

## Poster Abstracts

### ***Barriers and Solutions to Advancing Careers***

#### **A01: Assessing Interventions Aimed at Promoting Women's Advancement in Computing Careers**

*Heather Wright, Ama Nyame-Mensah, and Jane Stout—all of the Computing Research Association*

Women are underrepresented at all levels of the computing research pipeline. Underrepresentation can lead to feelings of isolation, lack of fit, and attrition from a field. To help alleviate these issues, the Committee on the Status of Women in Computing Research (CRA-W) runs mentorship and career development programs for women early in their computing careers. Two such programs are Grad Cohort and Career Mentoring Workshops, which are both workshops geared towards providing mentorship and connecting women with a supportive community. These programs also unite junior researchers and graduate students with women already established in their field. The established professionals provide practical information, advice, and support to their younger colleagues.

The Center for Evaluating the Research Pipeline (CERP) provides assessment for CRA-W programs through a multi-method research design. For one, CERP uses a pretest/posttest research design to assess the immediate impact of intervention programs on participants. For instance, this type of assessment indicates that Grad Cohort has a positive immediate influence on women computing graduate students' self-efficacy, interpretation of setbacks, strength of professional network, networking skills, and knowledge about skills necessary for professional growth.

CERP also conducts longitudinal, comparative evaluation that assesses the impact of an intervention on program participants versus non-participants over time. This technique has yielded a comparison database that has become a powerful national resource for the computing community. This type of data analysis also allows for the assessment of whether the CRA-W's programs promote success and persistence among women in computing compared to women who have not participated in CRA-W programs and compared to men. By collecting baseline data from both participants and non-participants, and assessing change in successes and persistence patterns across time, the CERP model offers a rigorous means of quasi-experimental research on interventions aimed at broadening participation in science careers. We will share our analytic model, methodology and preliminary results with conference attendees.

#### **A02: The Prelim-Prep Group: A Multi-part Intervention for Improving Graduate Student Performance during the Preliminary Qualifying Exam**

*Raquel Y. Salinas and Sherilynn J. Black—both of Duke University*

The Preliminary Qualifying Exam (PQE) is a critical academic milestone in the career of each graduate student pursuing a PhD. While each institution may vary slightly in their approach to the exam, the overall goal of the exercise is to 1) evaluate the scientific merit of the thesis proposal, 2) assess the scientific knowledge of the examined individual, and 3) to develop scientific writing skills (written scientific proposal) and scientific communication skills (verbal scientific presentation). In most biomedical science departments and programs across the nation, this exam lasts 2-3 hours and is a comprehensive evaluation of both oral and written exercises. Due to the high stakes nature of the PQE, it serves as a high stressor for many graduate students and can often mark the point of attrition from graduate school. For underrepresented students who may suffer from imposter syndrome and/or a lack of self-efficacy, this exam can lead to an even higher level of stress and anxiety beyond what a non-underrepresented student would face. To address these issues, we

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implemented a longitudinal, multi-part intervention designed to assist students in mastering the specific skills necessary for success in the PQE. The intervention, entitled “The Prelim Prep Group”, consists of a series of seminars and skills-based exercises designed to equip students with the knowledge and abilities required to succeed in the PQE. Students from a variety of scientific disciplines work together in a cohort to improve their skills in scientific writing, scientific communication and exam strategies. Importantly, student participants provide a high level of emotional and academic support for one another during the lengthy preparation process. Results indicate that students participating in this intervention feel more confident and prepared for the exam, and student participants have experienced high PQE success rates.

**A03: Impacts of a Career Coaching Intervention on Biomedical PhD Students’ Career Planning, Professional Development and Understandings of “Diversity, Difference and Discrimination”**

*Simon Williams, Bhoomi K. Thakore, Veronica Womack, Letitia Onyango and Rick McGee—all of Northwestern University*

In this poster we examine the impacts of an Academic Career Coaching intervention called the “Academy for Future Science Faculty” (hereafter the Academy). The Academy is an NIH-funded intervention for the professional development of PhD students in the Biomedical Sciences. It involved annual in-person meetings in its first 2-3 years, sustained by virtual meetings and individual contacts with a ‘coach’ and a coaching group of 10 students. This report focuses on quantitative and qualitative data to explore differences by race-ethnicity (URM status) and gender, focusing on two main areas: 1) The impact of the Academy on students’ Career Planning and Professional Development; 2) The impact of the Academy on students’ understandings of the role of Diversity, Difference and Discrimination in academic careers and professional “success”.

In this poster, we focus on the second Academy group, which consists of a diverse cohort of 60 PhD students near the completion of their PhD. Six “Academic Career Coaches” (faculty with high levels of expertise guiding research training) provided expert advice and guidance to the students and led the activities of their Coaching Group of 10 students. Surveys were administered to students at the end of each of the three days of the first in-person meeting in 2011. The non-parametric Mann-Whitney U test was used to explore potential differences by URM status or by gender. Overall, the majority of participants felt the Academy had a positive impact on their Career Planning and Professional Development. Of the 14 Career Planning and Professional Development items, 10 were non-significant by URM status, and 11 were non-significant by gender. URM students were significantly more likely to report benefits from discussions on seeking and designing a postdoc, how to achieve their ultimate career goal, and how to take control of their mentoring. URM students were also significantly more likely to see value in the use of their Individual Development Plan (IDP). Female students were significantly more likely to report benefit from discussions on seeking and designing a postdoc, being more confident in their ability to write an NIH grant proposal, and seeing an academic career to be more achievable. Qualitative data revealed that students felt they learned how to be proactive in their postdoc planning, how to be assertive in communicating with their mentor, and that there is a “science to writing grants”. Students also felt the IDP helped them to “set goals” and that an academic career seemed more “doable”.

Overall, the majority of students felt that their understanding of how Diversity, Difference and Discrimination operated in science increased. All 6 items in this category were non-significant both by URM status and by gender, suggesting that both well-represented and under-represented students can learn from, and participate in, discussions about diversity. Qualitative data revealed that both well-represented and under-represented students reported feeling a “greater awareness of discrimination”, “a need to confront the reality of discrimination” and knowledge of “the politics” that characterize science careers and professional promotion.

**A04: Gender, Ethnicity and Successful STEM Intervention Outcomes: Integrating Self-Authorship and Self-Efficacy Perspectives**

*Michelle Randolph and Phillip J. Bowman—both of University of Michigan*

Gender and ethnic comparisons reveal that talented African American females with interests in STEM fields must overcome great odds to achieve their educational and career goals. Existing strengths-based research has begun to provide new insights into factors critical to their success in STEM fields – what motivates them, how their backgrounds and family relationships have shaped them, and challenges faced by the growing number of high achievers who beat the odds. This comparative study integrates insights from both self-authorship and self-efficacy models to better understand successful STEM outcomes among of African American females in pipeline interventions. Building on the strengths-based literature, this study explores the specialized talents and motivations associated with successful STEM outcomes among African American females in an undergraduate pipeline program that promotes Ph.D. studies and faculty careers among underrepresented students.

More specifically, this study seeks to explore the following questions: (1) how African American females differ from others in pipeline intervention settings on specialized talents? (2) the relationship between specialized talents among African American females with STEM major, STEM Ph.D. and STEM research career plans? and (3) do research self-efficacy moderate the relationship between specialized talents and successful STEM outcomes among underrepresented females in pipeline interventions? The survey data for this poster comes from a NIH-NIGMS supported study of students engaged with the CIC-Summer Research Opportunity Program (CIC-SROP), which is an undergraduate pipeline program at 12 major research universities. Comparative and inferential statistical analyses systematically explore the specialized talents and motivations associated with successful STEM outcomes among African American females. Research findings will be discussed with a particular emphasis on theoretical issues as well as practical and policy implications for STEM interventions.

**A05: Strengths Based Leadership Training for Graduate Students and Postdocs Leading Campus Organizations Dedicated to Diversity**

*Steven P. Lee and Carlos Ruvalcaba—both of University of California, Davis*

As many initiatives strive to build a diverse and inclusive community at academic institutions, a critical component are campus organizations that are led by students and postdoctoral scholars. These organizations provide an opportunity for students and postdocs to take ownership and contribute to building a diverse community themselves, and to also gain and practice leadership skills that will be invaluable for their future success. However, their service for these organizations is not often supported with leadership training and related resources. This gap in support makes it challenging for these organizations to grow and thrive, and hinder their contributions to building a diverse community for students and postdocs from underrepresented minority (URM) groups.

