Academic Research (STAR) Fellowship Program to Promote Underrepresented Minority Faculty into Health Disparity Research

Presenter: Harlan P. Jones **Institution**: University of North Texas Health Science Center **Co-Authors**: Jambooor K. Vishwanatha

Eliminating disparities in health can benefit from the inclusion of diverse populations pursuing health disparity research careers. A goal of the Texas Center for Health Disparities (TCHD) is to provide opportunities for underrepresented minority faculty to become successful health disparity researchers. The TCHD created the Steps Toward Academic Research (STAR) fellowship program to provide faculty and community partners a yearlong face-to-face and online hybrid curriculum focused on acquiring fundamental concepts in biomedical and behavioral health disparity research, basics in grantsmanship as well as professional development skills. In total, this training approach is envisioned to provide mutually beneficial co-learning experiences that will increase the number of URMs entering translational research toward the elimination of health disparities.

P16: Engaging rural students in biomedical research through One Heath focused undergraduate research experiences

Presenter: K. Hueffer **Institution**: University of Alaska Fairbanks **Co-Authors**: Arleigh Reynolds, and Paul Cotter

The large size of Alaska and resulting subsistence lifestyle is a challenge for traditional western-based approaches to student engagement (Merculieff 2010). By presenting biomedicine in the context of the One Health Paradigm, which explicitly links animal, environmental and human health, we hope to be able to specifically engage and retain rural and Alaska Native students into this program that synergistically integrates research and teaching and aligns more closely with indigenous patterns of learning and teaching. Our Biomedical Learning and Student Training program (BLaST) provides undergraduate research experience in a One Health

context to train students in a meaningful way (Hueffer, Reynolds, and Taylor 2016)(Taylor et al. 2017). Initial quantitative and qualitative data from students and faculty indicate high levels of engagement and satisfaction with mentored research experiences. Undergraduate researchers report significantly increased interest, comfort, and competency in laboratory research, and improved understanding of science and of laboratory research methods ($p<0.01$ in all cases; Wilcoxon Paired Sample Tests). Further, these improvements were observed each semester of student experience - undergraduate research experiences continue to be perceived as learning experiences by students through successive semesters of participation. Trends suggest undergraduate researchers from rural backgrounds are especially interested in connections between animal/environmental health and human health. Our data suggest that One Health is valuable in engaging and retaining students underrepresented in biomedical research, especially those from rural and/or subsistence backgrounds.

P18: Building a Sustainable National Infrastructure to Expand Research Mentor Training

Presenter: Kimberly Spencer **Institution**: University of Wisconsin-Madison **Co-Authors**: Jenna Griebel Rogers, Christine Pfund, Christine A. Sorkness, Emily Utzerath, Melissa McDaniels, and Pamela Asquith

High quality mentoring is an important predictor of persistence for researchers pursuing careers in science, technology, engineering, and math (STEM) fields and can also influence the confidence of historically underrepresented trainees' ability to successfully conduct research. Despite this, mentors typically do not receive any training on how to optimize their mentoring relationships. The focus of this research examines programmatic infrastructure developed to support the national dissemination of Entering Mentoring, an evidence-based research mentor training curriculum for early-career scientists that has been adapted for use across many disciplines and career stages. Dissemination of Entering Mentoring has been achieved through a train-the-trainer model aimed at increasing the number of individuals prepared to facilitate mentor training in their local contexts. The programmatic infrastructure to support this model includes: 1) an expansion initiative to increase the number of trained facilitators able to deliver train-the-trainer workshops nationwide; 2) implementation resources to support facilitators and help them overcome implementation barriers; and 3) standardized, centralized assessments to evaluate training. Data supporting the effectiveness of these infrastructure elements will be provided, which have cumulatively resulted in over 600 trained facilitators from 2010 to 2017 who implemented mentor training for over 4,000 graduate student, junior faculty, and senior faculty mentors. Facilitator confidence, preparedness, and satisfaction data will be shared. These findings have direct implications for increasing the likelihood of trainees from historically underrepresented groups to pursue research careers in STEM.

P20: Using a Master Facilitator Initiative to Build a National Network of Trainers for Research Mentor and Mentee Training

Presenter: Melissa McDaniels **Institution**: Michigan State University **Co-Authors**: Emily Utzerath, Stephanie House, Kimberly Spencer, and Christine Pfund

High quality mentoring is an important predictor of persistence, research productivity, and confidence for researchers pursuing careers in science, technology, engineering, and math (STEM) fields. Despite this, mentors and mentees typically do not receive any training on how to optimize their mentoring relationships. The National Research Mentoring Network (NRMN) was funded (2014) by the National Institutes of Health (NIH#U54GM119023), in part, to serve as a national training hub for the preparation of mentors and mentees engaged in biomedical research, with the goal of diversifying the workforce. The key mechanism for implementation of both in-person and online (synchronous & asynchronous) research mentor and mentee training was the creation of a Master Facilitator Initiative. Approximately forty (40) Master Facilitators from twenty-one (21) institutions were identified to deliver career-stage appropriate training using evidence-based curricula to optimize mentoring relationships, with a particular focus on those relationships that support scholars

from historically underrepresented racial and ethnic minority groups. In this poster, we will provide data demonstrating the national impact of the Master Facilitator Initiative as well as the content and efficacy of professional development efforts with the Master Facilitators themselves, including nine (9) webinars and four (4) multi-day in-person workshops. To date, NRMN Master Facilitators have implemented approximately two-hundred (200) mentor training, mentee training, and facilitator training workshops for over five-thousand (5,000) participants. Outcome data using a validated Mentoring Competency Assessment has been collected from a majority of these participants, creating a large national dataset. Lessons learned and implications for future initiative development will be shared. UI community members interested in culturally inclusive research mentoring, professional network development and/or scaling of evidence-based interventions will benefit from the knowledge shared in this poster.

P22: Transforming a College: Inclusive Excellence at Rochester Institute of Technology

Presenter: Jennifer Connelly **Institution**: Rochester Institute of Technology **Co-Authors**: Dina Newman, Elizabeth Hane, Lea Vacca Michel, and Scott Franklin

We report on a holistic program of support and inclusivity for deaf/hard-of-hearing, female and underrepresented students in the natural sciences that 1) develops faculty to proactively recruit and mentor a diverse student population in lab research; 2) creates new metacognition course materials to improve student sense of identity and self-efficacy; and 3) develops a faculty/student and student/student community that fosters inclusivity. This multi-prong approach directly transforms three separate environments critical to fostering student disciplinary identity: the research lab, the classroom, and the broader social culture. Importantly, it does so by transforming faculty attitudes and practices, which then creates a more hospitable environment for students of all identities. Faculty research mentor development workshops focus on issues particular to students from diverse backgrounds, in particular exploring how race and gender intersect in the research lab. [Johnson2007] Rejecting a student deficit model approach, faculty develop their own personal responsibility for creating an research experience around student's individual skills. A separate group of faculty are working together to develop a menu of short, five-minute metacognitive and affirmation activities that can be incorporated into classrooms of all levels to provide regular reinforcement of important non-content messages. Sample activities include concept and lateral transfer maps, classifying content within the context of Bloom's Taxonomy, Guided Reflection Forms, [Dounas-Frazer2015] and activities that emphasize a growth mindset and affirmation [Yeager2016] of individual values. Research has shown the importance of identity and sense of belonging, with students who feel they "belong" having a higher degree of intrinsic motivation and academic confidence. [Godwin2016] This sense of belonging goes well beyond classroom performance, striking at the heart of the idea of "discipline as culture" into which students can be welcomed (or, more often, driven away from). The program develops a novel series of "Playback Theater" workshops, a form of improvisational theater that promotes social change, to engage faculty and students in meaningful discussions around issues and experiences with diversity and inclusivity. Our assessment of this project takes a variety of forms. Social network maps are created from attendees at all project events, documenting the growth of a connected web of relationships between faculty, students and staff. A faculty inclusivity climate survey was developed, based on earlier research, to measure how receptive faculty were (and are) to efforts at increasing diversity and inclusion. Faculty within the research mentor development workshops keep journals of their experiences and growth, and these reflections are analyzed for both formative and summative purposes. Finally, faculty interviews and focus groups provide case study narratives of the program that are useful in publicizing the initiative and recruiting future participants.

P24: ASEE Safe Zone Workshops and Virtual Community of Practice to Promote LGBTQ+ Equality in STEM

Presenter: Benny C. Chan **Institution**: The College of New Jersey **Co-Authors**: Erin Cech, Rossen Tsannov, Tom Waidzunas, Stephanie Farrell, Rocia Chavela, and Alexandra Longo

This transformative project presents the work of the American Society of Engineering Educator's efforts to promote LGBTQ+ equality in engineering and STEM through faculty development. The culture in STEM may not create a discussion space on issues of diversity and inclusion which can lead to an oppressive climate. The project identifies the aspects of engineering that are barriers to LGBTQ+ equality, builds knowledge and skills in faculty members to disrupt biased behaviors, and promotes the best practices to increase LGBTQ+ equality. Safe Zones is a term in many schools and workplaces to indicate a space that is inclusive to diversity. The occupant is has typically undergone safety training and creates a visible network of support for the LGBTQ+ community. The ASEE received NSF funding to create a virtual community of practice (VCP), to develop Safe Zone Training modules for academic departments, to study the specific issues for LGBTQ+ inclusion, and to train faculty through the ASEE conference and virtual online training sessions. Over 500 Safe Zones have been created around the country and an increase in awareness and support for LGBTQ inclusion. The VCP meets regularly to hone the safe zone training and continue to conduct safe zone training to interested faculty.

P30: Examining the Scientific Human and Technical Capital of Early Stage Investigators

Presenter: Japera Johnson Hemming **Institution**: Morehouse School of Medicine **Co-Authors**: Kristin Eide, Kola Okuyemi, Harlan P. Jones, and Eileen Harwood

Significance - The National Research Mentoring Network (NRMN), a member of the Diversity Program Consortium (DPC), was established to address the R01 funding gap between underrepresented minority (URM) investigators and their white counterparts identified by Ginther et al (2011). NRMN provides intensive Grantsmanship Coaching Programs (GCP) that address the technical components of grant writing while acknowledging, and where feasible, addressing, the psychosocial and environmental challenges faced by URM investigators pursuing grant funding (Thakore 2014 and Jones 2017). The NRMN GCPs recruits ~70% URM investigators, which provides a unique opportunity to examine scientific, technical and human capital of a sample of early stage investigators. This analysis will contribute to the broader understanding of the differences in these forms of capital among URM investigators and their peers. Study population - The study includes 766 early stage investigators who applied to one of the four GCP models between August 1, 2015 and June 30, 2017. Applicants who were accepted into programs and applicants who were not accepted are included in the analysis. Most of the investigators had less than two years of research experience beyond postgraduate training (62%), 18% had three to five years of postgraduate training and 20% had five or more years of training. They represent a variety of racial and ethnic groups including Asian (17%), Black/African American (31%), Hawaiian/Pacific Islander (2%), Hispanic/Latinx (13%), Native American/American Indian (5%), White (23%) and Other (9%). Women made up 66% of the applicants, while men were a much smaller proportion (34%). Contextual Factors - We analyze application data to describe differences in capital between URM investigators and their majority peers. The two types of capital analyzed are (1) scientific & technical and (2) human, both of which are essential to sustainability in a research career (Bozeman 2001). Scientific & technical capital are measured by the investigators' previous grant submission experience and publication record. Human capital is measured by their time to conduct research, access to research resources, and faculty within their department with substantial federal research funding. Outcomes - Our descriptive analysis demonstrates that on average applicants to NRMN GCPs published 12 articles in peer reviewed journals and 6 as first author. Interestingly, Asians published 19 articles, Blacks 9, Hawaiian/Pacific Islanders 9, Hispanic/Latinx 13, Native Americans 10 and Whites on average published 12. Of all the racial/ethnic groups, Asians were more likely to publish as first or senior authors. White investigators in the sample were more likely to have received federal funding compared to another other group, however they were not more likely to have applied for funding. Hawaiian Pacific Islanders were more likely to report not having access to core facilities to conduct research, while Asians reported not having access to statistical support, Hispanic/Latinx respondents were most likely to report not having access to grants management offices and collaborators. Hawaiian Pacific Islanders were most likely to report spending less than 10% on research and grantwriting, supported by them also reporting the highest teaching load. We did not observe any difference

among the racial/ethnic groups access to colleagues with federal funding.

P34: The BUILD EXITO Scholar Pathway: Undergraduate Research Training Building to a Successful Research Career

Presenter: Jen Lindwall **Institution**: Portland State University **Co-Authors**: Kelly Gonzales

Significance Significant gaps in degree attainment persist in biomedical disciplines despite efforts by universities to support URM students on their educational pathways. Ongoing discrimination, stereotype threat, implicit bias, and a lack of supportive environments for minority students have all been shown to create significant barriers to success for these students in STEM fields. As a result, there have been persistent calls for universities to adopt innovative approaches to provide undergraduate research training for these students. BUILD EXITO, one of ten sites the NIH funded to implement a new approach to training URM students, provides comprehensive support and training for undergraduates from underrepresented student populations who aspire to health-related research careers. Portland State University (PSU), a major public urban university, and Oregon Health & Science University (OHSU), a research-intensive academic health center, lead the EXITO network of ten 2-year and 4-year institutions of higher education spanning Oregon, Washington, and the Pacific Rim. Fundamental components of this three-year research training pathway include integrated curricular enhancements, intensive research experiences, three tiers of developmental mentoring, and a supportive community and services. EXITO also addresses faculty and institutional development by holding curriculum development conferences, awarding pilot project research funding, and developing campus infrastructure to support Scholars with diverse backgrounds. Study population All EXITO Scholars are undergraduate students pursuing biomedical degrees and are enrolled full-time at one of ten BUILD EXITO institutions. Students come from a variety of racial/ethnic backgrounds, most receive need-based aid, and many are first-generation college students. Factors The EXITO model has been implemented across a variety of contexts (2-year, 4-year, remote island colleges and large urban universities) and locations with a wide range of diverse students including Native Pacific Islanders, African Americans and Latino students. EXITO forged new relationships with institutions who historically have had limited access to health science and biomedical training. As a result, each region and institution faces a unique set of contextual factors and resulting challenges. Challenges when seeking to generalize preliminary findings include the current stage of implementation, which has the first cohort currently in their final program year. Additionally, much is still unknown about the long-term success of Scholars. Outcomes BUILD EXITO's desired outcomes are based on the BUILD consortium's Hallmarks of Success which include participation in professional organizations, developing scientific self-efficacy and science identity, presenting research, authoring publications, and being admitted to graduate school. Preliminary findings have been promising. For example, student outcomes suggest that program benefits include greater retention rates and higher GPAs for EXITO Scholars. Additionally, EXITO Scholars are meeting program milestones such as presenting their research and authoring publications. These data provide an important overview of the student experience within the EXITO Scholar pathway and insights can be gleaned for tailoring research training programs to best support URM students pursuing biomedical degrees.

P36: ASCEND: An Entrepreneurial Training Model Diversifying the Biomedical and Behavioral Science Research Workforce

Presenter: Jocelyn Turner-Musa **Institution**: Morgan State University **Co-Authors**: Acquanette Pinchback, Oluwatoyin Ajayi, Cleo Hughes-Darden, and Sherita.henry@morgan.edu

The participation of underrepresented populations in the biomedical and behavioral science research fields is vital to ensuring a high-quality supply of biomedical scientists in the United States. Unfortunately, many underrepresented students do not see research careers as a viable option and may choose not to pursue graduate education in biomedical research (Byars-Winston, Guiterrez, Topp, & Carnes, 2011). Among the key elements for students' successful entry into graduate programs in the biomedical and behavioral sciences are: early identification of students with interests and potential talent for biomedical research, high expectations of student

performance and strengthening support if needed, mentoring and peer support, and required research participation (Chemers, Zurbriggen, Syed, Goza, & Bearman, 2011; Cameron, Lee, Anderson, Byars-Winston, Baldwin, & Chang, 2015). This study examines data from the first two cohorts of undergraduate students who participated in a 2-year entrepreneurial research training program (ASCEND) funded through the NIH "Building Infrastructure Leading to Diversity" (BUILD) initiative (Valentine & Collins, 2015). The program includes self-directed learning, development and execution of an interdisciplinary team-based research project, team learning, and critical self-reflection. It is hypothesized that the model will increase research knowledge and competencies, improve research self-efficacy, foster interdisciplinary collaborations, increase interest in biomedical behavioral science research, and improve admittance into graduate school. Forty mostly African American students who participated in an intensive Summer Research Institute were selected as participants in the ASCEND Scholars program. Students participated in several skill-building and career development workshops, interdisciplinary seminars, and study skills workshops. Pre-post data were collected on key measures of graduate school readiness such as study skills, writing skills, grade point average, and knowledge of health disparities and prevention research. Independent and paired samples t-tests suggest that students showed improvement in each of the areas assessed ($p < .05$). Examination of data from student Individual Development Plans and scores from a Biomedical Science Identity Scale show that students increased their perceptions of readiness for graduate school and identity as biomedical researchers. Preliminary findings suggest that the entrepreneurial training program may provide students with the requisite skills needed for successful entry into graduate school and biomedical research careers. Limitations, implications, and suggestions for successful implementation of an entrepreneurial intervention model to diversify the biomedical research workforce are discussed.

P38: Theme-Based Course-Embedded Implementation of Inquiry and Research in the Chemistry Curriculum

Presenter: Louise Wrensford **Institution**: Albany State University **Co-Authors**: Ghislain Mandouma, Amir Saheb, Xiaomei Zheng, and Yixuan Wang

Many institutions incorporate research activities into the undergraduate curriculum with positive student learning outcomes. In contrast to traditional lab activities, an inquiry-based or research approach is utilized by students to design and execute experiments and analyze experimental data. We have revised the chemistry laboratory curriculum, in five chemistry courses, from freshman to senior level, with a nano-technology theme to utilize this approach. In General Chemistry two modules were implemented; 'the Synthesis of Colloidal Gold Nanoparticles in Solution' and 'Inquiry-based-lab: CSI: Crime Scene Investigation'. These activities allowed students to explore the use gold nanoparticles as electrolyte sensors and applications in the real world. Organic Chemistry integrated the synthesis of polymer-based nano-particles with potential therapeutic value, exposing students to research methods common in organic chemistry and microbiology. The Quantitative Analysis course was revised to utilize a guided inquiry lab module in which gold nanoparticles less than 50 nanometers in diameter are synthesized and the particle size characterized using analytical instruments such as the UV-Vis spectrophotometer and Dynamic Light Scattering Particle Size Analyzer. Students in Physical Chemistry investigated 'Molecular Modeling of the Correlation between the Color and Size of Gold Nanoparticles and in Biochemistry they developed and investigated research questions about the impact of nanoparticles of various sizes on the properties of the enzyme acid phosphatase. The revised laboratories were designed to allow students to develop and improve critical thinking skills, problem-solving skills, and lab technical skills. Reinforcement of basic skills while developing advanced knowledge and skills were targeted learning outcomes as students progressed throughout the undergraduate curriculum. Here, we report on the implementation and discuss the impact on students learning and on their attitudes toward science.