To fill this gap, a novel intervention was implemented at UC Davis in Winter 2015 for graduate student and postdoc leaders of campus organizations that are dedicated to creating a diverse and inclusive community. This intervention provided leadership training for 18 leaders (16 of whom are in the STEM disciplines) of seven different organizations:

1. API Grads – Asian and Pacific Islander Grads
2. BGPSA – Black Graduate and
3. Professional Student Association
4. Chemistry URM Committee
- Ecology Diversity Committee

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5. ESTEME – Equity in Science, Technology, Engineering, Math, and Entrepreneurship
  6. LGSA – Latina/o Grad Student Association
  7. PSA – Postdoc Scholars Association

These graduate students and postdocs participated in leadership training that involved professional development workshops to assess and apply their leadership strengths for their respective organizations. The training materials focused on the Gallup StrengthsFinder 2.0 assessment test and “Strengths Based Leadership” book, along with materials from the Myers-Briggs Type Indicators (MBTI). This leadership training had two primary goals: (1) to help each grad student or postdoc to succeed in their own academic programs or appointments by assessing and applying their strengths; and (2) to help each organization to grow and thrive, and thereby to help create a diverse and inclusive community.

The leadership training consisted of assessment tests and five workshops that focused on community building and professional soft skills. After an introductory workshop, each of the following four workshops consisted of three components: (a) lessons on one of the four Gallup strength domains and MBTI dichotomy; (b) team exercises that involved applying those lessons for each leadership team and organization; (c) reporting back to the whole group on how they are applying the lesson, to encourage sharing of ideas and collaborations. This leadership training is a new activity for the Graduate Diversity Network (GDN), which was recently created at UC Davis to help facilitate communication and collaboration for the many people and programs that are dedicated to strengthening graduate education through diversity.

This presentation will provide a summary of the materials, exercises, and results from the leadership training, along with the evaluation received from the participants. Overall, the feedback has been overwhelmingly positive, as the participants appreciated gaining skills in community building and professional soft skills to succeed personally, and to benefit their respective organizations. We will also present future plans for this leadership training, along with other activities of the GDN at UC Davis.

#### **A06: Determining Learning Environment Components in Research Diversity Intervention that Promotes Success to the Next Career Level**

*Debra Murray and Dawayne Wittington—both of Baylor College of Medicine*

During the development and early implementation of the Human Genome Project, minority scientists were noticeably absent. To address this shortage, grantees of the National Human Genome Research Institute were encouraged to provide training to increase representation of minorities in this field. The Baylor College of Medicine's Human Genome Sequencing Center (HGSC) established an HGSC-Minority Diversity Initiative to give under-represented minorities an opportunity to obtain hands-on research in the genomic sciences to encourage participants to pursue doctorates in these fields. Our most successful intervention is the year-long post-baccalaureate program called the HGSC-PreGraduate Education Training (PGET). Our study focused on whether we established a learning environment that fostered the promotion of participants to the next career level. Specifically we wanted to determine the most critical element that led to success as indicated by advancement of the participants. We used Cross-Sectional Surveys, focus groups, and individual interviews to gather data from our program participants and their mentors. Our data indicate that while several components were involved in the success of the participants, the critical element to the participants' success was the mentoring component. Our future studies will investigate how these various mentoring components impact the participant's success and how we can utilize these resources to create a more positive learning environment.

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### **A07: Can Mentoring Style Influence the Career Path Choice of Trainees?**

*Hwa Young Lee, C. B. Anderson, S. Chang, C. D. Baldwin, C. Cameron—all of The University of Texas MD Anderson Cancer Center*

Introduction: While everyone recognizes that mentoring is important for trainee career success, most studies focus only on presence of a mentor, the mentoring function (career, psychosocial, etc.), and quality of mentorship defined broadly. Only one study mentions that mentors' prosocial traits (or style) significantly influence their specific mentoring behavior. In the biomedical science research literature, however, no single study addresses the mentor's style. A useful area of related research focuses on parenting style. Empirical studies suggest that parenting style is a significant predictor of children's attitudinal change and outcomes; we sought to study whether Baumrind's framework of parenting style could be used to assess mentoring style and trainee outcomes. Our purpose was to investigate the relationship between mentoring style, defined in terms of the constructs of the mentor's demandingness and responsiveness, and the trainee's intention to pursue a career path choice.

Methods: An online survey was administered to biomedical and behavioral graduate students and postdoctoral fellows (N= 510) at various institutions in Texas. Trainees were asked to report on their current mentor's style, using definitions borrowed from Baumrind framework of parenting style. We defined demandingness as the mentor's rule orientation, monitoring, insistence, and high expectations, and responsiveness as encouragement, adjustment, allowance, care, persistence, and openness. Our trainee outcome variable of research career path intention was measured by level of trainees' agreement on each of three questions, including academic research career as a principal investigator (PI), research career outside academia, and academic research career not as a PI. Hierarchical regression analyses were conducted to determine whether each mentoring style (demandingness and responsiveness) predicts trainees' career intentions, after controlling for trainee and mentor demographic characteristics.

Results: Mentor responsiveness was an important predictor of a trainee's intention to pursue a research career in academia as a PI ( $p < .001$ ; adj.  $R^2 = 15.4$ ). Trainees who reported that their mentors were more responsive were significantly more likely to express interest in a research career as a PI. Both responsiveness and demandingness were significant (or marginally significant) predictors of a trainee's intention to pursue a research career outside academia ( $p = < .001$  and  $.065$ , respectively; adj.  $R^2 = 6.8$ ). Trainees who reported that their mentors were more responsive and less demanding were more likely to express their interest in a research career outside academia. On the other hand, mentoring style was not a significant predictor of a trainee intention to pursue a career as an academic research scientist but not as a PI; for a trainee intention to pursue that career path, the only variable that was a significant predictor was a trainee's primary language (adj.  $R^2 = 1.9$ ).

### **A08: Understanding the Relationship between Mentor Beliefs and Perceptions and Mentoring Trainees in Scientific Communication Skill (SCS) Development**

*S. Chang, H.Y. Lee, C. B. Anderson, and C. D. Baldwin—all of The University of Texas MD Anderson Cancer Center*

Purpose/Methods: Encouraging reports show that mentoring can improve with training. However, little is known about how the beliefs of mentors predict their efforts to strengthen trainee SCS. Our purpose was to understand motivations for mentoring in SCS, we hypothesized that mentors who feel more strongly that mentors have a responsibility for training in SCS are likely to 1) help strengthen their trainees' SCS more often, 2) perceive fewer barriers to SCS mentoring, 3) believe that the benefits of mentoring outweigh the costs, and 4) believe that many trainees in their field

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lack sufficient skill in SC. We surveyed faculty mentors of biomedical doctoral and postdoctoral trainees, and used latent class analysis to group 159 individuals, based on seven indicators: perception of widespread weakness in SCS of trainees in one's field (1 item); belief in the responsibility of the mentor to provide training in SCS (1 item); beliefs in costs and benefits of mentoring (14 items for 2 indicators); and perceptions of barriers to mentoring in SCS, including barriers of trainees (15 items), self (14 items), and environment (6 items). We compared the demographic composition of classes, and mentoring practices categorized as writing (8 items), speaking (5 items), presenting (4 items) and general (17 items). Item responses used a 5-point Likert scale (1=strongly agree, 5=strongly disagree).

Results: We identified three classes of mentors, all of whom strongly felt that the responsibility of teaching SCS belonged to mentors and that the benefits to mentoring were many. Highly Motivated Mentors (HMMs, 8%) tended to perceive fewer barriers to mentoring in SCS, lower costs of mentoring, and a higher prevalence of weak skills among trainees in their field. Fairly Motivated Mentors (FMMs, 53%), compared to the HMMs, reported higher SCS mentoring barriers and similar costs of mentoring, but perceived a lower prevalence of weak skills among trainees in their field. Motivated Mentors (MMs, 39%), compared to others, perceived the highest barriers to SCS mentoring, and reported that the costs of mentoring were higher and almost equaled benefits. Like the FMM group, the MMs also reported perceiving a lower prevalence of weak skills among trainees in the field. Mentor class membership did not differ by academic rank, primary language, discipline, type of advanced degree, experience mentoring minority trainees, or formal training in SCS mentoring. Women were 1/3 of the HMM and FMM groups and 1/2 of the MM group.

Compared by mentoring practices, HMMs performed general behaviors more often than FMMs ( $p=0.075$ ) and MMs ( $p=0.003$ ), including helping trainees increase productivity and plan careers. HMMs also provided more support in writing than MMs ( $p=0.075$ ), including providing access to editors, and giving constructive critiques. However, HMMs reported spending less time than FMMs and MMs helping trainees prepare first-authored, first submission research manuscripts; MMs spent the most time ( $p=0.008$ ). HMMs reported more often having trainees who needed intensive SCS help than FMMs ( $p=0.03$ ) or MMs ( $p<0.001$ ). In our preliminary work, beliefs about mentoring distinguish three types of mentors who engage in SCS mentoring at different levels, suggesting that beliefs may influence mentor behaviors in predictable ways. Knowing more about how perceptions of mentors influence their behaviors may help increase the efficacy of mentoring interventions.

#### **A09: The Tuskegee Alliance to Forge Pathways to Academic Careers in STEM (T-PAC)**

*Shaik Jeelani and Mohammed A. Qazi—both of Tuskegee University; Melody Russell, Jared Russell, Martha Escobar, Michelle Vaughn and Robert Alex Sauer—all of Auburn University; and B. K. Robertson—Alabama State University*

The Tuskegee Alliance to Forge Pathways to Academic Careers in STEM (T-PAC) 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). T-PAC recruits 18 first year URM doctoral students (T-PAC Scholars) at the three Alliance institutions and assists them in their preparation through a promising novel model for STEM doctoral education (URMs or underrepresented minorities include African Americans, Hispanic Americans/Latino, American Indians, Alaska Natives, Native Hawaiians and other Pacific Islanders – racial and ethnic minorities that are underrepresented in STEM). The novelty of the T-PAC model lies in the joint mentorship that is provided by engaging Scholars in interventions that are characterized by their virtual nature. These strategic interventions have the potential to eliminate barriers and promote positive practices for URMs to successfully progress and transition through the various critical phases of

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their doctoral programs of study, such as completion of graduate course work, preparation for qualifying examinations, carrying-out research, and writing a publishable thesis. Readiness for STEM Professorial careers is advocated and emphasized throughout the T-PAC model.

Our poster will describe the efforts of the T-PAC Alliance to develop, implement, study and evaluate the proposed model for STEM doctoral education. A strong emphasis in our description will be placed on the study of the model and understanding its interventions using qualitative and quantitative techniques from educational research and the social sciences. This longitudinal study is guided by a research agenda that addresses several strategically formulated research questions. Results to-date will be summarized.

The T-PAC Alliance is funded by a grant of the National Science Foundation's (NSF) Alliances for Graduate Education and the Professoriate Program – Transformation (AGEP-T), effective September 1, 2014. Only eight (8) AGEP-T Alliances are currently operating. T-PAC is the only one led by an HBCU. These facts attest to the strong outcomes potential of the T-PAC Alliance in doctoral degree production among URMs and their transition to research careers.

### ***Evaluation and Program Efficacy: Lessons from the Literature***

#### **B01: A Developmental Rubric for Assessing Short Term Student Progress in an International Summer Research Program**

*Fernando Nieto and Duncan A. Quarless—both of SUNY Old Westbury*

A new student performance assessment plan was implemented for students participating in the Old Westbury Neuroscience International Program (OWNIP), based on a developmental rubric. The assessment is linked to an online hybrid mentoring model that complements the on site research mentoring by OWNIP foreign collaborators. The rubric includes three basic criteria, content knowledge, quantitative reasoning and multiple representations and five achievement levels. Each achievement level reflects the development of a student from its freshman year (level 1 to 1.5) to the senior level (level 3), master's level (level 4) and PhD (level 5). By in large students entering the OWNIP are rising seniors and graduating seniors. It is assumed they are able to perform at levels 2.5 to 3. The goal of the program is to document movement to level 3 to 3.5. These three criteria were applied to the scoring of three assessment instruments: an annotated bibliography, including ten research articles related to the topic of their research, a research report, including three drafts and a final, and an oral presentation. Students could access the scoring rubric prior to the online submission of the assignment. Based on the first draft of the research report students entered the program on average at a level  $2.0 \pm 0.22$ . At the end of the summer students achieved on average a  $3.42 \pm 0.25$  level in the final research report. Their performance on the annotated bibliography was significantly lower than expected at the entry level,  $1.75 \pm 0.18$  while achieving a level  $2.75 \pm 0.45$  by the end of the summer. This data supports the use of a hybrid online model together with a well-prescribed developmental rubric for the assessment of student progress in a short-term international research experience. It also validates this approach for the purpose of program assessment of short-term objectives.

This program is funded through a Minority Health Disparities International Research Training (MHIRT) grant#T37MD001429.

#### **B02: The Beyond Traditional Borders Program at Rice University: Assessment of a Global Health Education Program**

*Sandra Bishnoi, Veronica Leautaud, Maria Oden, and Rebecca Richards-Kortum—all of Rice University*

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The primary objective of the 2006 HHMI grant to Rice University was to develop, implement and expand Beyond Traditional Borders (BTB), a multidisciplinary education program in global health technologies at Rice University. BTB trains students from all majors to reach across geographic and disciplinary boundaries to design and implement solutions to global health challenges with the goal of creating a new globally minded generation of leaders in science education, and engineering. BTB also aims to take advantage of problem based learning (PBL) to engage students in Science, Technology, Engineering and Math (STEM) disciplines and majors, while ensuring the creation of global citizens, aware of global health issues, empowered to apply technology solutions, capable of communicating effectively and conducting advocacy for these global health issues. These open ended- client based projects provide students with real life opportunities to engage in research, which has been demonstrated to improve persistence in STEM, especially in women. BTB is a diverse program, attracting a significant fraction of women and underrepresented minority students (URM). Between 2006 and 2013, 689 students have participated in BTB courses and program activities, with 13% of these corresponding to URMs. Compared to the general student population, BTB attracted a significantly higher proportion of women; up to 64% of students participating in program activities between 2006 and 2013 were female students, in contrast to the 48% enrolled at Rice in the year 2008. As part of our year 3 report for the HHMI EXROP 2010 grant, we conducted an online survey among Rice students participated in BTB design-based courses since 2006. The survey was sent out to 435 students, and 180 responses were collected from July 2013 to September 2013. We assessed the composition of the program, as well as the gains reported by students using the Classroom Undergraduate Research Experience (CURE) inventory. We also assessed the effect of BTB on student perceptions and attitudes towards global health, and career outcomes, specially the intention of pursuing Global Health Careers. The results of our survey have shown that the creation of a program that places open ended design projects within a well-defined societal context, in our case Global Health, can provide significant and unique growth opportunities for students that go beyond what is traditionally taught in a classroom, specifically leadership, teamwork, and creative problem solving skills. The students valued the feedback between classroom theory and mentorship to field testing a product to meet the demands of a resource challenged area and then seeing the product implemented. Moving from an “open-ended” problem to an actual deliverable provided significant motivation to the students, despite the fact that they had to put a considerable amount of time into the projects compared to a traditional course. The skills developed in the BTB program were clearly transferrable into any career chosen by the students; however, the experience of working in Global Health was rewarding enough to inspire a large percentage of participants on focusing their future careers on Global Health. Our results are consistent with the issues addressed in social cognitive career theory that the combination of self-efficacy, outcome expectations, interests, and social supports help determine a student’s major career choices.