P40: An Examination of Faculty Diversity in the STEM Departments at ACC Schools

Presenter: Victoria Mukuni **Institution**: Virginia Polytechnic and State University **Co-Authors**: Ed Smith

We examined the level of faculty diversity in science and science related departments in universities in the Atlantic Coast Conference (ACC). Since only a small fraction of athletes go on to be professionals in their sports, science faculty who are minorities could offer athletes a viable career option: you "are likely to be what you can see." A total of 135 departments were evaluated through the websites of each of the 15 ACC schools. Our determination of diversity was based on the total number of visually-evident African Americans/Blacks, Hispanics, and women who are faculty members as shown for each department. These numbers included full-time faculty, tenure- and non-tenure track but did not include retired and or part time faculty. The number of minority faculty who hold positions as head of department was also considered. We used web-based resources to identify and verify ethnicity and race of faculty in each department at each school. Of the 15 member schools, Duke, Miami and North Carolina State were the most diverse with 88, 48, and 7, minority faculty. Of these, Duke had eight African American/Black, 72 women and eight Hispanic faculty. Miami had two Black, 32 women and 14 Hispanic faculty. North Carolina State had eight African American/Black, 64 women and five Hispanic faculty. Clemson, Virginia and Wake Forest were the least diverse with Clemson having a total of 39, of which 35 were women, three Hispanic, and 1 Black/African American. Virginia had a total of 48, of these three were African American/Black, 44 were women and four were Hispanic. Wake Forest had a total of 39 minority faculty, of these zero were African American/Black, 45 were women and seven were Hispanic. Georgia Tech had the most diverse head of departments with a total of four minority heads out of the nine departments while Clemson was the least diverse with no minority head of department. As a leading athletic conference in the nation, with significant number of minority athletes in revenue sports, there is need for partnerships between athletic and STEM departments to reduce the disparity described here. We speculate that faculty diversity investigated here may be a result of diversity in the academic administration of the 15 schools. Duke, for example, has an African American dean of the College of Science.

P42: Incorporating graduate assistants as near-peer-mentors in undergraduate research and mentoring programs: A case study of the CSULB BUILD program.

Presenter: Sewwandi Abeywardana **Institution**: California State University Long Beach **Co-Authors**: Alejandra Priede

Research has shown that incorporating graduate assistants as near-peer-mentors has benefited undergraduate students. The California State University, Long Beach (CSULB) Building Infrastructure Leading to Diversity (BUILD) research and mentoring program for undergraduate students has a nested mentoring model that incorporates graduate assistants as near-peer-mentors. A challenge of incorporating graduate assistants as near-peer-mentors is developing a training curriculum for a diverse group of graduate assistants - academically and culturally. Many graduate students lack the skills necessary to mentor a diverse student population in an undergraduate research training program. They have skills needed to be a teaching assistant or a discipline-based subject matter tutor, but need to learn other skills such as how to facilitate discussions, grade and provide feedback, and help trainees develop communication skills. CSULB BUILD program developed a training curriculum for the near-peer-mentors that focused on three domains: Technical skills (grading, using rubrics), cultural competency, and communication skills for graduate students from four colleges. Using a mixed-methods approach, this study aims to a) explore the benefits and challenges of incorporating graduate assistants as near-peer-mentors in a interdisciplinary undergraduate research training program, b) illustrate characteristics of the near-peer-mentor training curriculum developed by the CSULB BUILD program, and c) present the effectiveness of the near-peer-mentor training curriculum on increasing the quality of mentoring and trainees outcomes. During the summer and fall of 2017, 131 undergraduate students participated in the BUILD research training program and 17 GAs served as near-peer-mentors. Trainees responded to a survey at the end of the summer and at the end of the fall semester. The survey collected information about student outcomes such as sense of belonging, mindset, science identity, and research skills, and information about perceptions of their near-peer-mentor. Additionally, near-peer-mentors responded to surveys about the training they received and a survey at the end of the fall semester measuring what they learned. Preliminary findings suggest that incorporating graduate assistants as near-peer-mentors has

contributed to personal, educational, and professional growth for both trainees and near-peer-mentors. Near-peer-mentors state that thanks to the curriculum they have developed skills that have improved their mentoring quality. They feel more prepared to grade and provide feedback on different assignments, such as graduate application materials. They better understand their own cultural capital and developed confidence in incorporating cultural capital concepts when interacting with trainees. Additionally, trainees report that peer-mentors have provided personal and academic support. Thanks to the peer-mentors, trainees have been able to better understand their career options and plan their research career, increase their research and science identity, increase their stress and time management skills, find work-life balance, developed professional soft skills, and greater sense of belonging. Overall, there is evidence that shows incorporating graduate assistants as near-peer-mentors and providing them with training on technical skills, cultural competency, and communication skills promotes undergraduate and graduate student success.

P44: A Model for a Research-Based STEM Engagement Program Serving Underrepresented Minorities

Presenter: Julia Ribeiro **Institution**: University of California, Davis **Co-Authors**: Tricia Lam, and Tina Jeoh

Significance to the UI Community. We have created a STEM program, STEM for Girls, that is based on research in education focusing on learning and persistence. This program utilizes rigorous evaluation to improve its efficacy and to act as a model to create evidence-based school programs for minorities who would benefit from additional STEM experience. We specifically target adolescents, who are already at risk for losing interest in STEM (Tyson et al., 2007). Specifically, we utilize research-based strategies, such as highlighting new role models for girls to look up to in STEM (Smith & Erb, 1986), emphasizing hands-on learning (Simpkins, Davis-Kean, & Eccles, 2006), neutralizing stereotype threat, increasing belonging for minorities (e.g., Good, Aronson, & Inzlicht, 2003), and modeling programming based on cognitive abilities at our target age (e.g., Eccles, 1999). Our poster describes how our program influences STEM outcomes in 5th through 8th grade girls, as well as volunteers in college or graduate school. Future research should investigate long-term effects of programs like ours, what can be done to prolong the benefits, and if girls who engage in these programs are more likely to succeed in STEM careers. Study Population. From 2015 to 2017, we have had 157 girls participate, ranging from 10 to 14 years old ($M = 11.36$, $SD = 1.15$). These girls were in fifth through eighth grade ($M = 6.02$, $SD = 1.07$) from seven different schools. Most students were from families that made less than $50,000 a year; half made less than $25,000. In addition, 89% of participants were from minority groups. We have had over 117 undergraduate students, 70 graduate students, and 8 faculty or staff who volunteered; 83.59% were female, 12.82% were male, and 3.08% were gender non-conforming or questioning. In addition, 25.13% were the first in their family to attend college. Contextual and Other Factors. We host girls from neighboring school districts for a day of STEM workshops (e.g., chemistry, coding) and tours (e.g., human anatomy lab, student farms). To evaluate the impact of our programs, girls are surveyed before, after, and during the day about socioemotional factors (e.g., sense of belonging, interest, emotion) and future behaviors (e.g., college, taking STEM classes, following a STEM career). Outcomes of the Intervention. Girls reported feeling a greater sense of belonging in STEM, more interest in STEM, and more positive feelings after the event than before ($p < .01$). Girls also reported having someone in STEM to admire (i.e., a role model), wanting to attend other STEM events, and looking forward to taking STEM classes more after the event than before the event ($p < .01$). Furthermore, girls reported envisioning themselves in college and in a STEM career more after the event than before the event ($p < .01$). Returners, who had attended the event one year earlier, were significantly more likely than first-time participants to: imagine themselves going to college, want to come back the next year, have a role model in STEM, and imagine themselves in STEM ($p < .05$). Furthermore, our volunteers (undergraduate and graduate students) felt that they were better able to understand the importance of creating inclusive spaces and reflect on their identities because of this program ($p < .01$). In addition, this program contributed to their knowledge about campus resources and safety, academic success, and their connection to their university community.

P46: Examining Interpersonal Belonging and Science Identity among Historically and Newly Underrepresented Minority Students

Presenter: Matthew C. Jackson **Institution**: California State University Los Angeles **Co-Authors**: Gino Galvez, and La Keisha Jeanmarie

Underrepresented minority (URM) students face a set of unique and persistent challenges in trying to achieve degrees in science technology, engineering and math (STEM). Interpersonal belonging and science identity are factors that can contribute to freshman URM students' persistence in science. We coined the terms historically underrepresented minority (HURM) students to represent racial minority students who were underrepresented in both high school and college and newly underrepresented minority (NURM) students to represent racial minority students that attended high schools in which they were majority members prior to being underrepresented in college. Well-represented (WR) students were majority members in both high school and college. We were primarily interested in examining if interpersonal belonging scores are lower for NURM students in comparison to HURM and WR students. Additionally, we were interested in whether interpersonal belonging is predictive of science identity. Entering freshmen students (N = 567) intending to major in science completed an online survey. They were categorized into HURM (n = 76), NURM (n = 215), and WR (n = 276) groups according to their survey responses and high school ethnic demographic data from the California Department of Education. A one-way ANOVA was conducted to assess interpersonal belonging among HURM, NURM, and WR students. Results showed that NURM students (M = 4.91, SD = 1.52) were significantly lower in interpersonal belonging in comparison to HURM students (M = 5.40, SD = 1.39) and WR students (M = 5.23, SD = 1.29). A Pearson correlation showed lower interpersonal belonging was predictive of lower science identity ($p < .001$). Our novel categorization (i.e., historical vs. new) provides a new framework to understand the varying perceptions of belonging among URM students. NURM students may experience more acute concerns about belonging in comparison to their HURM counterparts, who have already experienced academic success while underrepresented in high school. These findings can inform the specific tailoring of interventions designed to address the precursors of STEM attrition (e.g., low belonging and science identity).

P48: Peer Learning and Mentoring in a Large-Enrollment STEM Classroom

Presenter: Marcia Shofner **Institution**: University of Maryland **Co-Authors**: Gili Marbach-Ad

A variety of studies have established that the optimal method of learning is active, where students are involved in their own learning by engaging in the comprehension and application of concepts. At the University of Maryland many courses have adopted a peer mentoring program using undergraduate learning assistants (ULA), adding to the standard lecture with biweekly undergraduate-led, in-class learning activities (LA). BSCI160 is the first biology course in a sequence of three required courses for biology majors that is being redesigned from the traditional lecture format to active learning led by ULAs. In addition to biology majors, the course also serves a large group of non-biology majors. An overarching goal is to develop an appreciation for evolutionary principles governing the function and diversity of living organisms. With BSCI160 students as an experimental subject and LAs as a model, we demonstrate that the ULA interactions not only increased student preparedness for examinations, but also led to high rates of student engagement and grasp of material. End-of-semester surveys of 234 students yielded results supporting the effectiveness of the learning activities. We found that students experienced the greatest improvement in study skills, research methods and critical thinking through the course as measured by pre and post assessments. These skills are of fundamental importance in an introductory science course. The group activity and peer evaluation exercises offered were positively perceived by most of the students. Further, we note that science educators should provide supplemental academic support activities in their courses (e.g., study groups, interactive sessions) to assist students of minority group status to attain optimal levels of academic performance in science courses. Our results provide support for the model of peer learning and teaching in large-enrollment classrooms.

P50: Factors that Affect Postdoctoral Trainee Persistence in Academia

Presenter: W. Marcus Lambert **Institution**: Weill Cornell Medicine **Co-Authors**: Linnie Golightly, Jacob Sneva, Rodrigo Valles, and Matthew Cipriano

A significant number of PhDs are entering postdoctoral training with interests in a broad array of career paths including academia, industry/for-profit, and non-research positions. While recent reports have examined the development of career interests of postdoctoral trainees (Gibbs et. al, 2015; Clair et. al., 2017), persistence along a career trajectory is not well-characterized. Moreover, women and underrepresented minority trainees have been shown to change career goals away from academia before and during their postdoctoral training, contributing to the dearth of faculty diversity in academia (Gibbs et. al, 2014; Layton et. al., 2016). To better understand the factors that contribute to career goal persistence in academia, we sampled biomedical postdoctoral fellows from across the United States for their research productivity, research self-efficacy, outcome expectations, values, and other factors that might influence intentions to pursue careers in academia. The U-MARC (Understanding Motivations for Academic Careers) survey generated 1200 respondents from over 200 universities. We found that 60% of postdoctoral trainees who in intend to pursue careers outside of academia are less committed to academic careers since starting a postdoctoral position, suggesting that career goals have shifted within their postdoctoral training period. Of those who intend to pursue academic faculty positions, 44% are more committed since starting their postdoc. Those postdocs who are pursuing academia (58% of our respondents) on average have 2 more publications, higher first author publication rates, publish in higher impact journals, have significantly higher research self-efficacy ($p<0.01$), and varied research career expectations and values than those opting for careers outside of academia. Yet among high achievers (>9 publications; highest impact factor >12), 35% intend to pursue careers outside of academia, citing job prospects, financial security, and immigration status. We propose a risk-reward model whereby motivations for academic careers are strengthened or weakened through self-efficacy, outcome expectations, and values during the postdoctoral training period, resulting in career goal persistence or the changing of a career intention. The results from this study provide a foundational piece for understanding why postdocs across racial, ethnic, and gender identities persist toward a career goal against considerable odds.

P52: Academic enhancement in the summer motivates URM students to pursue gateway programs for health professions

Presenter: Debabrata Banerjee **Institution**: School of Graduate Studies, Rutgers University **Co-Authors:** Smita Varia, and James Millonig

Background: Minorities make up almost 28% of the US population with 13% being African American and 16.6% being Latino/Hispanic. This is projected to rise to 50% in two decades. Physicians from these backgrounds barely make up 10% currently practicing or teaching medicine in the USA. The same is true for scientists and educators at the graduate schools. Several initiatives have been launched at national, state and regional levels but have yet to produce the desired outcome. Despite attempts to bring in students from these backgrounds there is considerable leakage from the pipelines. A recent study from the University of California system highlights the problem (Alexander et al 2009). The authors of the study found that even though the under-represented minority (URM) students, on average, did not perform on par with white students they were nearly as likely as white students to persist in completing at least four gateway courses. The authors concluded that URM students experienced academic challenges, but many persist in their prehealth courses despite these challenges if offered encouragement and opportunity. Therefore, interventions designed to support URM student performance in undergraduate and gateway courses are considered to be particularly important for increasing the diversity of health related professional and graduate schools (Estrada et al 2016 and McGee et al. 2012). Many medical schools have programs in place that prepare URM students for admission, however the number of qualified candidates remain far short of the desired goal. Finding meritorious URM students who can compete and qualify for admission to health related professions and graduate schools remains the biggest challenge. Hypothesis: A summer immersion program for disadvantaged students (including URM students) will prepare them to take on the rigors of a gateway masters program designed for aspirants to health related professions such as medical, dental and or

graduate schools for biomedical sciences. Design: We have initiated a four week intensive academic enhancement in the summer program for students who were just below the cutoff for admission to our master's program in biomedical sciences with the understanding that students who achieve a B or above grade in four relevant courses (Cell Biology, Biochemistry, Physiology and Microbiology) will be offered admission to the main master's program at the end of the program. Results: Over the past two years we have admitted 24 students into our summer program. Of the 24 students, 11 are women; and 10 are URMs; the rest are Asian or Caucasian. A few of them are self-declared economically disadvantaged and some are first in family to go to college. Twenty two of these students qualified for the main master's program after completing the summer program. We have followed their performance in the master's program and find that these students are indistinguishable from students who had been admitted to the master's program in the regular track. The summer program graduates are integrating well with their peers and are now beginning to be invited for interviews for admission to medical schools. Conclusions: Interventions at the gateway program level designed to attract and nurture disadvantaged students including URMs can be successful in increasing the number of qualified aspirants to health related professional schools and graduate schools. By opening up the opportunity to all disadvantaged students, we have been able

P54: UNDERSTANDING FACTORS THAT FACILITATE DOCTORAL DEGREE ENTERING: A LONGUITUDINAL STUDY IN A GROUP OF UNDERREPRESENTED MINORITY STUDENTS IN BIOMEDICAL SCIENCE

Presenter: Orestes Quesada **Institution**: University of Puerto Rico, Rio Piedras

The independent variables show that, on average, students actively participated in the research training program 21.82 months. Students had a mean GPA of 3.60 in a scale of 1 to 4, and 57.7% of the participants were females while 42.3% were males. Regarding the participants academic concentration, 61% earned a bachelor degree in Chemistry, 33.4% in Biology and 6% obtained their bachelor degree in a natural science field different to Biology and Chemistry. Among the Program scholars, 51% attended a summer research internship. From the resulting logistic regression equation, we observed that the independent variables of summer internship and academic concentration have a significant contribution in entering a doctoral degree in biomedical science. Although we recognized the limitations of focusing on only five independents variables, results represented the first effort made by the Programs staff to better understand the underlying mechanisms that facilitated Hispanic students entering graduate studies in biomedical science. An ongoing research will use as a starting point this results to have an in deep understanding of the activities provided by the program to facilitated service improvement and promote persistence in biomedical careers. Furthermore, a qualitative approach, based on group discussions has being implemented to better understand in what ways the summer internship contributes to students PhD entering. As demonstrated, the continuous successful outcome of the past 35 years has not only been limited to the research training process, prepared with the objective of the student to understand their potential as a researcher, future scientist and their high caliber to compete in any university or institution at the doctoral level outside Puerto Rico. Key words: Undergraduate research training programs: Understanding the factors that facilitate doctoral degree entering in a group of underrepresented minority students in biomedical science.

P56: ASCEND: An Entrepreneurial Training Model Diversifying the Biomedical and Behavioral Science Research Workforce

Presenter: Jocelyn Turner-Musa **Institution**: Morgan State University **Co-Authors:** Cleo Hughes-Darden, Acquanette Pinchback, and Oluwatoyin Ajayi

The participation of underrepresented populations in the biomedical and behavioral science research fields is vital to ensuring a high-quality supply of biomedical scientists in the United States. Unfortunately, many underrepresented students do not see research careers as a viable option and may choose not to pursue graduate education in biomedical research (Byars-Winston, Guiterrez, Topp, &

Carnes, 2011). Among the key elements for students' successful entry into graduate programs in the biomedical and behavioral sciences are: early identification of students with interests and potential talent for biomedical research, high expectations of student performance and strengthening support if needed, mentoring and peer support, and required research participation (Chemers, Zurbriggen, Syed, Goza, & Bearman, 2011; Cameron, Lee, Anderson, Byars-Winston, Baldwin, & Chang, 2015). This study examines data from the first two cohorts of undergraduate students who participated in a 2-year entrepreneurial research training program (ASCEND) funded through the NIH "Building Infrastructure Leading to Diversity" (BUILD) initiative (Valentine & Collins, 2015). The program includes self-directed learning, development and execution of an interdisciplinary team-based research project, team learning, and critical self-reflection. It is hypothesized that the model will increase research knowledge and competencies, improve research self-efficacy, foster interdisciplinary collaborations, increase interest in biomedical behavioral science research, and improve admittance into graduate school. Forty mostly African American students who participated in an intensive Summer Research Institute were selected as participants in the ASCEND Scholars program. Students participated in several skill-building and career development workshops, interdisciplinary seminars, and study skills workshops. Pre-post data were collected on key measures of graduate school readiness such as study skills, writing skills, grade point average, and knowledge of health disparities and prevention research. Independent and paired samples t-tests suggest that students showed improvement in each of the areas assessed ($p < .05$). Examination of data from student Individual Development Plans and scores from a Biomedical Science Identity Scale show that students increased their perceptions of readiness for graduate school and identity as biomedical researchers. Preliminary findings suggest that the entrepreneurial training program may provide students with the requisite skills needed for successful entry into graduate school and biomedical research careers. Limitations, implications, and suggestions for successful implementation of an entrepreneurial intervention model to diversify the biomedical research workforce are discussed.

P58: Preresearch Initiative Increases STEM Student Retention

Presenter: Regina Sullivan **Institution** Queensborough Community College (QCC) **Coauthor**: Patricia Schneider; Raji Subramaniam; and Sara Danzi-Engoron

The benefits of an undergraduate research experience are well documented. But, students often fail to take advantage of existing research opportunities due to low self-confidence and misconceptions about research. To address these issues, we designed a series of preresearch activities which were offered during spring, summer or winter intercession. Students were recruited from an Introduction of Biology course and the first semester of our year-long General Biology for science majors. Student participation was voluntary. This “Gateway to Research” included both interactive detailed workshops on relevant topics and hypothesis driven hands on research projects. Workshops Topics included 1) How to maintain a lab book 2) Bioethics 3) Literature search and 4) How to Read a Scientific paper. Several of the sessions were offered jointly to Gateway students and research students who shared their experiences in a grant funded program. Students committed to 4-5 hour blocks per day for either one (summer and spring break) or two weeks (winter break). Projects focused on microbiology, genetics or cancer biology. Formal lectures are avoided but in small informal groups students gained the basic knowledge to carry out the projects. Students would formulate hypotheses, design experiments (with guidance) and carry out the research. The cancer biology experiments required that the students learn the basics of cell culture and a common migration assay referred to as a wound healing or scratch assay. Culminating PowerPoint presentations were given by the students. They received certificates of completion and presented their results during QCC-Honors conference in May. Participants were guided to additional enrichment activities and over a third joined a research program. All the preresearch students persisted in a STEM curriculum at Queensborough Community and/or transferred to a four-year college with a STEM or Health Science concentration.

D22: Cultivating PhD Scientists in a Pre-med Environment

Presenter: Dorian A Canelas **Institution**: Duke University **Co-Authors**: Sherilynn Black, Devyn Gillette, and Daniel Lew

How do we make sure that all students, including individuals who belong to groups underrepresented (UR) in science professions, are exposed to the inner workings of the careers of research scientists? This question is especially challenging, because data suggest that pre-health profession ideas are very frequently conflated with students' stated interests in science disciplines or science careers. Indeed, many students who enjoy science arrive for their first year on college campuses with the viewpoint that they will pursue a pre-health course of study, or at least that they might want to keep their options open (Barr et al., 2010; Chang et al., 2014). At Duke University, as an illustration, 80% of students in a spring-term, freshman-level chemistry courses agree with the statement "I plan to attend a health-related professional school (medical, dental, vet, pharmacy, etc.)," while 40% of students in the same classes agree with the statement "I plan to attend graduate school in the natural sciences." (Canelas, Hill, & Novicki, 2017) Some of these students may envision MD/PhD programs in their futures. But the actual pathways of graduates paint a different picture: Duke finds itself in the top-five nationally among PWIs graduating UR students who continue on to receive an MD (AAMC, 2017; JBHE, 2013), but at the same time Duke produces a comparatively tiny number of UR students who go on to earn a PhD in a scientific field. Many institutions put significant resources into helping students plan pre-health curricula, and some employ pre-health advising professionals. However, even though multiple studies have suggested "what works" in terms or retaining UR undergraduates in STEM careers (Chang et al., 2014), dramatically fewer resources are spent advising for scientific research careers. Data from our institution and other studies (Chang et al., 2014) reveal that this issue is exacerbated by the fact that students from UR groups are much less likely to arrive on campus with prior laboratory research experiences when compared to their non-UR peers. These students are swept up like reeds into the rapid current of pre-health preparation, and almost all students without previous mentored-research experiences ultimately abandon any budding scientific research aspirations. We observe that, while all groups at our institution show a positive slope for increased laboratory research experiences over four years of college, a persistent gap remains between students from UR-backgrounds and their non-UR peers. Self-reported data from thousands of students makes it clear that this gap does not close over time. Since research experiences are a crucial component in the decision-making process for pursuing a scientific research career, the persisting gap between UR and non-UR students concerns us. We are currently using our IMSD program (Duke BioCoRE) to take steps to lower barriers for our undergraduates to enter into high quality mentored-research experiences. We have created a survey taken by undergraduates enrolled in chemistry courses that asks students to respond to several items regarding career plans and rate the certainty of their plans. We propose using the "level of certainty" data to target outreach to first-year students and sophomores, including those who express interest in both science and medicine, through summer research opportunities and our newly envisioned "BioCoRE Explorers" program in an effort to reduce attrition from STEM careers.

S6: Applying Computer Science in Biology: A Model for Incorporating Interdisciplinary Pedagogical Approaches through ePortfolio in the First Year Experience at Community College

Presenter: Yun Ye **Institution**: LaGuardia Community College at CUNY **Co-Authors**: Na Xu

The method to be introduced is about how ePortfolio is used as a platform for an interdisciplinary, collaborative course project for first year seminar (FYS) students in Engineering and Computer Science FYS class ECF090, and in Liberal Arts, Math and Science FYS class LMF101. This project was designed to enrich the integrative research experience of the new-to-college students at LaGuardia Community College, whose student body is known for its diverse background, and to engage them in hands-on inquiry and problem solving practice, with a broader goal of increasing the retention rate in STEM field. The major task in the project was to compare DNA sequences using computer programs, in order to facilitate the blood cancer study. Through the project, the students in both ECF090 and LMF101 classes applied math knowledge to perform algorithm analysis on a Biologic problem, and were exposed to the application and technology in Computer Science. The collaboration work was conducted on an online course platform ePortfolio which hosted all

student work and allowed remote communications and collaboration to happen between two classes in different majors. Based on the survey feedback, the students were impressed by the way how they could contribute to the task using basic math and computer skills, and the interest in continuing STEM path was expressed unanimously.

S40: Chicana STEM Faculty: Narratives of isolation, challenging norms, and institutional leadership

Presenter: Yvette FLores **Institution**: University of California, Davis **Co-Authors**: Lisceth Brazil-Cruz

Currently, Latinas regardless of race or ethnicity represent less than 3% of STEM doctoral degrees. Once in academia they are unlikely to advance to senior university professorial and leadership ranks. Currently, we lack accurate measures truly capturing the percentages of Chicana women in academia. Although research exists on the experience of faculty of color, scant research has been conducted on the career paths of Latina STEM, much less a focus on Chicana scholars and the challenges they face in academia. This interdisciplinary study, aimed at investigating the educational paths of Latina STEM faculty across the nation through in-depth, semi-structured interviews. Findings point to the importance of Latina positionality in the academy and transformational career pathways as a result of mentorship.

6:30 pm – 7:30 pm Poster Session B

P3: Role Modeling: A viable retention strategy for undergraduate women in STEM

Presenter: Paul R. Hernandez **Institution**: West Virginia University **Co-Authors**: Elaine Godfrey, Emily V. Fischer, Rebecca Barnes, Brittany Bloodhart, Wenyi Du, Manda Adams, Melissa Burt, Heather Henderson, Sandra M. Clinton , and Ilana B. Pollack

There is increasing recognition that the U.S. can only meet its national scientific innovation goals by developing a diverse and inclusive science, technology, engineering, and mathematics (STEM) workforce. However, a number of STEM disciplines, including Earth Systems and Environmental Sciences (ESES) have shown a persistent gender gap over the last decade. The current study examines the impact of PROmoting Geoscience Research, Education, and SuccesS (PROGRESS), a novel theory-driven role modeling and mentoring program aimed at supporting first- and second-year college women interested in ESES-related degree and career pathways. We use a longitudinal prospective multi-site quasi-experimental design to compare female STEM majors in PROGRESS to a propensity score matched control group (N = 380). Consistent with the study design, PROGRESS members identified more female STEM career role models than controls (60% vs. 42%, respectively). A multilevel modeling analysis revealed that the number of female STEM career role models supported persistence in ESES-related majors at follow-up. In addition, the analysis revealed that holding an ESES-related major at baseline moderated the impact of PROGRESS. Among participants with an ESES-related major at baseline, PROGRESS members exhibited significantly higher rates of persistence in an ESES-related major at follow-up compared to controls (95% vs. 73%). However, there was no difference between persistence rates of PROGRESS members and controls with nonESES-related STEM majors at baseline. The results have implications for role modeling and informal support programs for women in STEM.

P5: AccessComputing: Broadening the Participation of Students with Disabilities in Computing

Presenter: Lyla Crawford **Institution**: University of Washington

The University of Washington's (UW) Alliance for Access to Computing Careers (AccessComputing) is funded (grant #CNS-0540615, CNS-0837508, CNS-1042260, and CNS-1539179) by the National Science Foundation (NSF) to: Increase the number and success of students with disabilities pursuing undergraduate and graduate degrees and careers in computing fields. Increase the capacity of

postsecondary computing departments and other organizations to fully include students with disabilities in computing courses and programs. Create a nationwide resource to help students with disabilities pursue computing fields and assist computing educators and employers, professional organizations, and other stakeholders develop more inclusive programs and share effective practices nationwide. AccessComputing works with partners who represented a diverse set of postsecondary institutions as well as existing alliances and computing organizations that serve to increase the participation of women, underrepresented minorities, and individuals with disabilities in computing fields. The Alliance engages individuals with disabilities as well as those who support, serve, guide, educate, and employ them in transformational efforts that lead to sustainable structures and practices that make computing disciplines more welcoming and accessible to individuals with disabilities. This poster session will share outcomes and impacts of the project, highlighting lessons learned and promising practices.

P7: Evaluating the NIH Diversity Program Consortium (DPC) - Examples of collaborative approaches and consortium-wide outcomes

Presenter: Lourdes R. Guerrero **Institution**: University of California, Los Angeles (UCLA) **Co-Authors**: Teresa Seeman, Steven P. Wallace, Dawn Purnell, Christina A. Christie, Karina D. Ramirez , Heather McCreath, and Nicole M.G. Macalla

Background - The Diversity Program Consortium initiative is a five-year $250M NIH-funded set of programs to enhance diversity in the biomedical, behavioral, clinical, and social sciences research workforce. The UCLA Coordination and Evaluation Center (CEC) coordinates Consortium level interactions for this initiative, and assists in the design and the conduct of the longitudinal evaluation of the Consortium programs - the Building Infrastructure Leading to Diversity (BUILD) and the National Research Mentoring Network (NRMN) programs, which comprise over 50 primary and partner institutions. These transformative initiatives are testing a range of possible interventions and programs designed to enhance the development of diverse biomedical researchers from undergraduate through advanced career stages (graduate, post-doc, junior to senior faculty, scientific position, etc.). Significance to the UI community - The CEC is charged with leading the overall consortium-wide evaluation of the two major programs within the Diversity Program Consortium - BUILD and NRMN. The BUILD programs focus on testing a range of interventions (e.g. research opportunities, mentoring, advising, training, curricular developments) targeting undergraduate students and faculty at 10 teaching intensive institutions (and over 40 partner institutions) characterized by their high prevalence of under-represented groups (URGs) in their student populations, and sharing common goals of enhancing success and graduation rates of these URGs in biomedical majors, increasing URG continuation in biomedical career pathways, and enhancing mentoring and professional development of faculty. The NRMN program provides a range of training opportunities including grant writing skills and career coaching for post-doctoral students and junior faculty, mentor-mentee training, and strategies to expand research networks to prepare trainees, particularly focusing on, but not limited to, traditionally underrepresented persons, to succeed in the biomedical sciences. The consortium-wide evaluation, implemented by the UCLA CEC, is a rigorous, multi-method (quasi-experimental) longitudinal evaluation, examining the full range of BUILD and NRMN interventions, allowing for assessment of academic and career outcomes (e.g., persistence, academic achievement, science identity, scholarly productivity, career stage progression), an understanding of factors common to interventions that lead to success, and a framework for future training programs. Findings from the consortium-wide evaluation of the DPC are of interest to programs and institutions interested in transforming the national biomedical research training pipeline and improving the Nation's health. Study population - Undergraduate students and faculty at 10 teaching intensive institutions, plus graduate students, post-doctoral trainees, junior faculty, and mentors nationally; with particular attention to traditionally underrepresented groups. Context and other factors - The National Institutes of Health (NIH) funds training programs to increase the numbers and skills of scientists who obtain NIH research grants, but few have been rigorously evaluated. The Diversity Program Consortium (DPC) is unique in that it includes the development and implementation of a consortium-wide evaluation which spans the activities of the 10 (BUILD) awardees and the National Research Mentoring Network (NRMN). This poster describes the evaluation design and innovations

P9: A Preliminary Examination of Student Familiarity with Big Data and their Intent to Pursue Big Data Careers

Presenter: Gerald Young **Institution**: San Francisco State University **Co-Authors**: Antwi Akom, Ph.D., and Leticia Márquez- Magaña, Ph.D.

The HEALTH & SOUL R25 training grant aims to increase diversity in biomedical Big Data by providing faculty with the skills and knowledge to promote underrepresented minority (URM) student engagement and persistence in this field. While some researchers promulgate the necessity to increase diversity in biomedical Big Data (e.g., Canner et al., 2017; Konkel, 2015), scant empirical data exists on how to achieve this goal. Additionally, the psychosocial variables that might facilitate student persistence in biomedical Big Data fields have not been identified because they have not been studied. To begin to address this gap in knowledge, we administered a baseline survey to a convenience sample of undergraduate students at a minority-serving, public university (n = 70). These students were queried about the extent of their familiarity with Big Data and their intent to pursue Big Data careers. We also collected information about students' self-reported science identity and science self-efficacy to examine whether these theoretically relevant variables (Estrada et al., 2011) are associated with intentions to pursue Big Data careers. Results of the baseline survey indicated that 40% of the convenience sample were familiar with Big Data prior to taking the survey, and that this familiarity generally stemmed from enrollment in classes and scholarly engagement in research labs. Despite the fact that only 40% of students who were queried reported familiarity with Big Data, 80% wanted to learn more about the field and how it's research outcomes can be applied to the health and public health sectors. URM and non-URM students were equally familiar with Big Data, but males were more familiar with Big Data than females. A linear regression model was conducted to examine whether gender (males vs. females), URM status (URM vs. non-URM), science identity, and/or science self-efficacy were related to self-reported intent to pursue a career in Big Data. This analysis revealed that science identity was positively associated with intent to pursue a career in Big Data in our convenience sample, and that there were no other significant associations. Furthermore, exploratory analyses indicated that science identity was associated with students' intent to pursue a career in Big Data for URM, non-URM, and female students, but it was not associated for males (when taking into account the other variables). In summary, more than half of students surveyed were unfamiliar with Big Data, but the majority of them were interested in learning more, which demonstrates students' interest in the burgeoning field of Big Data. Additionally, preliminary results suggest that fostering science identity among students may be an important psychosocial variable for faculty to target when aiming to enhance diversity in Big Data Science.

P11: Process and Outcomes Evolution of the MARC U*STAR Program at University of Maryland, Baltimore County (UMBC)

Presenter: Jackie King, PhD **Institution**: University of Maryland Baltimore County **Co-Authors**: Phyllis Robinson, Kenneth I. Maton, Lasse Lindahl, and Shelter Dziya

The proposed poster presentation format will allow for informal discussion of UMBC MARC program contexts and best practices. The University of Maryland, Baltimore County (UMBC) MARC U*STAR program has been active since 1997 with the goal of increasing the number of students from underrepresented groups who pursue Ph.D. degrees and research careers in the biomedical, behavioral or mathematical sciences. MARC program funding is provided by the National Institute of General and Medical Sciences (NIGMS), of the National Institutes of Health (NIH). The MARC program provides trainees with academic year and summer research opportunities, individualized academic advising and coaching, guided preparation for graduate school, administrative support and professional development activities to ensure a competitive edge in today's scientific arena. In a recent process evaluation, a web-based survey was administered to current MARC trainees to assess trainees' perception of various program activities. Among the 30 respondents, (22, 73.3%) strongly agreed that participation in summer or sustained research increased their interest in a research career. Furthermore, the trainees either strongly agreed (12, 40%), or agreed (14, 46.6%) that individual advising and coaching provided by MARC program staff prepared them for entry into graduate school. To examine graduate entry outcomes for MARC trainees graduating between

Spring 2016 and Spring 2017 from UMBC, a matched comparison sample was generated. The 42 comparison students were selected to match as closely as possible the 42 MARC graduates in terms of gender, ethnicity, year of college entry, GPA after sophomore year, and college major after sophomore year. The comparison students were similar to (and did not different significantly from) the MARC students in terms of gender (MARC students, Control students)(41% and 43% male, respectively), underrepresented minority status (64%, 71%, respectively), GPA after sophomore year (3.57, 3.65 respectively), and college major after sophomore year (100% science with the majority biology, chemistry or biochemistry in both samples). Based on their majors, and their GPAs after their first two years of college, the comparison students would have been eligible for enrollment in the MARC U*STAR Program Chi-square analysis revealed that the MARC students were significantly more likely to attend doctoral programs, χ2 (4) = 28.44, p < .001. Of note, MARC trainee college graduates were almost five times more likely to attend PhD and MD/PhD graduate programs (69.2%) than their academically comparable college graduate peers in the Comparison sample (14.3%). The success of the MARC U*STAR Program at UMBC provides a solid foundation for student achievement, based on three key elements: recognizing and recruiting outstanding student talent and passion, research mentor excellence, and comprehensive and supportive administrative staff support.

P13: Qualitative Analysis of Student Journals: Affective Changes Over the Course of a Summer Research Training Experience

Presenter: Avis Jackson **Institution**: Morgan State University **Co-Authors**: Christine F. Hohmann, Eric Boorman, shiva.mehravaran@morgan.edu, and Farin Karmangar

Intensive summer research internship programs, sometimes described as research "boot camps," have become a mainstay in the landscape of undergraduate student research training (1,2,3). These experiences have been shown to be quite effective in increasing student science interest, persistence, and self-efficacy, which has led to their adoption across a spectrum of different training programs. The common denominator of research "boot camps" is that they are residential programs, expecting students to work with each other and on their research experiences exclusively for a continuous stretch of 8 to 10 weeks, and they usually end with a capstone experience such as an oral or poster presentation of the summer's research. The ASCEND Summer Research Institute (SRI) at Morgan State University (MSU) is the initial component of a two-year scholarship program (sponsored by the NIH BUILD program at MSU (BUILD at MSU 5RL5GM118972). Approximately 30 sophomore and junior STEM and social/behavioral sciences students enter the SRI each summer, and 20 of these students are selected to become ASCEND Scholars by fall. The ASCEND SRI, like the internship programs referenced above, is a residential, research-intensive training model. Unlike most other programs, however, the SRI uses a group-based, cooperative learning model to acquire research skills in health sciences. Instead of training in individual faculty laboratories, students proceed through a curriculum that teaches them research principles, provides hands-on experience with research techniques, and culminates in students designing a group-generated research proposal. This research proposal is a high-stakes capstone for the students, because it factors into their selection as ASCEND Scholars for the two years following the SRI. This presentation is based on the qualitative assessment of bi-weekly journal entries that the students are asked to maintain throughout the SRI. Data was entered into Linguistic Inquiry Word Count, a computer program designed to quantify various aspects of written text, such as emotional content, cognitive content, etc.(4).Variables selected for further inquiry comprised: Overall Affect, Negative Emotion, Positive Emotions, and Anxiety. A series of Repeated Measures ANOVA analyses were conducted to determine how each variable changed over time. Most variables displayed non-linear sinusoidal trends throughout the course of the SRI. Peaks and valleys corresponded closely to specific training modules in the SRI curriculum, suggesting that these experiences precipitated the affective changes seen. Verbal indicators of negative emotions and anxiety peaked around week three of the eight-week experience, while indicators of positive emotions reached their highest level towards the end of the SRI, at the time that students were preparing their capstone research proposals. To our knowledge, this is the first time a qualitative word count analysis has been used to assess student experiences in a summer research training program. The data we present here suggest that this may be a good approach to gauge student responses to training components. Future studies will subject the journal entries to more fine-grained, manually coded analysis of student

responses, in order to explore specific concepts of attitudes towards research that have been raised in the literature.