### ***Intersection of Non Profit Organizations and Interventions***

#### **C01: The Society of STEM Women of Color, Inc.: An Intersectionality Theory Approach to Broadening Participation**

*Kelly Mack, Claudia Rankins, Patrice McDermott, Orlando Taylor, and Falcon Rankins— all of Society of STEM Women of Color, Inc.*

If the U.S. is to remain a competitive leader in science and engineering, radically different approaches to maximizing the potential of its domestic talent pool are imperative. However, women of color (Black, Hispanic, American Indian) – who now represent one of the fastest growing

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undergraduate populations in US higher education as well as a significant part of what is expected to become the largest percentage of our populace by the year 2042 – remain a largely untapped resource. Further, the underrepresentation of undergraduate minority women in STEM is not expected to change significantly without a critical mass of same-race/same-gender faculty role models who are believed to provide one of the greatest influences and determinants of success in STEM disciplines.

However, STEM women faculty of color are too few in number to comprise a critical mass, and, more importantly, institutional professional development efforts aimed at retaining diverse faculty continue to overlook the role of intersectionality in STEM career advancement, fail to inextricably link intersectional approaches with strategic planning for diversity, and are devoid of the elements of self-efficacy needed to sustain long-term change and coping ability.

To that end, the Society of STEM Women of Color (SSWOC), Inc., a non-profit 501(c)(3) organization, founded in 2014, relies upon a comprehensive approach to professional development that empowers STEM women of color for career actualization, contributes to the research base and national discourse on the role of intersectionality in the academy, and harnesses a centralized body of knowledge and best practices that will support institutions of higher education in expanding their capacities to recruit, retain and advance a diverse STEM faculty.

A major activity of SSWOC, which represents the largest network of women of color from all academic STEM disciplines, is its annual STEM Women of Color Conclave. The Conclave brings together nearly 200 women and men faculty and administrators of diverse backgrounds, professorial ranks, and institution types – with increasing attention to Latinas and American Indian women in STEM. The intensive 2-day professional development meetings are grounded in intersectionality and self-efficacy theories that support and accelerate transition through the various stages of career identity, while also catalyzing self-efficacy for achieving career and leadership actualization.

This presentation will highlight preliminary data, which suggest that Conclave participation, as well as other intersectionality theory driven models of STEM faculty development, may have an impact on scholarly productivity.

## **C02: Using National Survey Data to Assess Interventions**

*Ama Nyame-Mensah, Heather Wright, and Jane Stout—all of Computing Research Association*

Comparative evaluation is used in social science research to explore how an intervention affects participants compared to non-participants. In recent years, this analytic technique has become a preferred method for evaluating computing, science, engineering, technology, and mathematics (C-STEM) intervention programs because it allows for a quasi-experimental design. The Computing Research Association's Center for Evaluating the Research Pipeline (CERP) utilizes comparative evaluation in order to assess the effectiveness of intervention programs aimed at increasing diversity and persistence in computing-related fields. To do so, CERP disseminates surveys to a national sample of computer science students enrolled at institutions across the United States. CERP's surveys measure (a) students' participation in intervention programs; (b) correlates of success and persistence in computing (e.g., sense of belonging; self-efficacy); (c) academic and career intentions (e.g., intentions/aspirations to pursue a PhD in computing); and (d) actual persistence in computing.

Importantly, CERP's data are culled from very large samples of computing students each year, and these datasets contain diverse demographic information, including socioeconomic variables, that serve as covariates during program assessment. Further, CERP's data contain indices of participants' and non-participants' achievement and motivation such as reported GPA and involvement in external research activities. In order to conduct rigorous comparative evaluation, CERP analysts statistically control for background variables that could explain students' tendency

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to participate in intervention programs and obtain academic success. In this way, CERP's assessment measures the impact of intervention programs on participants' versus non-participants' outcomes over and above other predictors of student success and persistence in computing.

One research question that CERP addresses using comparative evaluation techniques concerns the beneficial nature of research experiences for undergraduates (REU) on computing students' preparation and aspirations for graduate school. Specifically, CERP is currently evaluating whether computing REUs are similarly effective for underrepresented (all racial/ethnic minorities and women) and well-represented (White and Asian Males) students pursuing computing degrees. This poster will highlight CERP's comparative evaluation model using its research evaluating REU programs.

### ***How Practice Informs Research***

#### **D01: Effective Low Cost Recruitment Strategies That Attract Underrepresented Minorities to Summer Research Programs**

*Cherilynn R. Shadding, Dawayne Whittington, Latricia E. Wallace, Sylvia Wandu, and Richard K. Wilson—all of The Genome Institute at Washington University in St. Louis*

The paucity of underrepresented minorities (URM) earning STEM degrees remains an issue in revitalizing the U.S. biomedical workforce. Due to reductions in federal funding, maintaining the integrity of programs that focus on URM retention and recruitment is crucial. We present data on cost-effective mechanisms used to recruit students to an undergraduate summer research program, Opportunities in Genomics Research. Our data show that these mechanisms (e.g. email, events, referrals, website) were equally effective in attracting applicants to the program. However there were gender, race and institutional differences in who were attracted to the program. We further classified recruitment mechanisms relative to their cost to implement. Our results indicate that lower cost mechanisms were equally successful in recruiting students to our summer program who persisted to Ph.D. programs as well as other STEM professional degree programs (M.D., D.D.S). Results from a binary logistic regression showed that the relative cost of recruitment mechanisms was one of five variables distinguishing Ph.D. and non-Ph.D. pursuants in our sample. Additional data is needed to determine the level of contribution of the relative cost variable. Collectively, these data demonstrate for the first time that lower cost mechanisms are successful in recruiting URM to summer programs that eventually pursue Ph.D.'s in STEM fields.

#### **D02: Together We Stand, Divided We Fall: The Meyerhoff Scholars Program Community**

*TaShara C. Bailey, Mario Sto. Domingo, and Kenneth I. Maton—all of University of Maryland, Baltimore County*

There are growing numbers of pre-K to career pipeline interventions that are designed to improve college readiness among underrepresented students and better prepare them for advanced degrees and STEM careers (Carreathers, Beekmann, Coatie, & Nelson, 1996; Landis, 1985; Maton, Hrabowski, & Schmitt, 2000; Shay, 2000; Thomas, 1985, 1992). Although there are many promising models, it is becoming increasingly clear that we must move beyond single-component strategies (only financial aid, academic skills development, higher education promotion, career development, expert mentoring, or personal development) toward more comprehensive and multi-component interventions (Bowman & St. John, 2011; Trent & St. John, 2008; Hrabowski, Maton, & Greif, 1998; Hrabowski, Maton, Greene, & Greif, 2002).

Several descriptive and evaluation studies suggest that strong pipeline interventions

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contain multiple components and are formally structured or organized to be comprehensive. Specifically, there are three main categories of strong interventions: philanthropic (e.g., Meyerhoff Scholars Program, Gates Millennium Scholars Program), federal/governmental (e.g., National Science Foundation – Louis Stokes Alliances for Minority Participation), and consortia (e.g., Committee on Institutional Cooperation – Summer Research Opportunity Program).

The Meyerhoff Scholarship Program (MYSP), a formally structured comprehensive and multi-component social organizational system, at the University of Maryland, Baltimore County (UMBC) is recognized as a model for promoting underrepresented students' success in pursuing a PhD in science, technology, engineering, and mathematics (STEM) fields of study. The MYSP is organized around thirteen core components: financial aid, summer bridge, program values, advising/counseling, on-campus & summer research internships, faculty involvement, recruitment, study groups, program community, promotion of tutoring, administrative involvement/support, mentors, and family involvement/open communication with families. The proposed study builds on a strength-based approach with strong values and beliefs of positive organizational practices of program community to investigate participants' perspectives on how the Meyerhoff Scholars Program creates community during summer bridge (Kloos, Hill, Thomas, Wandersman, Elias, & Dalton, 2012; Oguntebi, Shcherbakova, & Wooten, 2012, Seligman & Csikszentmihalyi, 2000).

This theory-driven case study will employ responses to survey questionnaires from MYSP summer bridge participants in 2013 and 2014 and will utilize interview data from key personnel. Guided by the program theory of the MYSP model, the specific aim is to provide theory-driven insight into how the MYSP creates community during summer bridge. Findings from this study can further inform the refinement of best practices within the MYSP and the development of new strategies in fostering program community to promote students' success in STEM to further diversify the professional and research workforce.