P15: Broadening Participation- How a targeted faculty development institute enables change

Presenter: Mary Crowe **Institution**: Florida Southern College

The Council of Undergraduate Research's Broadening Participation Institute has been held 3 times in the past five years. Institutions send teams of faculty members and administrators to learn how to design and implement programs on their campuses that promote inclusive excellence. The institute is designed for faculty and administrators to develop (or enhance) their knowledge, skills, and competencies in increasing access, fostering diversity, and creating an inclusive environment for all students. On this poster we will share the outcomes of the institute by providing an overview of the plans and programs developed by teams that attended the institute. We'll provide a summary of what institutional teams learned while at the institute, as well as the challenges and successes the teams faced as they implemented their plans on their home campuses.

P17: The Importance of The Expectancy Value Model of Achievement Motivation for STEM Persistance

Presenter: Victoria Davis **Institution**: Virginia State University **Co-Authors**: Toni S. Harris, Ph.D, and Cheryl Talley

Motivation is often described as an internal state that has observable consequences for persistence, choice, and performance (Eccles, Wigfield, & Rodriguez, 1998). This phenomenon is explained through the Expectancy-Value Model of Achievement Motivation that indicates expectancy to be the strongest predictor of performance, and value to be the strongest predictor of intention and choice (Eccles & Wigfield, 2002, Wigfield & Eccles, 1992). This study is an effort to better understand the factors that contribute to the disproportionately high rate in which HBCU STEM programs contribute to the limited number of STEM graduates every year. In order to obtain a better understanding of this phenomenon, the current study examines how well self-expectancy, task value, and the use of self-handicapping differ among high and low achieving students in STEM courses, which was informed by the Expectancy-Value Model (Wigfield & Eccles, 2000). Participants included two hundred and forty-six African American male and female college students who were given an assessment battery that assessed task value, self-handicapping, and expectancies for success. It was hypothesized that high achievers would be less likely to use self-handicapping strategies and have higher expectancies for success and task value. In addition, it was hypothesized that low achieving students would be more likely to use self-handicapping strategies and have lower expectancies for success and task value. After, researchers dichotomized final course grade, results found that low achievers were more likely to use self-handicapping strategies than high achievers and high achievers had higher task value then low achievers. Additional analyses also found that students' expectancy for success was a significant predictor for final course grades. Educational implications to inform interventions targeted at low achieving STEM students and STEM retention are addressed.

P19: Research advising and mentoring professionals may increase underrepresented student success in research.

Presenter: Arleigh Reynolds **Institution**: University of Alaska Fairbanks Co-Authors: K. Hueffer, Paul Cotter, Marsha Sousa, and Lori Gildehaus

Engaging undergraduate biomedical students in research has been shown to improve retention rates, promote student engagement and increase the likelihood of pursuing science degrees (Gregerman 1999, Ishiyama 2001, Jones et al. 2010, Fechheimer, et al. 2011). We have developed a group tiered mentoring system to support underrepresented students in their research activities. The heart of this system is the Research Advising and Mentoring Professional (RAMP). RAMPs work with their mentees to create an individual

development plan, assist in comprehensive advising, help with mentee placement in a research laboratory and project, provide psychosocial support and meet regularly to monitor progress and trouble shoot problems. Surveys of these students show that RAMP mentoring was helpful in getting them started in their research, a valuable source for academic advising, and support in academic as well as non academic challenges. We conclude the RAMP mentoring is likely to increase underrepresented student success in research and in the retention and completion of their undergraduate biomedical academic programs.

P21: The Role of Social Media in Increasing Psychological Sense of Community and Cultural Capital: A Grounded Theory Approach

Presenter: Shawnisha Hester **Institution**: University of Maryland Baltimore County **Co-Authors**: Renetta Tull, and Denise Williams

The PROMISE AGEP (Maryland's Alliance for Graduate Education and the Professoriate), is a program sponsored by the National Science Foundation to initiate innovative programming aimed at increasing the numbers of underrepresented minority (URM) graduate students, postdoctoral fellows, and early career faculty members in the STEM academy. PROMISE, through its active social media campaign via the use of Twitter, is taking a grounded theory approach to demonstrate social media's influence on participants' psychological sense of community (PSOC) and their cultural capital (McMillian & Chavis, 1986).Utilizing hashtag activism, which creates extended communities, locates support, and builds technical capital, as a means of conversations on Twitter is a vehicle for consciousness raising activities because the shared dissemination activity among participants can do the work of raising one's own consciousness, providing a way to be in dialogue with others engaged in similar pursuits (Gunn, 2015). We hypothesized the use of this social media platform would/will foster URM participants PSOC and social capital, while allowing our team to positively influence and survey this fostering. Utilizing Twitter with the hashtag #ThinkBigDiversity, offered researchers rich and nuanced data that was telling of the dialogue trends between participating individuals. We also found that using the hashtag #ThinkBigDiversity increased PROMISE membership, and participation. This particular study engages members of the PROMISE community and provides data that is qualitatively measurable. Despite the targeted audience of this study, the findings can be added to research available on the implications that the use of social media has on unique constructs, such as improving cultural capital and measuring one's psychological sense of community within graduate students, postdoctoral fellows and early career faculty members who are underrepresented in STEM fields. Closely examining the trends associated with the hashtag #ThinkBigDiversity via a grounded theory approach garnered much more flexibility in the analysis of the data and can tell a much richer story in that the data guides the inquiry.

P23: A Collaborative Team Teaching Model Enhances STEM Students' Preparation by Bridging Theory and Applications

Presenter: Yoel Rodríguez **Institution**: Hostos Community College of CUNY **Co-Authors**: Francisco Fernandez, and Ross Flek

Hostos Community College of The City University of New York (CUNY) currently offers a two-semester sequence of college-level Chemistry and Calculus-Based Physics. These are gatekeeper courses that prevent student progression and retention within Science, Technology, Engineering and Mathematics (STEM) disciplines. Students find these courses challenging due to their inadequate problem-solving foundations, lack of abstract-analysis skills and a lack of sufficient ability to make connections with previous knowledge, specifically, mathematics [1-3]. Some of these students have never taken a Physics or Chemistry course in their previous education. Therefore, they have come to "dislike" college-level Chemistry and Physics, and feel frustrated and discouraged because they do not understand them. This inadequate preparation for college work contributes to the fact that only 22% of students who enter community college associate's degree programs at CUNY earn a degree in three years [4]. To address this problem, Hostos has created the intersession STEM Institute for science and engineering students. This practice is based on a Collaborative Team Teaching model between Mathematics and Science (Chemistry and Physics) instructors. This institute aims at providing STEM students with tools such as threshold Mathematics and major Science (Physics and Chemistry) concepts for future success in their first college science (Physics and

Chemistry) courses. Both instructors (Mathematics and Science) designed an interdisciplinary curriculum and taught the same students' cohort for four weeks: in alternate sessions of three hours per day each, first the math professor teaches the threshold math concepts to be used in science and then the science instructors introduce the science concepts. The program evaluation tools, including student surveys, student grades, and student pass and retention rates, show that most students taking these bridge STEM Institutes 1) perform better in their regular college level chemistry and physics courses considering these course grades; 2) improve their mathematical proficiency for physical sciences by one letter grade; and 3) act as learning catalysts in those courses for their peers who did not enroll in the institute. Lessons learned from this intervention are helping us to improve and expand our model every year, and make it available and scalable to other community colleges seeking to enhance STEM student academic preparation.

P25: The Relationship of Grit, Sense of Program Community, Research Self-Efficacy, Science Identity and STEM PhD Entry among Meyerhoff Scholars

Presenter: Rupsha Singh **Institution**: University of Maryland Baltimore County **Co-Authors**: Mariano R. Sto. Domingo, Kenneth I. Maton, and Ishita Arora

Previous research has shown that having strong research self-efficacy and scientific identity are significant predictors of success in undergraduate Science, Technology, Engineering, and Mathematics (STEM) majors (Maton et al., 2016). However, there is a lack of research examining the mechanism by which students who initially enter colleges with low research self-efficacy and scientific identity later succeed in their STEM majors and pursue PhDs. Grit, broadly defined as perseverance and passion for long-term goals, has been predictive of greater academic adjustment, sense of belonging, college grades and GPA, college satisfaction, faculty-student interaction, and intent to persist (Akos & Kretchmar, 2017; Duckworth et al., 2007). Similarly, previous research has shown that sense of community is predictive of STEM students pursuing a STEM PhD (Maton et al., 2009). Thus, in the current study, we aim to examine whether grit and sense of community moderate the association among research self-efficacy, scientific identity, and pursuit of a STEM PhD among underrepresented minority (URM) students in the Meyerhoff Scholars Program at University of Maryland, Baltimore County. We hypothesize that grit and sense of community will be more strongly related to STEM PhD entry for students with low research self-efficacy and low scientific identity than for students with high levels of research self-efficacy and science identity. Participants will be students from two cohorts (entry year 2012, 2013) in the Meyerhoff Scholars Program (MSP). Research self-efficacy and scientific identity are measured using the Scientific Self-Efficacy Scale and the Scientific Identity Scale (Chemers et al., 2010), respectively, which assess the students' ability to function as a scientist in a variety of tasks, and the degree to which the students feel like they are scientists. Grit is measured using the original Grit Scale (Grit-O; Duckworth et al., 2007), which assesses students' perseverance and passion for long-term goals. Lastly, sense of program community is measured using the MSP Sense of Community Scale that was created for the larger study. The measure assesses the degree to which the students feel like a part of the Meyerhoff Scholars community. Research self-efficacy, scientific identity, grit and program sense of community were assessed in spring 2015 and 2016, when the students were juniors and seniors, respectively. Information about STEM PhD entry was collected after the students graduated. The hypothesis will be tested using logistical regression analyses (analyses currently underway). If the hypothesis is supported, the study has the potential to inform the Meyerhoff Scholars Program, as well as other scholars' programs in the United States to facilitate an environment where students are encouraged to persevere (grit) and join together in program community, as well as supporting the development of research self-efficacy and scientific identity.

P27: Enhancing research careers: an example of a US national diversity-focused, grant writing training and coaching experiment

Presenter: Kristin Eide **Institution**: University of Utah

Significance: Preparing a successful research proposal is one of the most complex skills required of professional scientists, yet this skill is rarely if ever, taught. A major goal of the National Research Mentoring Network (NRMN) in the United States (U.S.) is to support the professional advancement of postdoctoral fellows and junior faculty from diverse populations by offering intensive coaching in the development of grant proposals early in their careers. NRMN's goal is met by the National Institutes of Health's (NIH) NRMN initiative to prepare diverse constituencies of early-stage biomedicine scientists for research careers by implementation of an evidence-based nationwide program of comprehensive grant writing and professional development. These efforts exemplify NRMN's potential to enhance the career development of diverse trainees on a national scale, building research skills, competitiveness for obtaining faculty positions and capacities that will result in high quality research proposals from a diverse pool of applicants, thereby advancing innovations in science and diversifying the U.S. biomedical workforce. Study population - Post-doctoral fellows and early-stage faculty researchers are recruited to receive tailored programming based on their readiness to write and prepare a grant application. Coaching groups consisting of accomplished senior faculty are similarly recruited to learn how to facilitate one of the unique NRMN program grant writing model programs. Contextual Factors: NRMN delivers four unique but complementary coaching models: the Proposal Preparation Program from the University of Minnesota (UMN); Grant Writers Coaching Groups from Northwestern University (NU); Grantwriting Uncovered: Maximizing Strategies, Help, Opportunities, Experiences from the University of Colorado Anschutz Medical Campus (UC) and Washington State University (WSU); and Steps Towards Academic Research (STAR) from the University of North Texas Health Science Center (UNTHSC). Because these programs cater to scientists at different career stages, rather than employ a single approach, each is uniquely tailored to test its efficacy at the national level. The first two models prioritize scientists with reasonably well-developed research projects who are ready to write proposals for specific NIH research competitions. The other two models target postdoctoral fellows and early-career faculty who need more extensive guidance in proposal development plans. To achieve scalability, all programs also recruit faculty as Coaches-in-Training to learn approaches and acquire particular group facilitation skills required by each model. Outcomes: A key outcome of NRMN's approach to grant-training is to increase a sustainable architecture that will support and facilitate harnessing the collective expertise of successful scientists in the interest of accelerating the re-search career development of a diverse constituency of faculty. Considering that proposals are a key element of academic job applications, NRMN programs targeting postdoctoral fellows is one its impactful innovations. Although outcomes are premature, it is expected that such programs will also help URM scientists to be more successful in obtaining faculty positions. As an outcome, we expect to see an increase in the number and proportion of URMs progressing in their faculty career in part by receiving NIH research grant awards.

P29: The Tuskegee Alliance to Forge Pathways to Academic Careers in STEM (T-PAC)

Presenter: Mohammed A. Qazi **Institution**: Tuskegee University **Co-Authors**: Deloris Alexander, Oladiran Fasina, Martha Escobar, Mamie Coats, Chastity Bradford, Curtis Shannon, Melody Russell, Shaik Jeelani, Michael Curry, Misty Thomas, Alain Bopda Waffo, B. K. Robertson, Adriane Ludwick, and Jared Russell

This poster provides an update on the progress of the Tuskegee Alliance to Forge Pathways to Academic Careers in STEM (T-PAC), a National Science Foundation Alliances for Graduate Education and the Professoriate-Transformation funded research project. This longitudinal project is a collaborative effort among three doctoral granting institutions in the state of Alabama consisting of two Historically Black Universities, Tuskegee University (TU) - the lead, Alabama State University (ASU); and a Traditionally White Institution, Auburn University (AU). The T-PAC program provides virtual based graduate education resources to underrepresented minorities (URM) doctoral students (T-PAC Scholars) initially recruited as first-year doctoral students across three Alliance institutions. This virtual graduate education model is designed to provide both academic and social support to Scholars through enriched professional development, STEM research experiences and academically-based resources to better prepare them for STEM faculty careers. T-PAC promotes strategic interventions or activities designed to eliminate mitigating factors that adversely impact degree completion for

URMs in STEM graduate programs. Moreover, through its various interventions, T-PAC provides a social network for Scholars to collaborate with STEM faculty and other STEM graduate students across disciplines to promote a sense of community for students both within and across the three institutions. This poster highlights the T-PAC interventions and program activities that have been implemented to-date and provides an overview of outcomes to date.

P31: One-sized-fits-some: Contextualizing utility value interventions with a diverse community college sample

Presenter: Michelle Francis **Institution**: University of Virginia **Co-Authors**: Stephanie Wormington, Chris Hulleman, Yoi Tibbetts, Megan Moran, and David Silverman

Community college is a rapidly growing educational option in the United States, with community college students now representing 45% of all undergraduates (AACC, 2014). However, nearly 54% of community college students fail to reach college-ready math proficiency even with remediation through a developmental curriculum, and is even more pronounced for under-represented minority students (Bailey, Jeong, & Cho, 2010). This trend has significant consequences for future employment and educational opportunities, signaling developmental math courses as a major academic barrier to adequately preparing students for the work force or further persistence in education. The present study seeks to evaluate whether a utility-value intervention, delivered via online computer modules, has a positive effect on math performance (e.g. course grades, pass rates) and persistence. Utility value interventions are designed to help students recognize the relevance and usefulness of the course material they are learning (i.e., utility value) for their current lives or future goals and careers. Students who believe that their coursework is more valuable to them typically become more engaged and persistent in the learning process and more interested in the material (Hulleman et al., 2010). However, these interventions have not been widely used in community college contexts, whose students are demographically dissimilar than four-year universities. For example, students who attend two-year colleges (compared to four-year colleges) are more likely to come from disadvantaged backgrounds, have families to support, and/or work full-time (Goldrick-Rab, 2010; Horn & Nevill, 2006). To address this gap in the literature, we administered one of three different utility value activities to students assigned to the utility value condition in order to assess whether there was a differential impact on outcomes depending on the presentation of the intervention material. We plan to ascertain which form of the intervention is most effective with which students in the hopes of modifying the intervention to optimize its effect on student outcomes. This is of critical importance for the present study as data collection is ongoing at least through 2018. The study was conducted with nearly 1,500 developmental math students at a large community college system in central Florida across two semesters. Integrated into the curriculum of their respective courses, students were asked to participate in online modules wherein they were randomly assigned to either the utility value or control condition. Students in the utility value condition were assigned to one of three sub-conditions. In each of the utility value conditions, students engaged in activities that encouraged them to identify value in their math course but the three sub-conditions differed in the specific tasks students completed to achieve this end. We plan to examine differences in short-term student outcomes (performance, motivation) by comparing them across treatment and control conditions as well as between utility value sub-conditions in concordance with characteristics of the student (e.g. demographics, previous achievement, etc.), course (e.g., modality, content), and instructor (e.g., gender, experience). By leveraging insights gleaned from these analyses, we hope to make changes to the current utility value interventions to maximize their effectiveness. Our presentation will document the results of this process.