### **D03: The Impact of Mentor Training on Researchers' Conception of Diversity**

*Kim Spencer, Stephanie House, and Christine Pfund—all of University of Wisconsin-Madison*

In 2010-11, we conducted randomized controlled trial (RCT) across 16 academic health centers to test the effectiveness of a research mentor training curriculum adapted for clinical and translational researchers. As part of the assessment, structured post intervention interviews were conducted with 283 mentor/mentee pairs. Specifically, mentors were asked if they changed their behavior in each of the six mentoring competencies addressed in the training: 1) maintaining effective communication, aligning expectations, assessing understanding, addressing diversity, fostering independence, and promoting professional development. We used content analysis to assess overall behavioral changes, and found that 97% of mentors changed their mentoring behavior as a result of participating in mentor training.

We have since undertaken further investigation of the self-reported behavioral changes. Specifically we have analyzed the post-training data to determine the impact of training on these clinical and translational research mentors' conception of diversity and their behavior. Content analysis was used to code the interview responses of trained mentors into the following categories: no change, awareness, intent to change, or implemented change. Sixty one percent (N=84) of mentors reported some level of change, with 20% (N=17) describing specific ways of implementing changes to their behavior around concepts of diversity. We will present our findings, including analyses that examine the nature of these changes and what common elements present across the 16 academic health centers.

### **D04: Bridging the Divide, Program to Broaden Participation in STEM Ph.d.: Success and Challenges**

To sustain our global leadership in discovery and innovation for knowledge based economic growth, bold initiatives to significantly increase capacity in STEM fields are crucial. A challenge for Arkansas is that it is relatively less populated (ranks 33) yet its minority population is increasing thus identifying the section of Arkansas population that needs to be encouraged and supported for increasing the talent pool in STEM. Underrepresentation of minorities, women, first generation students from rural areas, persons with disabilities and veterans (underrepresented groups, URG) in STEM fields is a major challenge facing Arkansas workforce. Research shows that a new recruitment strategy (holistic review of applications for admission) along with sustained support, training and wrap-around mentoring are essential for the academic success of URG students. Therefore, following the proven successful Fisk-Vanderbilt (FV) bridge program and modifying it to suit the needs of Arkansas, a nurturing and wrap-around mentoring program to expose undergraduates to research that will inspire them to join masters programs which will serve as a bridge to the doctoral programs is being implemented with funding support from NSF and resources from the three participating institutions, Arkansas State University-Jonesboro (A-State) and the two HBCUs in Arkansas, the University of Arkansas at Pine Bluff (UAPB) and Philander Smith College (PSC) in Little Rock.

In the first year of this program, we recruited seven undergraduate URG students to perform nine weeks of research along with professional development training at A-State during summer. The program also recruited one student to the master's program in environmental sciences at A-State with two additional applications, one for master's and one for Ph.D. program currently being reviewed for admission. The interactions among faculty in the three institutions have resulted in research collaborations that will help students in the three campuses to work together in research projects. Evaluation of our performance in the first year has provided valuable inputs. All the students who participated in the summer research unanimously evaluated their research experience as very valuable and expressed their decision to pursue graduate education. They also expressed a desire to have more opportunities for social interactions. While the program does face challenges such as distance between the three institutions, different levels of research infrastructure available in each institution and the faculty in all the three institutions having a heavy teaching load, the positive experiences of the undergraduate students and the small, yet positive increase in the admission of URG students in A-State in the first year of implementing this program have been very encouraging.

These results indicate that by adopting and modifying the FV bridge program, even in small universities and colleges (where most of the URG students opt to study) with limited resources it will be possible to significantly increase URG Ph.D.s in STEM through collaborative efforts, dedication, passion, learning, evaluating, responding and adapting. Knowledge gained from this project can help several other smaller and rural institutions to successfully implement measures to bridge the divide nationally towards developing innovators and scientists of the future from diverse backgrounds.

### ***Training STEM Undergraduates: Lessons for Minority Serving Institutions***

#### **E01: Increasing Recruitment and Persistence of Underrepresented Minorities in STEM Career Pathways**

*Calvin Briggs and Bruce Crawford—both of Lawson State Community College*

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Lawson State Community College currently has two grants designed to create pathways into professional careers in science, technology, engineering, and mathematics (STEM) through awareness activities, field experiences, teaching and learning through problem-based learning concepts, and the establishment of a college bridge program at Lawson State Community College (LSCC). The 2-Pi STEM Program and Georgia-Alabama Louis Stokes Alliance for Minority Participation (GA-AL LSAMP) at Lawson State has given students, teachers, and educational partners the opportunities to capitalize on their roles in the development of STEM career pathways. Additionally, faculty involvement in the partnership has increased their academic, technical performance, and knowledge of STEM careers. The projects have spanned more than eight-years with funding from the National Science Foundation, Association of Public Land-Grants, Lawson State Community College, educational partners, and business/industry. The three primary goals, identified to increase student recruitment and persistence in STEM career pathways was the establishment of 1) a mentoring program to address cross-curricular mentoring and learning communities for STEM students with an emphasis on improving STEM persistence and efficacy in STEM courses; 2) provide STEM enrichment and academic enhancement programs for high school and undergraduate students; 3) the establishment of the STEM Bridge Pathways to College Project.

### **E02: Increasing Retention and STEM Persistence at an HBCU**

*Christen Priddie, Mark Harris, John Fife, Cheryl Talley, Oliver Hill, and Katherine Palmer—all of Virginia State University*

Within the United States, minorities are less likely to graduate in 4 years, earn overall lower GPAs, and are less likely to earn a degree in a STEM discipline (National Center for Science and Engineering Statistics, 2013). In this present study, we describe an intervention called Project Knowledge designed to translate positive beliefs into an academic behavior change for college freshmen attending a minority serving institution. The intervention is based on Phenomenological Variant Ecological Systems Theory (PVEST), which is a conceptual framework that includes reference to the unique sociological context in which minority children are educated and, with the current study, is aimed at increasing resilience in African American students. Thirty-seven incoming freshmen honors and non-honors STEM majors at a small urban HBCU were required to attend a one week intensive intervention called “Transition to College” or T2C. This part of the intervention took place one week before the start of the semester, and participants lived on campus during this time. T2C consisted of activities aimed at creating communalism among the participants, building an academic identity, and was the motivation for habit formation. Additionally, participants were matched with a mentor that shared the same or similar major and all activities during T2C were centered around mentor groups. After T2C, participants were required to meet weekly for one hour for 10 weeks during their first two semesters at the university. These weekly meetings featured check-ins between mentors and mentees, reiteration and expansion on the academic skills introduced during T2C, and focus on building self-efficacy and motivation to succeed while building habits that could be maintained through matriculation. The intervention placed more emphasis on affective factors and less on remediation. Results indicated that the intervention increased the retention of African American student participants by 12% when compared to the general population of the university. Results also revealed that participants were less likely to switch majors (stem to non-stem) than members of the general population and had an average GPA of 2.78 for the first three semesters. These findings were consistent with our hypothesis that an intervention that focused on emotional development and agentic behavior would result in changes in academic habits.

### **E03: First Semester Performance of STEM Students in a College Transition Program**

*Edward Mosteig—Loyola Marymount University*

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The College of Science and Engineering at Loyola Marymount University (LMU) initiated a program—A Community Committed to Excellence in Scientific Scholarship (ACCESS)—in 2009 to promote retention and success among first-generation and under-represented students in STEM fields. ACCESS is a learning community for 18 students of different majors in engineering and the sciences, which places particular emphasis on the first year experience. Similar models of an academic support network have been implemented in numerous settings, and have proven to be successful in increasing retention and promoting academic excellence among populations of first-generation and under-represented students.

ACCESS provides an opportunity for incoming first-year students to participate in a one-month summer residential program that immerses scholars in a collaborative environment that focuses on academics and critical thinking in the sciences. During their first academic year, students enroll in a First Year Seminar that builds on their summer academic experience and deepens their connections with one another, and helps them expand their knowledge of—and inclination to take advantage of—a broad set of resources on campus. It appears likely that the program has had a positive impact on students' academic performance during the first semester of college.