P33: Pathways to Persistence and Success in College STEM: Results from the University System of Maryland LSAMP

Presenter: Rukiya Wideman **Institution**: University of Maryland Baltimore County **Co-Authors**: Kathleen Stolle-McAllister, Shuyan Sun, Ishita Arora, Ana Maldonado, Surbhi Godsay, Rupsha Singh, Mariano R. Sto. Domingo, Jennifer Hosler, and Kenneth I. Maton

Funded by the National Science Foundation, the University System of Maryland Louis Stokes Alliances for Minority Participation (USM LSAMP) program aims to increase undergraduate minority students' persistence and success in STEM on three campuses: University of Maryland College Park (UMCP), University of Maryland Baltimore County (UMBC), and University of Maryland Eastern Shore (UMES). As an integral part of the USM LSAMP program, this research study aims to test the psychosocial pathways for program participants to persist and succeed in STEM. Driven by the Psychological Model of College Retention (Bean & Eaton, 2001), Bandura's (1997) social cognitive theory, McMillian and Chavis' (1986) theory of psychological sense of community, and identity theory (Burke & Stets, 2009), this study hypothesizes that participants' perceived racial/ethnic climate, science self-efficacy, sense of belonging, academic and social integration, and science identity mediate the relations between participation in the USM LSAMP program and STEM outcomes (e.g., GPA, persistence in STEM, and STEM degree completion). The research sample will include students in the USM LSAMP 2017 through 2020 cohorts and a comparable sample of students who do not participate in the program. To obtain the non-LSAMP sample, this research will use a matched-subjects design. First, propensity scores will be generated from a logistic regression model in which program participation is predicted from student race/ethnicity, gender, high school GPA, SAT math, highest math class, math placement test, and socioeconomic status. These propensity scores are the probabilities of participating in the LSAMP program after controlling for variables used in the model. Second, propensity scores will be used to match LSAMP participants with STEM majors who are not LSAMP participants. Matching by propensity scores enhances the internal validity of the research design (Fan & Nowell, 2011). The sample size each year is approximately 300 for the LSAMP sample and approximately 100 for the non-LSAMP sample. Therefore, the total sample sizes for this study are approximately 1,500 for the LSAMP sample and 500 for the non-LSAMP sample. Data collection for the 2017 cohort is currently underway. A pilot study to provide preliminary data assessing the viability of the proposed model was conducted in spring 2017, and these results will be reported. All of the measures to be included in the primary study were administered to a sample of URM UMBC students involved in program components comparable to the LSAMP components, and comparison students. These students varied in their levels of participation in LSAMP-like components. Analysis is currently underway, and will be completed in January. The reliability and validity of the measures will be examined. Results presented will focus on examining individual pathways in the proposed model. This study will contribute new knowledge for understanding pathways for URM students to persist and succeed in STEM.

P35: The impact of the RISE and MARC programs on underrepresented students pursuing a STEM PhD degree at California State University, Dominguez Hills.

Presenter: H. Leonardo Martinez **Institution**: California State University Dominguez Hills **Co-Authors**: Jonathan Whittinghill, Vivian Law, Simeon Slovacek, and Laura Flenoury

The MARC U*STAR and MBRS RISE Programs at California State University, Dominguez Hills have provided support for research participation and career enhancement of freshman-through-senior undergraduates in the science field since 1998 and 2001 respectively. Through this research study, we proposed to establish a scientifically valid comparison group to assess the impact on students who directly benefit from participation in these programs, the roles and comparative values of specific interventions, and the influence of family factors on the MARC/RISE-supported students when they pursuit an advanced degree. The research questions guiding this effort were: 1. What proportion of students who participate in MARC/RISE graduate from CSUDH with a degree in the sciences, and how do they compare to students in a matched comparison group? 2. Upon graduation from CSUDH, how do the grade point averages of MARC/RISE participating students compare to those of a matched comparison group? 3. How do the rates of entrance into science PhD programs compare between the MARC/RISE students and a matched comparison group? Using a matching approach based on a nearest-neighbor algorithm, when compared to a control group of science students who did not receive the MARC/RISE treatment, the study found that the MARC/RISE students performed significantly better on the key outcomes which included degree completion, GPA at time of degree completion, and entry into Ph.D programs. All comparisons were statistically

significant at the p =.001 level or better. This presentation is aimed at engaging other individuals working on similar interventions on a best practices discussion. The presenter is the Program Director for the MARC and RISE programs at CSUDH.

P37: Encouraging a Growth Mindset toward positive nutrition in HBCU Student Teachers.

Presenter: Josetta Arnold **Institution**: Edward Waters College **Co-Authors**: Dr. Wider Lewis

The USDA documents the disparity in nutrition between students in Title One schools as compared to other schools. Findings from Hall, Chai, & Albrecht (2016) suggest that future nutrition interventions should focus on facilitating the improvement of children's self-efficacy. Results from their intervention demonstrate disparities in nutrition knowledge and behavior outcomes between students surveyed from Title I and non-Title I schools (Hall et al., 2016). Graduating teachers from Edward Waters College are hired into Title one Schools. Many of these new teachers have not experienced positive nutrition habits in their personal development and therefore carry misconceptions of healthy eating into their classrooms. They also carry some misconceptions about teaching and learning of science at the elementary school level (Otero & Nathan, 2004). The College's Department of Teacher Education and Urban Studies developed a means of introducing healthy eating to pre-teachers through a Healthy Halloween Initiative. This intervention is on pre-service teachers beliefs about science through creative lesson planning using art and science objectives. Surveys were collected and analyzed from participants gaining viable feedback for pre-service teacher lesson planning conceptions about nutrition and scientific modeling (Nelson & Davis, 2009). The presentation will feature the development of the Healthy Halloween initiative, analysis of pilot data from two years of promoting this initiative. One of the end goals is to get pre-service teachers to attend to lesson plan elements of scientific modeling in their lesson plan (Nelson & Davis, 2009).

P39: BioFIRE: A Living and Learning Community to Increase Student Success and Persistence in the Chemical and Life Sciences

Presenter: Katerina V. Thompson **Institution**: University of Maryland

A series of curricular and co-curricular initiatives have resulted in overall increases in undergraduate student persistence and graduation in the chemical and life sciences, but an examination of disaggregated data indicates that not all segments of the student population have similar success. In particular, students who are not part of campus living-learning communities are more likely to leave encounter difficulties in gateway STEM courses, abandon STEM majors, and leave the university without graduating. This gap is particularly evident in underrepresented minority students, those of low socioeconomic status, and those who are the first generation in their families to attend college. In response, we created the BioFIRE Living and Learning Program, which aims to support academic and social integration of incoming chemical and life sciences freshmen via a living-learning community that combines elements of other evidence-based interventions, namely student learning communities and early research experience. Students live in on the same floor of a residence hall with integrated academic support, participate in community building activities, enroll together in introductory science courses, and are immersed in authentic, faculty-driven, coursed-based research during their first three semesters. Data from the first two cohorts indicate that BioFIRE students (N=45) show higher achievement in gateway science courses and greater retention in STEM majors than students with similar entry credentials who were not in a living-learning community. These preliminary results indicate that the program supports students effectively in their first-year transition and may be a promising way of enhancing success and persistence in STEM fields.

P41: The effects of an undergraduate research and mentoring intervention at a teaching university on faculty identity, mentoring skills, and campus connectedness.

Presenter: Alejandra Priede **Institution**: California State University Long Beach **Co-Authors**: Misty Sawatzky

Past research highlights the effects of undergraduate research and mentoring interventions on student retention, achievement, and science identity (Hurtado, et al., 2011; Griffin, et al., 2010). While previous work has explored various aspects of faculty identity (Reybold, 2003), the effects of mentoring interventions on faculty identity has been ignored. The present study sought to examine the effects of these mentoring interventions for faculty mentors. This study looked at faculty mentors' identity as a mentor, mentoring skills, science/research identity, and connectedness to campus. This quasi-experimental design compared faculty who participated in the Building Infrastructure Leading to Diversity (BUILD) program (BUILD, 2017) to those who did not. A hundred and thirty faculty members at a teaching university responded to the Higher Education Research Institute (HERI) Faculty Survey (HERI, 2017). Propensity Score Matching (PSM) (Dehejia & Wahaba, 2002) was utilized to estimate the impact of the mentoring intervention on faculty mentors when lacking a true experimental design. Results show positive effects of the mentoring intervention for faculty mentors in terms of saliency in mentoring and science identities, mentoring skills, positive views of students, and faculty connectedness to their campus.

P43: The LSU-BRCC Bridges to the Baccalaureate Program: Removing Barriers to the Success of Two-Year College Students in Biomedical and Behavioral Sciences

Presenter: Shannon Watt **Institution**: Louisiana State University **Co-Authors**: Sandra Guzman, Gloria A. Thomas, Laura Younger, Isiah Warner, Mary G. Miller, and Guillermo Ferreyra

In 2012, Baton Rouge Community College (BRCC) and Louisiana State University (LSU) partnered to implement an NIH-sponsored Bridges to the Baccalaureate (Bridges) program for BRCC students, particularly those from under-represented backgrounds, in the biomedical and behavioral sciences. Program activities—including articulation agreements, curricular improvements, co-curricular supports, and undergraduate research experiences—were developed to improve the success of these students in completing A.S. degrees at BRCC, transferring to LSU, and completing subsequent B.S. degrees. Formative qualitative program assessment detailed a range of barriers to student success. A number of these barriers seem to be the unintended consequences of policies and practices that are based on the traditional model of a "typical" first-time, full-time, on-campus resident without dependents who matriculates and remains enrolled at a single four-year institution directly out of high school with at least some family support. Students from two-year colleges are more likely than their four-year counterparts to be older, members of under-represented racial-ethnic groups, first-generation, low-income, and/or enrolled part-time while working to support themselves and their dependents. [1] These "atypical" students often face disadvantages in the traditional systems of scientific training and many four-year institutions, even though nearly half—46% overall in 2013-14 [1], and 47% in science and engineering from 2006-11 [2]—of students completing four-year degrees had been enrolled at two-year colleges. Given the size of this population, it is critical to reduce barriers that arise from systems designed for "typical" undergraduate students. This poster will discuss the barriers observed and the resultant policy and practice changes considered or implemented in both the Bridges program and at the partner institution(s) over the project period. Personal, institutional, and societal barriers to two-year students' success have been described in the literature [3]; however, the specific combination of factors described in this case study reflect local variations in institutions and student populations. Although not all factors are generalizable, it is likely that at least some play a role in many circumstances; thus, they may be used as a starting point for programs and institutions seeking to examine the effect of policies and practices on student success.

P49: A Post-baccalaureate Preview of Graduate Studies as an Intervention for Promoting Success and Retention of Underrepresented Minorities in Biomedical Sciences Graduate Programs

Presenter: TanYa M. Gwathmey **Institution**: Wake Forest School of Medicine **Co-Authors**: Debra I. Diz

It is well established that distinct populations of individuals have long been under-represented in the biomedical sciences; particularly African Americans, Native Americans, Hispanics, and Pacific Islanders. While these groups represent ~30% of the US population, the 2011 US Assessment of Research Doctorate Programs by the National Research Council reports that of 40,900 Ph.D. students in 982 biomedical sciences programs included in the assessment, only 4,700 (11.5 %) are from underrepresented minority groups (URMs). To help address this disparity, the Wake Forest School of Medicine and Graduate School of Arts and Sciences developed a Post-baccalaureate Research and Education Program (PREP) to promote competencies and readiness of URM for graduate studies in the biomedical sciences. The Wake Forest PREP is a one- to two-year program supported by the National Institutes of General Medical Sciences, and utilizes individualized academic and professional development plans to: introduce participants to rigorous biomedical research via hands-on participation in a research project; develop critical skills in scientific writing and literature evaluation; develop strong analytical and technical skills, and the ability to conceptualize investigative research processes. Since its inception in 2001, Wake Forest PREP has facilitated entry of 89% of program participants (68 out of 76 individuals) into biomedical sciences graduate programs/professional schools. Moreover, students who completed the Wake Forest PREP had a 92% retention/completion rate in graduate programs, compared with the national average for retention/completion of 52%. Specific outcomes include 60% of participants into PhD, 22% into terminal research Masters (MPH, Clinical Psychology, MBA, Biomedical Engineering) and 9% into professional programs (totals more than 89% as students are counted in more than one category). Thus the Wake Forest PREP has demonstrated effectiveness in facilitating entry into and retention/completion of URM in biomedical sciences graduate programs through a well- developed post-baccalaureate training program. Supported by GM064249.

P51: Targeted Recruitment of Students for Undergraduate Research Mentorship

Presenter: Christopher E. Bassey **Institution**: Azusa Pacific University **Co-Authors**: Mary C. Bassey

Despite the enormous benefits of undergraduate research experience, less than forty percent of college students participate in this program in the Science, Technology, Engineering, and Mathematics (STEM) fields. This percentage is even much smaller among African American and other ethnic minority students. We propose that intentional efforts by faculty and program directors, aimed at students of color, could increase their involvement in STEM research, leading them to choose STEM-related careers. In the past 15 years, at least 20 students worked under my mentorship at two predominantly white institutions namely, Western Kentucky University, Bowling Green, Kentucky and Azusa Pacific University, Azusa, California. Ten or 50% of these students were students of color who were intentionally recruited. These students made significant contributions of the research work, participated, and presented their work at professional and student conferences such as the National Society Black Physicists Conference, the Biomedical Engineering Society Conference, the Biophysical Society Conference, and the Annual Biomedical Research Conference for Minority Students. Eight or 80% of these students are still involved with STEM fields, and two have obtained advanced degrees to date. This work indicates that targeted recruitment of minority students for research experience increases their ability to succeed, and it also enhances the effort to diversify the workforce in STEM fields.

P53: Effect of intervention on Performance as well as Autonomic Function of Students with Autism Students engaged and not engaged in Team Universal Design Projects in STEM Engineering courses Using Spectral Analysis and Posture Entrainment

Presenter: Ahmed Kamal PhD **Institution**: Tennessee Tech University

Objective: The dysfunction of the autonomic nervous system investigated in students with Autism compared with healthy one are

possibly associated with the parthenogenesis of Autism . The purpose of this study is to quantify the intervention of the performance of students in STEM Engineering course with Autism working STEM universal design team projects and students with Autism without working in STEM team projects by use the spectral and coherence analysis of heart rate variability signal (HRV), respiration signal and peripheral Blood flow(PBF) to assess the autonomic activity of both groups as well as the grade performance in their projects for the clinical usefulness of the applied methods of signal processing and time frequency analysis for screening and treatment of Autism. Methods: Twenty Students who had Autism and who were not taking any medications and Twenty two age and sex matched controls were participated in this study at Tennessee Tech University, Cookeville,TN , as well as Department of Neurology at Johns Hopkins Hospital, Baltimore, MD, USA and Regional Medical Center, Cookeville,TN,USA. Respiration signals as well as HRV signal derived from Electrocardiogram (ECG) were measured during supine and standing positions. Auto power, cross power and coherence spectra were produced to investigate the sympathetic and parasympathetic activity in both groups. The performance of study was implemented by the grades of students for each group not engaged in Team Projects Results: The results clearly indicate that in students with Autism engaged not engaged in projects had less average grades in performance in the engineering course as well as , the coherence values are less than in Students with Autism engaged in team projects group in both low frequency (LF) and high frequency (HF) bands at coherence spectra between HRV and PBF as well as HRV and respiration in both supine and standing position. Also, the ratio of amplitude at nearly frequency of 0.1 Hz in auto power spectra and coherence spectra is less in students Autism group than in matched control ($p<0.001$). Conclusion: The intervention of Team projects in STEM Engineering courses using Auto power and coherence spectra analysis for Students with Autism engaged in group universal projects compared to students not engaged In team projects seems useful in the engagement of Autism patients to increase the grading performance as well as reduce the autonomic dysfunction and increase autonomic function specially parasympathetic activity in students with Autism engaged in team projects revealed by auto power and coherence spectra analysis is significant and may be related to the effective of working together as team of Autism students in this disorder compared to other The integration of Team projects in STEM Engineering course as intervention method to increase the team activities of Autistic students and may be social treatment for them.. Further studies is needed using other tests and methods of signal analysis to introduce clinical indices and team methods engaged for improving autonomic function in patients with Autism.

P55: Injecting Biomedical Research into the Undergraduate Laboratory Environment: a Case Study from San Antonio, Texas

Presenter: Jesus A. Segovia **Institution**: UT Health San Antonio **Co-Authors**: Thirumalai R. Kannan, Joel B. Baseman, Timothy Raabe, and Ahmad Galaleldeen

Integrating research into university courses allows undergraduate students to gain exposure to, and be involved in, the primary duties of being a scientist (1). Through proper implementation of the scientific method, coupled with the course director's desire and passion in their scientific area of expertise, the students' involvement can help transform a general laboratory course into a powerful pursuit aimed at tackling a modern-day scientific problem. Being directly involved in the scientific process can have many positive downstream effects on the students' course choices and career goals. Although there are many difficulties and challenges inherent to basic research, such as cost, technical expertise and time, many of these challenges can be circumvented or minimized with proper planning, creativity and student coordination. Herein we describe a case study in which a biomedical research project was incorporated into a sophomore level undergraduate laboratory aimed at developing experimental approaches to cellular and molecular biology. Our goal was to enhance the students' laboratory experience, improve student learning and skill development, and teach students how basic laboratory techniques are used to tackle real-world health issues. The study was performed at St. Mary's University in San Antonio, Texas in partnership with UT Health San Antonio under the San Antonio Biomedical Education and Research (SABER) program. The incorporated project included the study of Community-Acquired Respiratory Distress Syndrome (CARDS) toxin from Mycoplasma pneumoniae and how this toxin exhibits cytotoxic effects on epithelial cells in vitro (2). The students performed various laboratory techniques aimed at cloning, expressing and purifying CARDS toxin, followed by hypothesis-driven experimentation involving treatment of epithelial cells

with CARDS toxin produced in lab. Students acquired and analyzed data and presented their findings at a department-sponsored undergraduate research poster session open to the general student population. Following completion of the course, student feedback indicated that incorporation of CARDS toxin research into the laboratory resulted in many positive impacts, such as enhanced learning/applying of lab techniques, development of data analysis and critical thinking skills, and an overall greater appreciation and interest in undergraduate research.

P57: Qualitative Impacts of a STEM Living-Learning Community

Presenter: Mary A. Farwell **Institution**: East Carolina University **Co Authors**: Kathleen Hill; Enrique Reyes; Margot Neverett

Significance: Student success in STEM is lower among demographic groups that are underrepresented in higher education; this is especially preponderant among first-generation and minority students [1-3]. Although many minority and first-generation students aspire to STEM degrees and their inherent rewards, do not persist in STEM majors or complete STEM degrees at the same rate as majority students [1, 4-6]. It is known that quantitative measures such as math SAT are strongly correlated with success [2], qualitative factors have also been identified [7]. In order to increase STEM degree attainment among these groups, we need to identify ways to support students to complete STEM degrees. High Impact Practices (HIP), defined as programs and activities that require students to devote focused time and effort while interacting directly with faculty and peers, have been associated with student success [8]. Specifically, Living-learning communities (LLCs), one type of HIP, can potentially increase the success of first generation and minority students in STEM [7].

Study population: Our study was focused on thirty-one full time Biology intended majors (cohort) at a large state university who joined the Biology LLC as incoming freshmen. The study population was 68% first generation college students with 48% underrepresented minority status, and was followed on a semester basis throughout their first four years in college.

Contextual factors: The LLC cohort was provided with a common residential space, group activities, tutors, one introductory class together, as well as faculty advisors that were involved in the study through the duration of their studies until graduation. Our data shows better outcomes in quantitative aspects including persistence, retention and graduation rates of this cohort compared to a control cohort that did not receive the intervention. In addition, a qualitative study was conducted to ascertain what factors contribute to the success of these students in STEM. Individual in-depth interviews with eight of the graduating members of the first year LLC cohort were conducted based on maximum variation sampling. The intent of this sampling is to capture the core experiences and shared impacts of engagement in the LLC [9]. The semi-structured, open-ended questions explored the influence and impact of student LLC involvement on the overall undergraduate college experience. Student participants all conveyed that participation in the LLC during their first year positively contributed to their college experience and completion of the degree in four years. Major themes that emerged specific to positive impact on student success included: 1) transition and adjustment to college environment in a small community setting, 2) peer and faculty interactions that integrated both academic and social support, 3) access to resources and unique engagement opportunities, 4) career exploration, clarification, and readiness.