Students in the program have higher GPAs than their peers in their first semester, either when measured against (i) students from the same demographic or (ii) students from the college overall. ACCESS scholars also show an increase during the summer of (i) a sense of belonging, (ii) confidence in math and science, and (iii) pro-social skills in scientific scholarship, all of which can contribute to student success. At the midpoint of each semester, faculty at LMU report grades for those students whose performance falls below a satisfactory level. Although the proportion of ACCESS scholars with midterm deficiencies in their first semester of college is comparable to the remainder of the other first-year students, a significantly greater proportion of the ACCESS scholars were able to convert their deficiencies into passing grades by the end of the semester.

#### **E04: The University of Texas-Pan American RISE Program: The Success and Challenges of Implementing a New Program to Diversify the Scientific Workforce**

*Stephanie Segura, William Donner, and Robert K. Dearth—all of University of Texas-Pan American*

The University of Texas-Pan American (UTPA) is a Hispanic serving institution located in area of southern Texas known as the Rio Grande Valley (RGV). Situated 10 miles from the U.S.-Mexico border, the institution is in one of the fastest growing (93% Hispanic) metropolitan areas in the nation. UTPA ranks 5th among universities in the number of Hispanics enrolled and undergraduate/graduate degrees (Masters) awarded to Hispanics. Despite the growing number of UTPA graduates each year, those that have pursued and obtained a Ph.D. in behavioral or biomedical sciences is alarmingly low. Therefore, in 2012, UTPA established a NIGMS supported Research Initiative for Scientific Enhancement (RISE) Undergraduate Training Program (or UTPA RISE Program). The overarching goal: to increase the number of UTPA students that graduate, pursue PhD degrees and complete them. Briefly, the UTPA RISE program recruits 6 undergraduates each year to conduct laboratory research and participate in a series of career development activities and workshops (available for all students) that prepares them for graduate school. The data presented represents independent surveys conducted over the first 3 years of the program. This is a summation of our foundational assessment of program success based on: graduate school acceptance; student perceptions; participant's scholarly achievements (papers, presentations, academic success,); impact of external research experiences, and new institutional activities and workshops (data review, seminars, career day; work life balance; how to apply to graduate school). Included are identified challenges in successfully recruiting and engaging a naive student population. Furthermore, we established baseline community and institutional data in order to determine awareness of research endeavors at UTPA; interest in and understanding of a graduate

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education; and the effectiveness of the RISE program as it develops in coming years. While still in its infancy, the UTPA RISE program has had a tremendous impact on the students in the program as well as the institution. It has paved the way to the development of new courses and more students pursuing graduate degrees. Overall, the impact of this program and the foundational activities will increase the number of undergraduate and master students that engage in science at UTPA and as a long-term goal the participants will pursue independent careers in research diversifying the scientific workforce.

### **E05: Confirming Reliability and Validity of a Self-Regulated Learning Measure for African American Students in STEM**

*Ontario S. Wooden, Caesar Jackson, Sherry Eaton, and Vinson J. Goldman—all of North Carolina Central University*

*Introduction.* One continuing challenge for STEM education at North Carolina Central University (NCCU) is that many of the students entering the university come from academic backgrounds with less effective preparation for college STEM course taking. In particular, NCCU serves a range of students who score significantly less than the middle 50 percent of all college-bound seniors in North Carolina and the nation. Research indicates that self-regulated learning may be a key enabler of student academic success and has also shown that self-regulation for learning can be taught and can enhance academic achievement and a sense of self-confidence or efficacy. However, little is known about self-regulated learning in an HBCU (historically black colleges and universities) context. Therefore, the purpose of this project is to investigate the effect of self-regulated learning training and development on student success in STEM at NCCU. The Motivated Strategies for Learning Questionnaire (MSLQ) will be used to assess self-regulated learning (SRL) strategies. However, the MSLQ was developed on a student population whose demographic characteristics are substantially different than the student population at NCCU—an HBCU. The MSLQ was developed in 1988 on a sample of 354 Midwestern college students attending a public, four-year university and 24 students attending a community college (N=378). The sample was 50.5% female, 26.3% male, and 23.3% missing; 66.3% Caucasian, 3.7% African-American, 1.1% Hispanic-Spanish speaking, 2.4% other, and 24.2% missing. Eighty-nine (89) of the students completing the MSLQ at this stage were not given the demographics sheet to report data such as race and gender. The NCCU student population demographics are 67% female and 33% male; 78% African-American, 12% White, 1.8% Latino/Hispanic, 1.2% Asian, and 0.007% International. Although numerous studies have been conducted utilizing the MSLQ, there have not been any to date with a study population consistent with that at NCCU. Therefore, prior to conducting research on SRL in STEM education at NCCU, we conducted a preliminary study to establish the psychometric properties of the MSLQ for our study population (STEM students who attend NCCU) to establish the reliability and validity which would result from use of the MSLQ instrument.

*Measures.* The MSLQ is a self-report measure composed of motivation and learning strategies scales (Pintrich, Smith, Garcia, and McKeachie, 1991). There are 81 items making up 15 separate scales on the MSLQ. There are six motivation scales (MS) in which 31 items measure students' goals, value beliefs about the course, their beliefs in their efficiency to succeed in the course and concerns regarding the tests related with the course. There are nine learning strategies scales in which 31 items measure the different cognitive and metacognitive strategies of students and 19 items measure resource management strategies.

*Participants.* Participants for the preliminary study were STEM majors recruited from their STEM courses at North Carolina Central University. The ethnicities of the STEM undergraduate student body are approximately 86% African American, 5% White, 1.5% Asian, 1% Hispanic, 0.5% American Indian, 1% Non Resident Alien, and 4.5% Other. African American females are 53% and

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African American males are 34% of the STEM undergraduate student body.

*Method.* The specific STEM courses that were targeted include MATH 1100 College Algebra and Trigonometry, Math 1410 PreCalculus, Math 2010 Calculus; CHEM 1100 General Chemistry I; PHYS 2110 General Physics I and PHYS 2305 General Physics for Scientist and Engineers I. The courses are selected because they are required in many of the NCCU STEM degree programs and also because many times the rate of DWF grades in these courses exceed 30%. Participation in the preliminary study was voluntary and research personnel administered the survey during class sessions before midterm of Fall Semester 2014. Demographic information and student academic data such as course grades, grade point averages (term and cumulative), and hours earned and attempted will be collected on each participant at the end of the semester.

*Data Analysis.* In an effort to determine the internal reliability and concurrent validity of the MSLQ, Statistical Package for Social Sciences (SPSS) software will be used. Descriptive statistics will also be conducted on the demographic information. The correlation matrix for the MSLQ will be tabulated and the Cronbach's Alpha for each scale will be computed to measure internal consistency and reliability. Confirmatory Factor Analysis will be performed to assess construct validity. Predictive validity will be measured by correlating scale scores on the MSLQ with final grades in the STEM courses. Local norms for the MSLQ will be developed subsequently for the different STEM courses at NCCU.

### **E06: Increasing Underrepresented Students in STEM through an Authentic Research Introductory Biology Laboratory Course**

*Michael S. Gaines, Jane L. Indorf, and David P. Janos—all of University of Miami*

The Howard Hughes Medical Institute-funded introductory biology laboratory course at the University of Miami (UM) was developed to expose students to scientific research during the first year of their undergraduate career. Because UM has an underrepresented student enrollment of 50%, the lab has the potential to diversify the students seeking research careers. Instead of the traditional 'cookbook' style labs in which there is an expected outcome, students perform their own inquiry-based group research project led by a multi-generational team consisting of a research faculty mentor, graduate student, and advanced undergraduate peer facilitator. The research projects are based on the faculty mentor's research, but allow students to investigate their own hypotheses and design their own experiments. This creates a sense of ownership over their research and connects each student on a personal level with the process of real scientific inquiry. Student research projects have focused on topics such as population genetics, symbiosis, gene expression, and behavioral ecology.

Based on 10 years of data, we have found that students who take these labs are twice as likely to have subsequent individual research experiences as students with matched SAT scores who take the traditional introductory biology labs. Each semester we use David Lopatto's Classroom Undergraduate Research Experience (CURE) survey to evaluate UM's authentic research biology labs. Students who take this laboratory course make larger gains in research-related skills compared to all other students surveyed. Both formative and summative data show that these labs are highly successful in increasing student engagement in STEM. With this success, we have now expanded these labs to include more students and integrated the course with chemistry, so that students are exposed to the interdisciplinary nature of scientific research. Additionally, we are implementing this course at Miami Dade College to provide underrepresented and economically disadvantaged students with these early authentic research experiences that increase their persistence in STEM.

### **E07: I-CUBED, RISE and BUILD Programs at Xavier University of Louisiana**

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*Maryam Foroozesh, Loren J. Blanchard, Gene A. D'Amour, and Tiera S. Coston—all of Xavier University of Louisiana*

Xavier University of Louisiana is a historically Black and Catholic university that is nationally recognized for its science, technology, engineering, and mathematics (STEM) curricula. During the past decade, Xavier has ranked first nationally in the number of African Americans earning undergraduate degrees in biology, chemistry, physics, and the physical sciences. Seventy percent of Xavier's undergraduates major in the sciences, and Xavier is a national leader in the number of STEM majors who go on to receive M.D.s and Ph.D.s in science and engineering. Despite Xavier's advances in this area, African Americans still earn less than 10% of bachelor's degrees, less than 7% of master's degrees, and less than 3% of doctoral degrees conferred in STEM disciplines in the nation. Additionally, although many highly motivated students are attracted by Xavier's reputation in the sciences, most of these students, though bright and capable, receive inadequate preparation at the secondary school level in science and mathematics and so are academically underprepared to succeed in STEM majors. The NSF-funded Innovation through Institutional Integration (I-CUBED), the NIH-funded Research Initiative for Scientific Enhancement (RISE), and the NIH-funded Building Infrastructure Leading to Diversity (BUILD) Programs are designed to address this underpreparedness in Xavier's STEM student population, and provide support for students' engagement and persistence in STEM disciplines from freshman through senior years. These Programs work collaboratively to support initiatives that revamp freshman- through senior-level STEM courses, prepare students for research careers through specialized courses and workshops, and provide pedagogical support and mentor training to faculty. The Programs support and integrate the activities of various offices and STEM initiatives in an attempt to address those factors that hinder the success of underrepresented minority students in STEM majors. The course improvement/development projects supported by the I-CUBED Program are focused on freshman-level STEM courses. The modifications serve a variety of purposes, including addition of new knowledge, enhancement of critical thinking, scientific reasoning and computer literacy skills, and the inclusion of real-world applications. The curriculum improvement projects supported by the RISE Program are focused on sophomore-level STEM courses and have very similar goals to the I-CUBED Program. The BUILD Program, which is the newest and most comprehensive program in this group, involves junior- and senior-level course development/modification designed to give students the knowledge, skills and mindset they need to become successful biomedical researchers. This program also provides needed resources to faculty, including support to improve faculty skills in teaching, advising, and mentoring undergraduate students, particularly minorities, as they move along the biomedical research pathway. Notably, the I-CUBED, RISE and BUILD Programs continue to promote and increase the effective integration of Xavier's various STEM initiatives, as well as intra- and inter-departmental communication and collaboration.

### **E08: A Student-centered Entrepreneurship Development Training Model to Increase Diversity in the Health Research Workforce**

*Cleo Hughes-Darden, Jocelyn Turner-Musa, Farin Kamangar, Gillian Silver, Payam Sheikhattari, Christine Hohmann, Michael Koban, Gloria Hoffman, Ian Lindong, and R. Trent Haines—all of Morgan State University*

Strategies used to date to increase the number of individuals from underrepresented minority (URM) groups who receive doctorates in biomedical sciences have had limited success, and the proportion of URMs in health research is not commensurate with their proportions in the population. Moreover, once URM individuals graduate with a PhD, they continue to be underrepresented in and underfunded compared to the overall research workforce.

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We are implementing an innovative method to address this problem: a student-centered entrepreneurship development model (rather than an apprenticeship model) to motivate and train 220 undergraduates (over 5 years) in health research. In this model, students will take ownership of their research from the start by proposing and selecting their topic, developing the methods, writing small grant proposals, and generally advancing the project, all in consultation with faculty mentors.

Coursework, co-curricular activities and training modules will help students understand the biological, psychological, and social antecedents of health problems, as well as research methods designed to understand the etiology, prevention and treatment of these problems as they engage in practical research experiences. Throughout, students will be encouraged to work in interdisciplinary teams. They also will be provided with several types of research mentors: 1) peer and near-peer mentors; 2) research expert mentors; and 3) research skills training mentors.

As part of the entrepreneurship model, ASCEND Scholars will prepare Individual Development Plans (IDPs). IDPs are a tool to identify academic and career goals, assess the feasibility of obtaining these goals with respect to the individuals' skill-sets, and develop a plan to acquire these skills and competencies to obtain short- and long-term academic and career goals. In addition, it provides opportunities for further communication between the student and mentor.

The overall goal of the ASCEND model is to empower students to exchange ideas, identify and develop their own research topics, be creative, and take ownership of their research. Choosing this training model is supported by substantial research showing that: a) learning occurs more effectively when students are given autonomy and the ability to use their creativity, thus constructing their own knowledge; b) the next generation of biomedical/social behavioral science PhDs must: have the skills to work in interdisciplinary teams; be able to communicate well with others and with the public; and, have the ability of transferring their skills creatively to new areas of inquiry. These skills will help them succeed in both academic and non-academic settings.

In addition to training students directly, this program will promote and support robust intra-university and inter-institutional (pipeline and research partners) relationships, and interdisciplinary collaborations. Faculty will compete for intramural grants to conduct interdisciplinary research pilot projects, and to design interdisciplinary courses. The project will be evaluated to determine how successful it has been in helping students meet the hallmarks of success, and in strengthening institutional capacity for conducting health research.

### **E09: Improving Success in Organic Chemistry**

*Leyte Winfield—Spelman College*

Organic Chemistry is considered to be a gateway and bottleneck course for most STEM majors. Successful completion of the course coincides with a student's ability to master the skills and concepts of the course and demonstrate critical thinking and reasoning. For the past 5 years, mediated learning strategies have been employed to enhance students' cognitive ability and confidence in utilizing chemical concepts. Concept mastery was evaluated using pre- and post-assessments. Results are compared to those of students in sections of the courses utilizing traditional methods for content delivery. Additional data on student learning outcomes and perceptions on learning was collected through surveys and observations. Not only does the information identify those activities that were most beneficial, it also provides a correlation between students' perceived value of the activities to their mastery of content. Preliminary outcomes show increased self- and peer-advocacy and a sustained motivation for science. In addition, this cohort performs modestly better on standardized post-assessments than those in traditional courses. This presentation will provide an overview of the approach and a quantitative summary of learning outcomes and behaviors.

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## **E10: Integrating Undergraduate Minority Students as Effective Climate Change Communicators**

*Samer Dessouky, Hatim Sharif, Joseph Kulhanek, Carmen Fies, and Hongjie Xie—all of University of Texas - San Antonio*

The University of Texas at San Antonio (UTSA), San Antonio College (SAC), and the University of North Dakota (UND) have partnered with NASA to provide underrepresented undergraduates from South Texas climate-related research and education experiences through the Climate Change Communication: Engineering, Environmental science, and Education (C3E3) project. The program aims to develop a robust response to climate change by providing K-16 climate change education; enhance the effectiveness of K-16 education particularly in engineering and other STEM disciplines by use of new instructional technologies; increase the enrollment in engineering programs and the number of engineering degrees awarded by showing engineering's usefulness in relation to the much-discussed contemporary issue of climate change; increase persistence in STEM degrees by providing student research opportunities; and increase the ethnic diversity of those receiving engineering degrees and help ensure an ethnically diverse response to climate change. Students participated in the third summer internship funded by the project. More than 75 students participated in guided research experiences aligned with NASA Science Plan objectives for climate and Earth system science and the educational objectives of the three institutions. The students went through training in modern media technology (webcasts), and in using this technology to communicate the information on climate change to others, especially high school students, culminating in production of webcasts on investigating the aspects of climate change using NASA data

## **E11: Integrating a CSI Style Mass Spectrometry Lab Experiment to Improve Student Learning Outcomes in Organic Chemistry Laboratories**