Outcomes of the intervention: The analysis of outcomes continues and will be supported with additional data given that the length of the study allows for the examination of another four cohorts that are in the pipeline to graduation.

P59: The PhD Outreach Committee*: Informing and Inspiring the Next Generation of Scientists

Presenter: V.H. Freedman, N. Schwartz, W.D. Wessinger, A. Van Wart, N.E. Street, S.J. Black, I. Tartakovsky, and C.F. Wright

The NIH Chief Officer for Scientific Workforce Diversity, Dr. Hannah Valantine, has recently commented on the lack of representation of some groups in the biomedical workforce and the major challenges facing its diversification (1). The PhD Outreach Committee is an active committee of the AAMC Graduate Research Education and Training (GREAT) Group. Recognizing that professional societies can have a positive role in furthering diversity in science trainees (2), the PhD Outreach Committee's mission is to reach high school and undergraduate students who are interested in science, along with their advisers, educators and parents, to excite them about biomedical research careers and to explain what graduate education and the PhD is all about. The Committee meets monthly via conference calls and makes in-person presentations at various local and national events throughout the year. From many interactions with undergraduates and their advisers we have learned that there is little understanding of the breadth of careers for biomedical scientists and scant knowledge of the pathway to the PhD. Studies have shown that trainees want information about biomedical careers earlier in the training process (3) and that providing cultural capital to help students understand the norms of the field of science (4) is important. We therefore developed a suite of outreach materials to use in various venues to educate students and their advisers about the PhD. These materials include: (a) a brochure describing the PhD and providing very general information about biomedical research and PhD training; (b) a series of workshops with slide sets on various aspects of biomedical PhD training, preparation for the PhD, the PhD application process, and PhD careers; (c) a website www.aamc.org/students/research/phd with extensive information about the PhD, including what students should expect during PhD training, the graduate school application process, careers for individuals with the PhD and most importantly a comprehensive list of all biomedical PhD programs and undergraduate summer programs; and (d) a series of recent webinars on these same topics that are now posted on the National Research Mentoring Network's (NRMN) YouTube channel: https://www.youtube.com/channel/UCjjGfIwE91ZLJ61vrEEVTfw/videos. The PhD Outreach Committee has organized and led panel discussions and presentations about the PhD at the NIH Graduate Fair, ERN, SACNAS, ABRCMS, and NCUR (undergraduate research). The committee has also hosted recruitment fairs and/or workshop sessions for regional undergraduate and high school students following the GREAT Group annual meeting in different host cities. In addition, we have given formal presentations at the pre-meeting minority workshops of the AAMC annual meeting. Our data show that through these activities, in 2017 alone, we reached more than 2,500 underrepresented students in multiple venues, including: ~1900 at major conferences (the NIH Fair, ERN, SACNAS, ABRCMS and the AAMC minority fair); 456 from live viewing of NRMN webinars; and 166 from viewing of posted webinars on the NRMN website. Evaluations of our *"How to Have a Great Interview"* workshop revealed that >60% of students indicated that they had acquired new skills, that the session will aid them in becoming a better scientist, and that they had been helped to advance to the next career level. In summary, our group has found that by partnering with national societies (AAMC and NRMN) we have been able to reach thousands of underrepresented students with information on careers in biomedical sciences and how to prepare for and apply to PhD programs. From our work, we have learned that providing complete and accurate educational and career information to students at all levels is a critical step in increasing the diversity of the scientific workforce. We are now implementing more detailed surveys and study methods to identify those elements of our outreach efforts which are most helpful to trainees seeking careers in the sciences.

*The PhD Outreach Committee is a standing committee of the AAMC (Association of American Medical Colleges) Graduate Research Education and Training (GREAT) Group. We thank AAMC and Dr. Jodi Yellin for their leadership and support.

D3: Onboard Curriculum Training for New and Novice Teachers

Presenter: Darrell Lewis **Institution**: Edward Waters College **Co-Authors**: Dr. Wider Lewis

Urban schools are particularly vulnerable to high turnover rates with greater than fifty percent in communities of low-poverty. (Ingersoll, Merrill, & May 2014). The rate of transfer and or exit among novice teachers at urban schools is higher than their counterparts at suburban schools (Hanushek, Revink, & Schuman, 2013). A few research studies indicated characteristics associated to school climate lead to teachers' choosing to transfer or walk away from the profession (Darling - Hammonds 2016; Ingersoll, et al.; Hanushek et al., 2013). It is very expensive and detrimental to the development of a school's culture to continuously experience high teacher turnover,

especially for private schools in urban settings where funding is based on student enrollment (Boyd, et al., 2011). Low retention rates contribute to the shortage of teachers especially in the areas of math and science (Ingersoll, Merrill, & May 2014; Ingersoll, 2000), special education (Boe, Cook, & Sunderland, 2008), and in urban communities (Ronfeldt, Loeb, & Wychoff, 2013). This project is an onboarding curriculum designed to reduce the number of teachers leaving within first year of teaching by providing support utilizing an urban classroom management model and cultural relevant pedagogy.

W7: Applying Computer Science in Biology: A Model for Incorporating Interdisciplinary Pedagogical Approaches through ePortfolio in the First Year Experience at Community College

Presenter: Yun Ye **Institution**: LaGuardia Community College at CUNY **Co-Authors**: Na Xu

The method to be introduced is about how ePortfolio is used as a platform for an interdisciplinary, collaborative course project for first year seminar (FYS) students in Engineering and Computer Science FYS class ECF090, and in Liberal Arts, Math and Science FYS class LMF101. This project was designed to enrich the integrative research experience of the new-to-college students at LaGuardia Community College, whose student body is known for its diverse background, and to engage them in hands-on inquiry and problem solving practice, with a broader goal of increasing the retention rate in STEM field. The major task in the project was to compare DNA sequences using computer programs, in order to facilitate the blood cancer study. Through the project, the students in both ECF090 and LMF101 classes applied math knowledge to perform algorithm analysis on a Biologic problem, and were exposed to the application and technology in Computer Science. The collaboration work was conducted on an online course platform ePortfolio which hosted all student work and allowed remote communications and collaboration to happen between two classes in different majors. Based on the survey feedback, the students were impressed by the way how they could contribute to the task using basic math and computer skills, and the interest in continuing STEM path was expressed unanimously.

W13: Research advising and mentoring professionals may increase underrepresented student success in research.

Presenter: Arleigh Reynolds **Institution**: University of Alaska Fairbanks

Engaging undergraduate biomedical students in research has been shown to improve retention rates, promote student engagement and increase the likelihood of pursuing science degrees (Gregerman 1999, Ishiyama 2001, Jones et al. 2010, Fechheimer, et al. 2011). We have developed a group tiered mentoring system to support underrepresented students in their research activities. The heart of this system is the Research Advising and Mentoring Professional (RAMP). RAMPs work with their mentees to create an individual development plan, assist in comprehensive advising, help with mentee placement in a research laboratory and project, provide psychosocial support and meet regularly to monitor progress and trouble shoot problems. Surveys of these students show that RAMP mentoring was helpful in getting them started in their research, a valuable source for academic advising, and support in academic as well as non academic challenges. We conclude the RAMP mentoring is likely to increase underrepresented student success in research and in the retention and completion of their undergraduate biomedical academic programs.

S9: Improving STEM Outcomes for Underrepresented Students: Can a Modest Intervention Impact a Deep-Seated Problem?

Presenter: Dr. Gail Horowitz **Institution**: Brooklyn College of CUNY **Co-Authors**: David Turbeville, Rose Bergdoll, Edith Rosales, Shoshana Mayer, and Evan Grandoit

Many would argue that a good deal is already known about why students (both underrepresented and otherwise) struggle to succeed in college level STEM courses. Factors such as transmissive teaching styles and chilly classroom climates are still cited as principle reasons why students leave STEM (Gasiewski et al, 2012; Hunter, 2016). While much is known about what pedagogies work effectively in STEM classrooms, with articles by world renowned scientists calling for more student-centered learning methods (Deslauriers, Schelew, & Wieman, 2011; Sills, Hoffman, & McGuire, 2009), change is still slow to come. In light of this, we implemented a modest, innocuous and non-controversial pedagogical tool known as an exam wrapper (Lovett, 2013) into a traditional STEM classroom in order to examine if it could be utilized to improve students' self-regulated learning (SRL) (Zimmerman, 1990) and/or course performance. We examined the use of exam wrappers in an Organic Chemistry I course at a midsized, urban, public university that is highly diverse (approximately 37% of students are underrepresented ethnic minorities, 50% are low income, 32% are first generation). Two pre-test exam wrappers asked students Likert-scaled questions regarding their confidence in their knowledge of the course material, perceived problem solving ability, and perceived ability to obtain help. Two post-test exam wrappers asked students to rate their satisfaction with their course performance, to indicate how much time they were putting in to studying and problem solving, and to describe what they planned to change in their study behaviors in order to improve. We found, consistent with the Kruger-Dunning effect (1999), that students who were successful in the Organic course were more likely to underestimate their abilities and that students who did not succeed in the Organic course but who had also previously struggled in the prerequisite course were more likely to overestimate their abilities. Additionally, successful students did not necessarily put in more time towards the course than unsuccessful ones and when unsuccessful students did increase their problem solving time, this increase did not result in success. When comparing the students' intended changes to study habits reported in the third and fourth exam wrappers, there were notable differences among the four groups. At week 5 of the semester, at risk, unsuccessful students were more likely to report a plan to utilize electronic or physical help (e.g. from an online resource or physical text), whereas by week 7 their intentions shifted towards plans to seek human help (e.g. from office hours, a tutor or the learning center). Additionally and somewhat surprisingly, unsuccessful students reported that they were going to adopt more strategic behaviors, such as planning which problems to solve (e.g. advanced problems, textbook problems, online problems, etc.) and planning the timing of particular study behaviors (when to read the book, how to pace their problem solving, etc.). Early on in the semester, appreciable numbers of students from all four categories indicated that they intended to devote more time to problem solving. However by week 7, the not at risk, successful students no longer indicated that they needed to devote additional time to problem solving. Yet, the not at risk, unsuccessful students still reported that they intended (and needed) to devote more time to problem solving.

S29: An Innovative Career Exploration Course Designed to Retain Undergraduate Students in the Life Sciences Increases Student Confidence in Pursuing a Wide Variety of STEM Majors and Careers

Presenter: Rachel L. Kennison **Institution**: University of California, Los Angeles (UCLA) **Co-Authors**: Jess Gregg, Marc Levis-Fitzgerald, Erin Sanders, and Casey Shapiro

In recent decades, the proportion of STEM majors in the overall undergraduate population has declined. Even though students indicate high levels of interest in STEM when entering college, fewer than 40% of students intending to major in a STEM field complete a STEM degree after 6 years (1), with particularly troubling early STEM departure rates among women and underrepresented racial minority (URM) students. At UCLA, fewer than 60% of freshman entering as STEM majors finish their intended degree in 4 years (2), with higher rates of departure for URM students both at 4 years (26% of URMs graduate vs. 59% non-URM) and 6 years (42% of URMs vs. 71%

non-URMs). 52% of UCLA's first-time, full- time 2013 STEM cohort entered their academic careers at UCLA planning to major in pre-medicine (3); yet other evidence suggests that many of these students will leave STEM fields entirely, in part because they have not considered other careers beyond medicine. We designed an intervention to address this crisis point for undergraduates at risk for leaving STEM (4) by designing a course that includes exposure to a range of STEM guest speakers, combined with a curriculum that focused on self-exploration and career development (5). Our hypothesis was that the impact of an innovative career exploration course will result in greater retention of UCLA undergraduate STEM students. Career Exploration in the Life Sciences (LS 110), was designed to target freshman and sophomore Life Science students, particularly URMs, and those who were unsure about their career path. The goals were to apply student's self - assessments inventories (Myers Briggs Type Indicator, Strong Interests, Values and Skills) to career research. Through collaboration with Partnership UCLA, alumni in a variety of industries exposed students to career options. Finally, via course assignments students could apply what they learned through self-reflection and refining of their personal and professional goals. The popularity of this course, offered quarterly, has increased exponentially. By the end of winter quarter 2018, ~500 students will have completed the course. This course reaches a diverse group of students, including 27% URMs, 17% Transfer students, 82% first years and 45% Pell grant recipients. Evidence based active learning curriculum was developed to accommodate large class sizes. Preliminary quarterly assessment data over the past year suggested that this course has been very effective in: 1) Increasing student's identification as scientists by broadening their understanding of the diversity of STEM careers and skills 2) Increasing student's self-awareness by reflecting on their self-assessments, which they use to make career decisions 3) Increasing confidence in the career development process resulting in developing an action plan to declare or remain in their major and explore multiple options they had not previously considered. 44 life science guest speakers whose educational requirements span Associates, B.S, MS, PhD, MD attended the class. Students reported that they most valued the invited speakers, informational interviews, self-assessments, cover letter and resume writing skills. Each year, an annual survey will be sent to all LS 110 alumni to evaluate over the long-term whether the LS110 course has a positive impact on retention in STEM majors compared to students who do not take LS110 and if this positive impact is seen for all students, regardless of background.

Sunday, March 4, 2018

7:30am – 8:30am **Breakfast Buffet**
Calvert Ballroom Foyer

8:30 am – 10:00 am **Plenary IV**
Calvert Ballroom

NSF Funding Opportunities for Interventions in Undergraduate Education

Presenter: Robin Wright **Institution**: National Science Foundation **Co-Authors**: Andrea Nixon, Rupa Iyer, and Thomas Kim

This session will highlight National Science Foundation programs that fund educational interventions. We'll explore NSF funding criteria, and examine specific funding opportunities that might align with interventions you are considering

implementing. Attendees will learn about major programs in the Division of Undergraduate Education and have opportunities to ask questions so that they can better plan future grant proposals.

10:15 am -11:45am Concurrent Symposia and Deeper Dives

Adaptation of the Meyerhoff Program beyond UMBC

Salon A

S16: The Meyerhoff Adaptation Partnership Experiment: Overview

Presenter: Kenneth I. Maton **Institution**: University of Maryland Baltimore County **Co-Authors**: Mariano R. Sto. Domingo, Charles Fisher, and Thomas Freeman

Although several institutions have attempted to adapt selected elements of the University of Maryland Baltimore County's (UMBC) Meyerhoff Scholars Program (MYSP), none have achieved similar outcomes (Maton et al., in press). An untested perception is that MYSP outcomes may not be attainable at majority institutions that lack dynamic, minority leadership. We established a partnership in 2013 that included UMBC, Pennsylvania State University (PSU), the University of North Carolina at Chapel Hill (UNC-CH), and the Howard Hughes Medical Institute, which provided funding. PSU and UNC-CH, research-intensive universities, have different histories, geographies, and institutional cultures than UMBC, but like-minded leadership. The Millennium Scholars Program (MSP) at PSU and the Chancellors Science Scholars Program (CSSP) at UNC-CH were designed to closely adapt all major components of the Meyerhoff program, including establishment of key administrators and senior faculty as program champions, allocation of space and funding, recruitment of diverse staff, targeted student recruitment and selection activities, cohort building (including an intensive Summer Bridge), early placement in research labs and summer internships, intensive academic advising and counseling, community service, and regular summative program evaluation (Habowski & Maton, 1995; Maton et al., 2009). The partnership approach to replicating Meyerhoff outcomes has been successful. Cohort sizes and growth closely parallel those of MYSP Cohorts 1 through 5 (1989 to 1993), with Cohort-5 sizes approaching the present-day MYSP Cohorts. Four-year retention rates of the first MSP and CSSP cohorts were similar to that of MYSP, and retention rates for Cohorts 2-4 of the programs are also similar to the historical MYSP retention rate. Students in the first graduating cohorts have entered STEM graduate programs at rates similar to or better than the first graduating cohort of MYSP. Our experiment shows that MYSP can be adapted at institutions that are much different from UMBC. Keys to success are commitment of dedicated administrators and faculty, recruitment of skilled, culturally appropriate staff, immersive inter-institutional training, rigorous outcome and process evaluation, and sustained collaboration. Approaches that leverage lessons learned from successful programs with immersive inter-institutional partnering could serve as an effective paradigm for expanding inclusive excellence in S&E. The proposed COMPLETE symposium, chaired by Kenneth Maton, will present the perspectives of each of the three universities involved in the partnership. The first presentation is titled "The Meyerhoff Adaptation Partnership Experiment: The UMBC Experience." The second presentation is titled: "The Meyerhoff Adaptation Partnership Experiment: The Penn State University Experience." The third and final presentation is titled "The Meyerhoff Adaptation Partnership Experiment: The University of North Carolina at Chapel Hill Experience." Taken together, the presentations provide a rich, multi-faceted perspective on the Meyerhoff Adaptation experiment to date from the vantage point of the universities involved, including challenges, successes, and future directions.

S10: The Meyerhoff Adaptation Partnership Experiment: The UMBC Experience

Presenter: Mariano R. Sto. Domingo Institution: University of Maryland Baltimore County Co-Authors: Kenneth I. Maton, Keith Harmon, Mitsue Wiggs, and Michael F. Summers

This presentation is a component of the symposium, "The Meyerhoff Adaptation Partnership Experiment: An Overview." The Meyerhoff Scholars Program (MYSP) at the University of Maryland, Baltimore County (UMBC) is considered a model for increasing retention and academic performance of underrepresented minority (URM) undergraduates in science and engineering (S&E). Since inception (1989 through summer 2017), MYSP has supported 1,404 S&E undergraduates (70.7% URM), with most graduates (1,041, 89.4%) earning science or engineering bachelor's (B.S.) degrees and most S&E B.S. recipients (932 students, 89.5%) matriculating to graduate or professional programs (37.1% Ph.D., 8.9% M.D.-Ph.D., 20.3% masters, 24.3% medical or other professional programs). According to NSF reports, UMBC is the top undergraduate school of origin of African American M.D.-Ph.D. recipients in the U.S., and the top majority school of origin of African American S&E Ph.D. recipients. Furthermore, research findings show that African American MSP students, compared to a Declined comparison sample (similarly prepared students who declined the offer to attend MYSP) are a) twice more likely to graduate with a STEM bachelor's degree, b) five times more likely to pursue a STEM Ph.D., and c) 4.8 times more likely to complete a STEM Ph.D. (Hrabowski & Maton, 1995; Maton et al., 2009; Maton el al., in press). The Meyerhoff Adaptation Partnership (MAP) was developed in 2013 to test whether majority institutions that lack the dynamic minority leadership present at UMBC can generate similar if not better outcomes, by fully replicating or adapting all of the key MYSP program components. These components are 1) Financial scholarships; 2) Selection weekend; 3) Summer bridge; 4) Study groups; 5) Program values; 6) Program community; 7) Staff academic advising, staff personal counseling; 8) Summer research internships and academic year research; 9) Faculty involvement; 10) Administrative involvement; 11) Community service; and 12) Family involvement. The two majority institutions in the partnership are Penn State University (PSU) and University of North Carolina, Chapel Hill (UNC-CH). MAP included immersive training of PSU and UNC-CH faculty and staff at UMBC. Furthermore, staff hired in the spring of 2013 were embedded with faculty leaders in the 2013 MYSP Summer Bridge, and weekly cohort activities were staggered among the institutions to facilitate training. Staff meet bi-weekly by video conference to discuss programmatic issues, evaluation team members meet monthly to develop and implement evaluation plans, and faculty leadership meet regularly by phone and in person to address administrative goals. Summer retreats involving participants from all three campuses provide sociodynamic critical mass for the smaller initial PSU and UNC-CH cohorts and help affirm programmatic values. As will be reported by PSU and UNC-CH, partnership benefits are reflected in multiple outcomes to date, including but not limited to the 5-year growth of cohorts, rates of minority participation and retention, academic performance, graduation rates, and rapid growth of endowments.

S12: The Meyerhoff Adaptation Partnership Experiment: The Penn State University Experience

Presenter: Charles Fisher **Institution**: Pennsylvania State University **Co-Authors**: Mary Beth Williams, Leticia Oseguera, and Georjanne Williams

This presentation is part of the symposium entitled "The Meyerhoff Adaptation Partnership Experiment: An Overview: necessary adapt, the Meyerhoff Scholars Program at Penn State as the Millennium Scholars Program. This three-institution alliance aims a) to develop new ethnically inclusive undergraduate programs in STEM disciplines at Penn State and UNC, and b) in so doing, to promote institutional cultural changes that significantly increase the number of high-achieving underrepresented minority PhD scientists, engineers, and mathematicians. Evaluation researchers from the three campuses have also partnered to conduct an extensive, rigorous investigation using mixed methods to examine both program processes and outcomes. We found that most of the program culture and individual components of the Meyerhoff Program (Maton et al., 2012) could be replicated in a straight forward way at Penn State. Some adaptations were made, including increases in the duration of the requirement for on-campus living and the amount of most scholarships, changes in GPA requirements, and adding a thesis requirement. These modifications were made because of differences in our geographic location, campus demographics, and the presence of a well-established honors program at Penn State. Close,

interactive, and ongoing partnership with the Meyerhoff Program staff and students has been invaluable to the Millennium Scholars Program. Other primary contributors to the success of the Millennium Scholars Program include having multicultural staff that understand the Meyerhoff Program culture and are committed to the program, strong and diversified backing from high administrative levels, widespread support from academic faculty, and strong institutional support for recruitment, selection, and matriculation of high achieving students from underrepresented groups. With support from HHMI starting in 2014, and an increasing level of support from our central administration, the STEM colleges, industry and donors, the program has flourished. The Millennium Scholars Program received our first major endowment in 2017 and has been identified as a priority by development offices in all of the STEM colleges and by the University. Over the last 4 years the incoming cohort size has doubled and there are now 102 Millennium Scholars who are enrolled in 5 STEM colleges. Scholarship award amounts have increased from a minimum of $15,000 per student per year, to a minimum of full tuition, room and board for Pennsylvania residents and full tuition for our out of state scholars. Millennium Scholars are academically successful, and have an average cumulative GPA (all cohorts) above 3.5, and all members of all cohorts have successfully passed, or are enrolled in, their required gateway calculus, chemistry and physics courses (Sto Domingo et al., submitted). In spring of 2017 we graduated our first cohort of Millennium Scholars. Like the Meyerhoff Program, a primary measure of success of the Millennium Scholars Program is matriculation of our graduates into STEM PhD programs (Summers & Hrabowski, 2006); of the 13 graduating scholars in our first cohort, 9 entered PhD or MD/PhD programs, 1 entered a masters of public health program, 1 began a research internship at the NIH, and the other 2 accepted industry positions. The dedication, hard work, and sacrifices of our scholars inspires us all and secures the future of the Penn State Millennium Scholars Program.

S14: The Meyerhoff Adaptation Partnership Experiment: The University of North Carolina at Chapel Hill Experience.

Presenter: Thomas Freeman **Institution**: University of North Carolina at Chapel Hill

This presentation is a component of the symposium, "The Meyerhoff Adaptation Partnership Experiment: An Overview." In 2013, the University of North Carolina at Chapel Hill (UNC-CH) partnered with the Pennsylvania State University (PSU) and the University of Maryland Baltimore County (UMBC) to determine if it was possible to replicate the successes of the UMBC Meyerhoff Scholars Program (MYSP) at different institutions with different cultures, climates, research infrastructures, and faculty and student populations. Specifically, UNC-CH is ranked as a Carnegie Very High Research institution, it is the first and oldest public university in the United States, is located in the South, and has a larger but less diverse student population than UMBC. The significance of this experiment is that the MYSP model has not been successfully replicated or adapted despite nearly 30 years of success, and is one of the most effective programs at helping underrepresented minorities persist in the sciences to earn undergraduate and graduate degrees in science and engineering [1]. The motivation of UNC-CH to engage in this experiment was prompted by a host of problems identified by faculty and brought to the attention of the university administration. First, the demographics of the student body at UNC-CH do not accurately reflect those of the state of North Carolina, which is ~21.5% Black/African-American and ~8.4% Hispanic/Latinx according to 2010 census data [2]. Second, URM students were failing out of STEM majors at twice the rate of their well-represented peers, and UNC-CH was the undergraduate school of origin of only six African-American science and engineering PhDs per year from 2002-2011[3, 4]. We instantiated our adaptation of the MYSP as the Chancellor's Science Scholars Program (CSSP), which utilizes a similar programmatic framework of core values and elements designed to ameliorate the issues that stymy the success of URMs in STEM [1]. Our attempts to replicate current day MYSP outcomes could only succeed with robust institutional support and a strong partner/mentor relationship facilitated by highly dedicated, like-minded staff and faculty at all three institutions. Establishing CSSP as an indispensable intervention within the university required extraordinary commitments from a number of departments and offices across campus, and strong faculty support played a critical role in initiating the program and supporting scholars throughout their education. CSSP is currently run by a dedicated and innovative staff, who are diverse, and themselves experienced in achieving academic excellence. Altogether, the structure of this partnership yielded remarkable outcomes within the short time span of CSSP's existence. The demographic composition of CSSP totaled over five cohorts is 37.7% Black/African-American, 19.8% Hispanic/Latinx, and 8.0%

Native American/Pacific Islander. The first graduating class had 40% enter a graduate program, 15% pursue professional degrees, and the remainder took a gap year or entered the STEM workforce. These outcomes are very close to those achieved by MYSP today, and exceed the outcomes of their first cohort [5]. These data show very clearly that our model of partnering a successful program with two novice programs - bolstered by broad institutional support, and a dedicated and innovative staff - is a highly effective way to help new programs flourish.

Mentoring Models II: Graduate
Salon B

S31: Improving Job Market Preparation through Skill-Building and Mentoring Workshops

Presenter: Dr. Medeva Ghee **Institution**: Brown University **Co-Authors**: Dr. Don Brunson, Dr. William Wittels, and Dr. Wallace Sharif

The Leadership Alliance is a 36-member consortium of research and teaching institutions that works to support underrepresented (UR) students as they embark upon research careers in STEM, the social sciences, and the humanities. The SYNERGI project aims to increase the readiness and competitiveness of scholars from diverse backgrounds as they train for and enter careers in academia and the broader biomedical research workforce. Skill-building and mentoring-intensive workshops for undergraduates, graduate students, postdocs, and early career research professionals are at the heart of the SYNERGI strategy. SYNERGI Partnering institutions include Brown University, Morehouse College, Spelman College, University of Chicago, and Vanderbilt University. This presentation will focus on SYNERGI's Career Development Workshop (CDW), which includes structured mentoring and market preparation activities that equip graduate students and postdoctoral fellows for careers in diverse biomedical research sectors. The workshop features TED Talk style presentations on diverse career pathways, CV/resume editing, pitch-refinement, presentations on job market trends, and networking opportunities with mentors from varied career sectors. For evaluation purposes, all participants were administered pre- and post-surveys. Subjective measures indicate a strongly positive experience. One hundred percent felt they met helpful future mentors. They also indicated that they were likely or extremely likely to reach out to the senior research faculty (88% of respondents), speakers (92% of respondents), and professional mentors (96% of respondents) in the three months following the CDW. The CDW also had a significant effect on subject perceptions of awareness of non-academic research careers, with 50% of respondents agreeing that they had a clear understanding of non-academic research careers before the CDW and 92% agreeing after. Similarly, the CDW had a significant effect on participants' evaluation of their understanding of the path to becoming successful in their desired career, with the percentage of participants agreeing that they had a clear understanding going from 36% before the CDW to 92% after it. These data demonstrate that the program structure and mentor accessibility (2:1 participant to mentor ratio), integrated with career-specific programming, effectively build awareness of career options and facilitate career decision-making for postdocs and early career researchers in the biomedical sciences. This presentation will feature SYNERGI collaborators from Brown University, Morehouse College, and Vanderbilt University and will focus on the following questions to provide insight into the effective career development for UR researchers: how and why are interinstitutional workshops effective venues for career development activities? Are they effective as spurring development across all types of career paths in the biomedical sciences or only some? What are some of the other ways that institutional partnerships can help to generate opportunities for effective career development? We anticipate that focusing on the above questions will provide an opportunity to work towards the following learning outcomes: insight into the challenges, opportunities, techniques for effective URM career development; best practices for CDW programming; better insight into how institutional partners can contribute to such programming; a clearer sense of the student CDW experience.

S44: Optimizing Mentoring Relationships Through Increasing Cultural Awareness in Mentoring

Presenter: Sherilynn Black **Institution**: Duke University **Co-Authors**: Alfred Mays, Angela Byars-Winston, Clifton Poodry, Christine Pfund, and David Asai

Effective mentorship plays a critical role in the long-term persistence and academic success of trainees in research career pathways, making a significant impact on trainees' research productivity, academic and research self-efficacy, and career satisfaction (Byars-Winston et al., 2015; Thiry et al., 2010; Villarejo et al. 2008). However, many faculty may be unprepared to address mentor-mentee dynamics that can arise in research advising relationships. These dynamics can increase in complexity for mentors working with trainees from underrepresented backgrounds, many of whom have unique experiences due to layers of race, ethnicity, access, and other areas of difference. Evidence suggests that mentoring that explicitly addresses both cultural diversity and psychosocial needs of diverse trainees is positively correlated with increases in trainees' science identity, commitment to a research career, and satisfaction with a research career (Fresquez & Haeger, 2016). Thus, to advance scientific workforce diversity, research mentors must increase their capacity to effectively navigate cultural diversity matters that arise in their mentoring relationships (Blake-Beard et al., 2012). To address this need in developing a diverse scientific workforce, the Howard Hughes Gilliam Fellowship Program (Gilliam) and the Burroughs Wellcome Postdoctoral Enrichment Program (PDEP) launched an innovative intervention to train cohorts of research mentors in evidence-based mentoring competencies and cultural diversity awareness. Both programs support the development of a diverse scientific workforce by having highly competitive fellows engage in multiple years of research training and professional development activities, guided by advisors who are committed to helping them advance to careers in biomedical or medical research. The goal of this intervention is to leverage the grant to influence the training environment. Acceptance of the grant carries with it the expectation that advisors participate in longitudinal mentor development. Gilliam and PDEP fellows and their advisors engage in developmental activities over 2 years: (1) foundational and career-stage specific mentee and mentor training that provides knowledge of specific competencies and characteristics of effective mentor and mentee roles; (2) extended training on building cultural responsiveness of mentees and mentors to address cultural diversity matters in their research mentoring relationship; and (3) targeted work on relationship dynamics. These professional development exercises were implemented in a step-wise fashion by cohort year such that all mentees and mentors received successive programming components in the first grant year. Data collected from the first cohort indicate significant gains for both mentors and mentees in the areas of communication, confidence in addressing topics of difference, and alignment of expectations and goals. Mentors also report feeling increased comfort in their mentoring abilities and empowered to incorporate aspects of these development exercises at their home institutions, thus disseminating the goals of Gilliam and PDEP with their faculty peers. Results indicate that faculty development activities related to cultural awareness in mentoring play a critical role in increasing faculty knowledge and efficacy in mentoring and student training, and also hold high potential to improve mentees' experiences and the overall institutional culture around inclusion.

S52: Incorporating graduate assistants as near-peer-mentors in undergraduate research and mentoring programs: A case study of the CSULB BUILD program.

Presenter: Sewwandi Abeywardana **Institution**: California State University Long Beach **Co-Author: Alejandra Priede**

Research has shown that incorporating graduate assistants as near-peer-mentors has benefited undergraduate students. The California State University, Long Beach (CSULB) Building Infrastructure Leading to Diversity (BUILD) research and mentoring program for undergraduate students has a nested mentoring model that incorporates graduate assistants as near-peer-mentors. A challenge of incorporating graduate assistants as near-peer-mentors is developing a training curriculum for a diverse group of graduate assistants - academically and culturally. Many graduate students lack the skills necessary to mentor a diverse student population in an undergraduate research training program. They have skills needed to be a teaching assistant or a discipline-based subject matter tutor, but need to learn other skills such as how to facilitate discussions, grade and provide feedback, and help trainees develop

communication skills. CSULB BUILD program developed a training curriculum for the near-peer-mentors that focused on three domains: Technical skills (grading, using rubrics), cultural competency, and communication skills for graduate students from four colleges. Using a mixed-methods approach, this study aims to a) explore the benefits and challenges of incorporating graduate assistants as near-peer-mentors in a interdisciplinary undergraduate research training program, b) illustrate characteristics of the near-peer-mentor training curriculum developed by the CSULB BUILD program, and c) present the effectiveness of the near-peer-mentor training curriculum on increasing the quality of mentoring and trainees outcomes. During the summer and fall of 2017, 131 undergraduate students participated in the BUILD research training program and 17 GAs served as near-peer-mentors. Trainees responded to a survey at the end of the summer and at the end of the fall semester. The survey collected information about student outcomes such as sense of belonging, mindset, science identity, and research skills, and information about perceptions of their near-peer-mentor. Additionally, near-peer-mentors responded to surveys about the training they received and a survey at the end of the fall semester measuring what they learned. Preliminary findings suggest that incorporating graduate assistants as near-peer-mentors has contributed to personal, educational, and professional growth for both trainees and near-peer-mentors. Near-peer-mentors state that thanks to the curriculum they have developed skills that have improved their mentoring quality. They feel more prepared to grade and provide feedback on different assignments, such as graduate application materials. They better understand their own cultural capital and developed confidence in incorporating cultural capital concepts when interacting with trainees. Additionally, trainees report that peer-mentors have provided personal and academic support. Thanks to the peer-mentors, trainees have been able to better understand their career options and plan their research career, increase their research and science identity, increase their stress and time management skills, find work-life balance, developed professional soft skills, and greater sense of belonging. Overall, there is evidence that shows incorporating graduate assistants as near-peer-mentors and providing them with training on technical skills, cultural competency, and communication skills promotes undergraduate and graduate student success.

Mechanisms of Community Change: GRE, Coursework, & Case Studies (Deeper Dive)
Salon D

D1: Case Studies for Advancing Systemic Change in STEM Education: Uniting Faculty and Administrators in Shared Learning Experiences

Presenter: Inese Berzina-Pitcher **Institution**: Western Michigan University **Co-Authors**: Andrea Beach, Linda Slakey, Jaclyn K Rivard, and Charles Henderson

Improving the educational experiences of students is becoming a priority for many colleges and universities. It is becoming widely recognized that isolated projects engaging either faculty or students, as are commonly used, will not lead to widespread change in undergraduate STEM education (Gehrke, & Kezar, 2016). There is a need for cultural change within institutions (Fairweather, 2008; Austin 2011), and creating such cultural change requires a systemic approach with engagement from "all levels of the institution, from department faculty to student affairs professionals to deans, provosts and presidents" (Elrod & Kezar, 2015, p. 5). This presentation will promote the use of case studies to create shared learning experiences. The intended audience is institutional change agents (e.g., project PIs, administrators, educational developers) who are looking for new strategies and potential solutions to common challenges in creating and implementing diversity-focused interventions. Examples will be given from a workshop that took place in Summer 2017 with the goal of advancing dialog on diversity and inclusion in undergraduate STEM education. Workshop organizers invited institutions to submit case study proposals of ongoing interventions on their campuses focused on creating more diverse and inclusive STEM learning environments and used those cases as the basis for a full day of focused and facilitated discussion on issues and challenges associated with change in undergraduate STEM programs. Sixty-eight faculty and administrators participated in the workshop. Workshop participants were given the opportunity to hear about all of the cases, and then divide into case-based smaller groups for analysis. After this initial analysis, participants split from their case-based groups into change-topic-based groups to do a

cross-case analysis. The case study approach proved to be a promising strategy for creating opportunities for a dialog and shared learning experiences among faculty and administrators. It allowed for individual and group reflections and facilitated discussions. It also led to collective aggregation of ideas in small groups, that in turn revealed some overarching issues and questions with regard to diversity and inclusion. Moving questions from implicit on participants' minds to the floor for vocalization and discussion created the opportunity to examine how issues impact practice, and can potentially lead to purposeful change in practice.

D12: Addressing the gaps in student performance using metacognition

Presenter: Rebecca Ciancanelli Institution: University of Colorado Boulder

During the PKAL STEM Leadership Institute in 2016, I developed this project. Focus of this study: The main purpose of this ongoing study is to teach metacognition and related study strategies to undergraduate students in STEM courses and to determine which strategies students choose to adopt to be successful on exams in these courses. This project aims to document the effectiveness of the Student Academic Success Center's (SASC) community-centered approach to improving STEM education. We are a multicultural learning community serving students who are low income, first generation, and/or from communities historically underrepresented in higher education. A new focus on students' ability to monitor their own learning processes, metacognition, has begun to emerge in many STEM disciplines. Successful interventions in chemistry (Zhao, 2014), biology (Stanger-Hall, 2012; Tanner, 2012) and physics (Taasoobshirazi, 2013) are showing improvement in student engagement and motivation, indicating that a shift in pedagogy beyond course content may be required to retain a diverse body of students in STEM fields. This project is relevant to the UI community; it demonstrates that creating relationships with students in STEM courses through metacognitive interventions improves student performance and may contribute to the retention of these students in STEM majors. Methodology used: ~1600 students involved each semester in this project, either taking small lecture courses through SASC in math, chemistry, and economics, or large lecture courses through the chemistry department. We gathered this data by administering the Metacognitive Activities Inventory (MCAI) survey in class before the first exam and at the end of the semester (Cooper, 2009). We ran the study twice with different interventions. In Fall 2016, we offered an optional workshop after the first exam discussing metacognition, learning strategies and mindset (McGuire, 2015). In Fall 2017, we introduced these concepts through nine 5-minute self-reflection activities during lecture throughout the semester. For both studies, we looked at survey results, exam scores and class grades. Preliminary data suggests that students increase their performance in the course if they participate in these interventions. I recently offered a shorter four-week challenge for SASC students only, in which students identified new learning strategies (they chose from a list of 39 study strategies -- mindset strategies, wellness strategies and exam taking strategies) and answered questions via survey for four weeks. I will examine course grades at the end of this semester. Survey results helped determine which strategies are most popular and which strategies are most beneficial to students and hope to develop strategies for academic advisors to coach students on learning throughout their years at CU. We could discuss the following questions: What types of assignments in class encourage students to reflect on their learning? What types of metacognitive activities foster an inclusive classroom environment? Is it worth giving up content to give time to these activities? What are effective learning strategies that students adopt outside the classroom - such that students are working towards mastery instead of accumulating points? Which study, mindset, wellness and test-taking strategies are most important, and how do we motivate students

to take them on?

D15: #GRExit - From Understanding Interventions to Widespread Institutional Change

Presenter: Joshua Hall **Institution**: University of North Carolina at Chapel Hill **Co-Authors**: Scott Barolo

Biological and Biomedical PhD programs in the United States often receive many more applications than they can accept each year, leading to a highly competitive admissions process. Historically, programs relied heavily on quantitative measures such as the GRE to select students for admission into their graduate programs. Admissions committees operated under the assumption that these metrics correlate with an individual's potential for success in graduate school, but these assumptions have recently been challenged based on an increasing body of peer-reviewed, independent studies comparing GRE scores with student performance. In January 2017, two independent studies on the relationship between the general GRE and biomedical PhD student outcomes were published by Vanderbilt University and the University of North Carolina at Chapel Hill (1,2). The publication and publicity of these studies encouraged many admissions committees to evaluate their own admissions practices and, in some cases, perform their own internal assessments. In August 2017, in response to these studies and others, the University of Michigan's Program in Biomedical Sciences (PIBS) solicited white papers from faculty arguing for and against the use of the GRE in PhD admissions and held a public town hall forum on this issue (3). As a result of this process, PIBS leadership announced elimination of the GRE requirement for applicants beginning in 2018. Besides the impact of a major biomedical PhD-training institution changing this long-standing admissions practice, the publicity of this decision and the thought process underlying it was important for additional programs wrestling with this issue at their own institution. Since October 2017, we have maintained a public list of bio/biomedical graduate programs that have eliminated or plan to eliminate the GRE requirement. Currently, there are at least 25 programs that dropped or plan to drop the GRE, many in response to these newly published studies. The research completed at UNC Chapel Hill in many ways was inspired by participation in the Understanding Interventions conference. The ongoing, national changes with regard to the use of the GRE in PhD admissions highlights the importance of not only publishing interventions-related research, but also publicizing these findings to the broader training community. Doing so can facilitate institutional change that broadens participation in the scientific community. This session will provide opportunity for participants to discuss the following questions: 1) What practical steps can be taken to eliminate or reduce reliance of the GRE at my institution? 2) What are the barriers to institutional change with regard to eliminating the GRE requirement? 3) How can the change to GRE requirements based on published studies be used as a framework for leveraging interventions research into institutional changes in other contexts? and 4) What are practical tips for publishing and publicizing interventions-related findings?

Diversifying the Professoriate through Professional Development
Salon E

S27: Using Alternative Space and a Psychological Sense of Community within Underrepresented Minority Graduate Student Professional Development to Aid Student Retention and Reduce Attrition

Presenter: Erika Aparaka **Institution**: University of Maryland

The PROMISE Summer Success Institute (SSI) is designed to offer graduate students professional development training, writing support, and a psychological sense of community (PSOC). There is a growing body of research examining the problem of underrepresented minority (URM) graduate students' attrition, as well as efforts to promote recruitment and retention at institutions of higher education across the United States. As outlined in currently available literature, graduate students of color cxperience social and institutional barriers that can negatively influence their retention of this specific graduate student population (Okahana, 2016). The SSI provides

tools and strategies that foster successful outcomes for students pursuing doctoral degrees and the data that has been collected over a four year period will be discussed in relation to those outcomes. The goal of the SSI is to support new and continuing graduate students' persistence to degree completion. The community building fostered at SSI creates an alternative space for URMs students to share their experiences, receive exposure to opportunities, and receive encouragement during what can be a challenging, yet satisfying academic and career path. This symposium will look at the results of participation in the PROMISE SSI and how it has shaped the experiences of the participants. Preliminary analyses demonstrate that participants in the SSI benefit from the community oriented aspects of the programming and derive motivation to complete their degree after attending the SSI events. Existing retention models will be introduced to further substantiate strategies that support the successful persistence of graduate student of color toward degree completion. Connections to the works of Oldenburg, Yosso, and Lovitts' research on graduate student attrition will be drawn to the role of SSI as an alternative space for URM graduate students. Yosso's model, specifically, presents an anti-deficit perspective on GSOC achievement which supports the PROMISE AGEP philosophy that all students inherently bring valuable attributes to the graduate community. Lovitts affirms the need for community building in graduate spaces, and Oldenburg identifies the need for informal gathering places for the betterment of the human condition. These approaches, along with the currently available data, can provide administrators, faculty, and students with context that can potentially be applied to efforts that highlight and support the retention efforts of graduate education programming.

S41: Structure and Belonging: Pathways to Success for Underrepresented Minority and Women PhD Students in STEM fields

Presenter: Mark Richards Institution: University of California Berkeley Co-Authors: Ira Young, Aaron Fisher, Colette Patt, Andrew Eppig, and Rodolfo Mendoza-Denton

Research in education and psychology suggests that a lack of structure and/or clear expectations will have a disproportionate effect upon students who come to graduate school less familiar with a high-performance, research-oriented academic environment - e.g., first generation college graduates, whose parents are neither professionals nor academics, and students from minority-serving and/or non-research-oriented colleges (Weinstein, 2002). For these students, unstated assumptions regarding the norms for academic productivity (publishing, presentations at prestigious conferences, etc.) may not become apparent to them until late in their PhD studies. Also, to the degree that the process of publishing often calls for subjective evaluation of the quality of a student's work, subtle judgments on the part of advisors and co-authors may cumulatively lead to fewer opportunities for minority scholars to present nationally and publish their work (Dovidio & Gaerter, 2000), placing them at a distinct disadvantage in the pursuit of academic careers, and directly affecting whether underrepresented minority (URM) scholars are hired into academic positions. In 2015 the California Alliance (Berkeley, Caltech, Stanford, UCLA) conducted a wide-ranging survey of 435 PhD students across the mathematical, physical, engineering, and computer sciences in order to identify levers to improve the success of PhD students, and, in time, improve diversity in STEM leadership positions, especially the professoriate. The survey data were interpreted via path analysis, a method that identifies significant relationships, both direct and indirect, among various factors and outcomes of interest. We investigated two important outcomes: publication rates, which largely determine a new PhD student's competitiveness in the academic marketplace, and subjective wellbeing. We found that distress levels for women and URM students were mitigated by clearly articulated expectations, students perceiving that they were well prepared for graduate level courses, and feeling accepted by their colleagues. Women and URM students who perceived that they were well-prepared for their graduate courses and accepted by their colleagues (faculty and fellow students), and who experienced well-articulated expectations in their PhD programs, were most likely to publish at rates comparable to their male majority peers. This UI 2018 symposium presentation will discuss our findings, which suggest that straightforward measures to provide PhD students in STEM with well-structured environments, which should in fact be beneficial to all students (Austin, 2002), may mitigate against confounding issues that might otherwise frustrate efforts to diversify the professoriate, especially at research-oriented universities.

S42: Differences in STEM doctoral publication by ethnicity, gender and academic field at a large public research university

Presenter: Colette Patt **Institution**: University of California Berkeley **Co-Authors**: Andrew Eppig, Mark Richards, Rodolfo Mendoza-Denton, Ira Young, Aaron Fisher, and Andrew K. Smith

Diversifying the STEM professoriate remains an important but illusive step toward broadening participation in STEM at all levels. In the competition for postdoctoral and professorial positions, a candidate's publication record is key. However, surprisingly little attention appears to have been devoted to studying possible disparities by ethnicity or gender in publication by doctoral students. As a large public university that has granted more STEM PhDs over the past 10 years than any other US university (NSF, 2015), UC Berkeley is an ideal setting to consider possible differences in publication among students as a function of underrepresented minority (URM) status and gender (we note that 8 of the 10 largest STEM PhD producers in the US are also large public universities). To this end, we conducted a study drawing from two extensive datasets on STEM graduate students at UC Berkeley. The first dataset, the Berkeley Life in Science Survey (BLISS), was collected in 2013-2014 and reveals potential differences in publishing activity among students as a function of URM status and gender. BLISS surveyed graduate students in mathematics, statistics, physics, astronomy, earth and planetary sciences, electrical engineering and computer science, chemistry and chemical engineering. Survey completion was voluntary and garnered high participation rates: 53% for women; 50% for URMs: 39% for non-URM men. Concerns about the possibility of a self-selected sample were addressed using data from a second study, a PhD exit survey. Both of these independent surveys of PhD students in STEM fields at Berkeley indicate that URMs publish at significantly lower rates than non-URM males. Differences as a function of gender reveal a similar, though less consistent, pattern. The exception is the College of Chemistry in which there do not appear to be differences in rates of publication by race and gender. The results of this study appear in Mendoza-Denton, et al. 2017. When a second, cross-institutional, study conducted by the California Alliance for Education and the Professoriate found that chemistry departments at other comparable institutions did not show the same equitable outcomes, we sought to understand why graduate publication outcomes in Berkeley Chemistry differ from other STEM departments. The California Alliance for Graduate Education and the Professoriate consists of Berkeley, Caltech, Stanford and UCLA. Similarly, a study at a Big Ten institution found sex differences in doctoral publication rates across STEM fields (Lubienski et al, 2017). We, therefore, conducted a third, qualitative, study of three of the largest UC Berkeley STEM departments. Interviews were conducted with Department Chairs, Vice-Chairs for Graduate Programs, and doctoral students. The results explain variations in graduate programs and how they appear to relate to publication outcomes for doctoral students. This UI 2018 symposium presentation will focus on structural features of graduate programs that appear to facilitate equitable outcomes for graduate students. Looking forward, the structural features identified in this qualitative study are being used to design a California Alliance-wide survey which will be conducted in 2019 to further explore the relationship between structural variations in STEM graduate programs and graduate student publication outcomes.

Promising Models of URM Advancement in the STEM Graduate Pipeline and Transition to the Professoriate

Location: Baltimore Theater

S38: OVERVIEW: Promising Models to Promote Advancement of URMs in the STEM Graduate Pipeline and their Transition to Professoriate

Presenter: Mohammed A. Qazi **Institution**: Tuskegee University **Co-Authors**: B. K. Robertson, and Shaik Jeelani

The Alliances for Graduate Education and the Professoriate-Transformation (AGEP-T) program has been established by the NSF to encourage institutions of higher education and other stakeholders to form strategic alliances and propose innovative models to increase the quality and quantity of underrepresented minorities (URMs) in STEM graduate education, STEM postdoctoral studies and the STEM Professoriate (URMs include African Americans, Hispanic Americans, American Indians, Alaska Natives, Native Hawaiians and other Pacific Islanders). The focus of the proposed symposium is to engage three active AGEP-T Alliances in dialogues on the development, implementation, study and evaluation of their respective models for URM STEM graduate education and transitions to careers in academia. The dialogue will consist of presentations by these three AGEP-T alliances to describe their models and associated research and evaluation activities, followed by a discussion with the audience. These research and evaluative components are critical to investigate the effectiveness of each model. They are driven by strategically formulated research or evaluation questions which are addressed by using qualitative and quantitative techniques from educational research and the social sciences. The participating AGEP-T Alliances will describe features of their models and their potential to preparing URMs that are better prepared to pursue STEM research careers at American Colleges and Universities. All AGEP-T Alliances are spearheaded by faculty members in key disciplinary areas who are the Principal Investigators, including STEM, behavioral sciences, education and diversity/inclusion. These individuals will lead the proposed dialogue during this session. The symposium dialogue will shed light on the factors that may impact the academic success and progress of URMs, and will illuminate positive practices leading to promising strategies that can be widely adopted to gradually increase URM representation in STEM faculty and research careers. NOTE: This symposium includes the following three presentations whose abstracts were submitted on Dec 15, 2018: 1) The Tuskegee Alliance to Forge Pathways to Academic Careers in STEM (T-PAC) - Dr. Melody Russell 2) Inclusive Program and Institutional Environments: Identity Development Interventions in STEM Doctoral Programs at Minority Serving Institutions - Dr. Diana Bilimoria 3) High-Impact Educational Practices for Graduate Student Success - Dr. Renetta Tull

S35: The Tuskegee Alliance to Forge Pathways to Academic Careers in STEM (T-PAC) - Research Study

Presenter: Melody Russell **Institution**: Auburn University **Co-Authors:** Jared Russell, Martha Escobar, and Misty Thomas

There is an increased need for broadening participation in STEM graduate programs, promoting STEM degree completion and career readiness for traditionally underrepresented groups. This study examines factors that influence career aspirations and STEM graduate persistence. Overall findings from each phase of data collection indicates that faculty/advisor support, funding, intrinsic motivation, adequate career advisement/counseling and undergraduate and precollege STEM research experiences influence graduate students' interest in pursuing a graduate degree, persistence in the STEM graduate program, and career aspirations in STEM (academic and non-academic). This research also provides insight on the importance of STEM preparation at the undergraduate level, and support from faculty, faculty advisors, and university administrators for promoting persistence in STEM graduate programs and encouraging career aspirations in STEM (academic and non-academic) for traditionally underrepresented groups. Significance to the UI Community: An increasing number of research studies investigate the myriad of factors that influence graduate program completion by traditionally underrepresented student. More research in this area can provide insight into how interventions that influence career aspirations in STEM (academic and non-academic) for traditionally underrepresented groups, especially since doctoral degree attainment is necessary for careers in the STEM professoriate. Gaining insight into the specific characteristics that prepare traditionally underrepresented groups to persist in STEM graduate programs can also facilitate diversifying the STEM faculty and STEM professions. Moreover, investigating

factors that pose barriers and challenges to the persistence of traditionally underrepresented graduate students in STEM and their pursuit of STEM faculty careers has also been at the forefront of numerous initiatives by the U.S. Congress. Contextual and Other Factors: In September 2014, a collaborative, NSF funded grant was awarded across three doctoral granting institutions in the southeastern part of the U.S. As part of this project two Historically Black Colleges and Universities (HBCUs) and an R1, Traditionally White Institution (TWI) formed a unique alliance. The alliance highlights interventions/activities designed to, (a) promote doctoral degree completion, (b) increase the numbers of traditionally underrepresented groups (e.g. Black/African American, Latino/a, American Indian, Asian Pacific Islander, Alaska Native, and Native Hawaiian) in STEM faculty careers, (c) diversify the STEM professoriate, and (d) broaden participation in STEM for traditionally underrepresented groups. Research questions driving this investigation included the following: 1) What factors impact traditionally underrepresented graduate students in STEM programs graduate experiences and career aspirations? 2) What role do undergraduate and graduate experiences play in graduate school persistence and STEM career aspirations for traditionally underrepresented students in STEM graduate programs? Outcomes of the Intervention: This research provides insight into factors that influence STEM graduate degree completion and career aspirations that can inform policy and practice in higher education in an effort to provide more access to STEM career opportunities for traditionally underrepresented students.

S36: Inclusive Program and Institutional Environments: Identity Development Interventions in STEM Doctoral Programs at Minority Serving Institutions

Presenter: Diana Bilimoria **Institution**: Case Western University **Co-Authors**: Keimei Sugiyama, and Queen Jaks

A critical challenge faced by underrepresented minority (URM) doctoral students in STEM is the simultaneous transition of their minority identity and professional scientist identity. These two identity transitions often intersect, affecting the extent to which students can reconcile their minority identity with their emerging scientist identity. Previous research suggests that Minority Serving Institutions (MSIs) provide direct support for minority identity development (e.g. Conrad & Gasman, 2015); yet not enough is known about how this is accomplished. Additionally, whereas previous evidence has investigated the experience of URM undergraduate and master's level students, almost no research has examined the identity development experiences of URM doctoral students. The current study addresses both these gaps in the literature. The research questions informing the study include: How do URM doctoral students in STEM engage in identity development across both minority and professional identities? How do MSIs engage in interventions at the program and institutional levels to address identity development of URM doctoral students? What can Predominantly White Institutions (PWIs) learn from MSIs about the development of URM doctoral students in STEM? To date we have conducted focus groups and interviews with URM doctoral students, faculty advisors, and doctoral program directors and staff at two MSIs to inform the research questions. Data analysis and reporting of findings will focus on the kinds of interventions used across both institutions and their outcomes.

S37: High-Impact Educational Practices for Graduate Student Success

Presenter: Renetta Tull **Institution**: University of Maryland Baltimore County

In 2008, George Kuh described how "High-Impact Educational Practices" serve all students, but seem to "benefit underserved students even more than their more advantaged peers." We agree. We extend the work by including graduate students within the context of serving "all students." Kuh's list of 10 high-impact practices focuses on transforming undergraduate education. The original 10 practices include: First-Year Seminars and Experiences, Common Intellectual Experiences, Learning Communities, Writing-Intensive Courses, Collaborative Assignments and Projects, Undergraduate Research, Diversity/Global Learning, Service Learning, Community-Based

Learning, Internships, and Capstone Courses and Projects. UMBC and institutions within the University System of Maryland present a modified version of the high-impact practices that address the needs of graduate students. By infusing the concept of "inclusive excellence" throughout a specialized graduate student professional development curriculum that is coupled with training within academic units, UMBC and institutions within the University System of Maryland have experienced gains in the numbers of underrepresented students who have completed advanced degrees in STEM disciplines. "PROMISE" in Maryland is an Alliance for Graduate Education and the Professoriate (AGEP), and is sponsored by the National Science Foundation. Led by UMBC, with founding partners the University of Maryland College Park, and the University of Maryland Baltimore, the PROMISE AGEP now serves graduate students at all 12 institutions within the University System of Maryland. UMBC's version of the high-impact practices would consist of the following: 1) Graduate student orientation and related Success Seminars throughout the year, 2) Common Intellectual Connection to Research, 3) Psychological Sense of Community, 4) Dissertation House, 5) Co-authored research across disciplines, 6) Pedagogy as research, 7) International Engagement, 8) Connecting research and mentoring to the broader community, 9) Short-term external experiences, and 10) Thesis and Dissertation Support. Similar to Kuh's findings, UMBC has found that students from underrepresented groups benefit from participating in practices such as The Dissertation House, and that participation yields higher likelihood of completion compared to underrepresented students who do not participate. Further, participation contributes to a sense of community for all graduate students who participate, regardless of race or gender. Study population: Graduate students, particularly in STEM fields. Contextual and other factors: This is a program. Practice is informed by the literature, and by evaluations. Outcomes of the intervention: This talk looks at the intervention as a "suite" of activities, to be taken together, and not in isolation. Outcomes include a stronger sense of STEM identity, higher rates of completion among students writing dissertations, a strong sense of community among participants that was experienced in "third spaces" - outside of the traditional academic environment. Expected Learning Outcomes: Participants will hear 10 high impact practices that apply to graduate students and how innovative solutions for success differ from the needs of undergraduates. They will hear proven retention activities that lead to degree completion, and how the practices are particularly successful for retention of students from underrepresented groups.

11:45 am – 12:00 pm **Refreshment Break**
Calvert Ballroom Foyer

12:00 pm – 1:00 pm **Closing Session**
Calvert Ballroom