*Michelle Waddell, Charles Bump, Godson Nwokogu, and Edmund Ndip—all of Hampton University*

The Department of Chemistry at Hampton University has a strong track record of producing graduates who pursue postgraduate studies in a considerable number of STEM disciplines including biochemistry, chemical biology, toxicology, pharmacology, neuroscience and forensics. More than 80% of the graduates from Hampton University are African-Americans with a gender breakdown of 65% women and 35% men. Hampton University produces a substantial number of female graduates in the physical sciences, where women are underrepresented nationally, especially within underrepresented minorities. Improving student learning outcomes in regards to spectroscopy was the incentive to designing a new laboratory experiment for first semester organic chemistry students. Students were introduced to NMR, IR and Mass Spectroscopy towards the end of their first semester organic chemistry lecture course. As part of the second semester organic laboratory course, students were expected to solve the identity of an unknown organic substance utilizing NMR, IR and Mass Spectroscopy. Of the three techniques, Mass Spectroscopy appeared to be the least understood by the students. Consequently, a guided-inquiry laboratory mass spectrometry experiment was developed utilizing a crime scene investigation theme. This new experiment was introduced during the first semester laboratory course. Students prepared samples and analyzed EI/CI and ESI mass spectrums of the unknown samples. The EI/CI mass spectra were obtained from the National Institute of Standards and Technology (NIST) database. ESI mass spectra were generated from student prepared samples submitted to the Chemistry Department's laboratory technician who ran the samples on the Agilent 500-MS LCMS Ion Trap. The laboratory activity was designed to engage student's problem solving skills. As part of the laboratory activity, student were required: (1) to perform a parts per million (ppm) sample dilution, (2) to analyze the

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EI/CI and ESI mass spectra of a sample to identify an unknown and (3) to indicate the origin of location for the unknown compound.

Included in the laboratory activity was a fictional crime scene investigation (CSI) scenario. The scenario states that a forensic chemist working for the FBI crime lab in Richmond VA has been handed several articles of clothing, carpet fibers and cloths collected from a home invasion crime scene. Compounds have been extracted from the various materials and need to be tested to determine their molecular structure. In addition to identifying the unknown organic compound, lab teams were tasked with locating the source of the sample. Based upon their data, lab groups were tasked with determining at which location the unknown chemical was found. The three choices were oil refinery, paint factory or pharmaceutical pilot plant. This presentation will highlight the impact of introducing a mass spectrometry lab experience in a first semester organic chemistry course. Assessments of student learning outcomes were performed during the second semester organic chemistry laboratory course.

### ***The Postdoctoral Experience in Broadening Participation***

#### **F01: Recruiting and Retaining URM STEM Graduate Students**

*Rhonda Fowler—Texas A&M University*

Professoriate- Transformation (AGEP-T) Collaborative Research: Advancing Interdisciplinary STEM Graduate Education in Energy and Sustainability Disciplines program was designed to open multiple paths to the doctorate and professoriate for URM populations by successfully developing and sustaining large-scale, distributed, yet interconnected STEM communities among the diverse Alliance institutions that increase participation, reduce barriers, and promote success of URM doctoral students preparing for careers in the professoriate. The Alliance is led by five institutions granting Ph.D.'s in Science, Technology, Engineering and Mathematics (STEM) that include Texas A&M University, Prairie View A&M University, Texas A&M University-Corpus Christi, Texas A&M University-Kingsville, and West Texas A&M University. The overall goal of the TAMUS AGEP program is to increase the number of students from underrepresented minority (URM) populations working to complete their doctorates in energy and sustainability and/or STEM fields and subsequently transitioning to competitive postdoctoral and/or faculty positions.

Over the course of the project the short-term operationalizable goal is to develop, implement and assess a set of transportable strategies to ultimately increase the number of successful URM STEM faculty by increasing the number of URMs who enter participating doctoral programs, the percentage of URMs completing STEM doctoral degrees, and the number who transition to faculty positions (or to competitive postdoctoral positions), and by reducing their time to doctoral degree. The project's four objectives are detailed below.

Objective 1. Increase the number of underrepresented minorities (URMs) entering STEM doctoral degree programs at TAMUS AGEP institutions.

Objective 2. Reduce the average time to degree for the TAMUS AGEP Alliance URM STEM doctoral students, and increase the percentage of students across the Alliance completing their doctoral degree programs in five years.

Objective 3. Provide the AGEP Alliance students with the preparation necessary to compete for faculty positions and increase the number of URMs transitioning from STEM Ph.D. programs to faculty or competitive postdoctoral positions.

Objective 4. Foster TAMUS research collaborations to support Alliance-wide collaboration with

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undergraduate, master's, and Ph.D. student researchers that will result in an increase in the number URM STEM doctoral research dissertations co-advised by faculty from at least 2 partner institutions.

The poster will include a description of the TAMUS AGEP-T model and will be followed with activities designed for each objective.

**F02: CIC Professorial Advancement Initiative: Challenges and Opportunities to Mentor Under-represented Minority Postdocs Transition into the Professoriate**

*Aman Yadav, Cristina Soto, Mark Smith, Amber Marks, and Kathy Dixon—all of Michigan State University*

Despite making up 28.5% of the total population in the United States, underrepresented minorities possess 9.1% of science and engineering jobs held by college-educated Americans (National Research Council, 2011). The changing demographics in the U.S. also provide compelling motivation to address under representation in the science, technology, engineering and math (STEM) fields. While African Americans, Hispanic Americans, American Indians, Alaskan Natives, and Native Hawaiians comprise 28.5% of our national population, they represent just 9.1% of college-educated Americans in science and engineering occupations (NRC, 2011), hold only 7.9% of STEM faculty positions at universities and four- year colleges (AIR, 2009), and are significantly underrepresented in high-end research. In 2006, only 5.3% of NIH and 6.5% of NSF principal investigators were minorities (NRC, 2011). By 2050, it is projected that the present majority population will be in the minority (Bernstein and Edwards, 2008), which means that the U.S. scientists and engineers needed to maintain the U.S. STEM workforce will have to come from the groups that are currently in the minority. Having a critical mass of minority faculty in a discipline positively impacts URM enrollment. URM faculty serve as role models to minority students, which helps them persist in completing their degree programs (Jayakumar et al., 2009). If a minority student sees others of their cultural background in successful positions, it signals that they too can be successful (Plata, 1996; Hagedorn et al., 2007). The goal of our current work is to create and cultivate a mentoring-based professorial advancement initiative for underrepresented minority postdocs at CIC (Committee on Institutional Cooperation) institutions, with the mission of training a new generation of exceptionally well-prepared scholars to populate the CIC faculty ranks.

The first step in this direction is to better understand challenges underrepresented minority (URM) students face in STEM fields as they transition into the professoriate. We interviewed URM postdoctoral students to better understand their experiences in STEM fields. Qualitative analysis of 19 initial participant interviews revealed URM postdocs face a number of challenges in STEM fields including, feeling disconnected from the field, feeling different, juggling different priorities, and difficulty of balancing work and family obligations. URM postdocs also discussed that there are challenges to being successful in academia that include difficulty preparing manuscripts, challenges in securing funding, and exhaustion from collaboration. URM postdocs also brought up positive aspects about their experiences in STEM disciplines, such as support received during a postdoctoral position included positive treatment, good feedback, and support from supervisors, collaborators, mentors, and teammates. The proposed poster will present our findings.

**F03: Career Outcomes from a Minority Postdoctoral Cohort - the DiverseScholar Doctoral Directory**

*Alberto I. Roca—DiverseScholar; and Edward Krug—Medical University of South Carolina*

The postdoctoral condition as a poorly designed career training stage is receiving renewed

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attention. The National Academies has released a new report (Postdoctoral Experience Revisited). The discontent among trainees has been picked up by mainstream media (Boston Globe) especially publicizing recent town halls organized by postdocs (Future of Research Symposium). However, the topic of diversity has been missing from these conversations.

Minority postdocs are an underserved community at a vulnerable career stage representing a significant leak in the science-training pipeline. Any minority postdoc who does not secure a professional position after completion of their training represents a tremendous loss in the national investments made in diversity initiatives. Note that the actual talent pool for a STEM Assistant Professor job opening is the postdoctoral population and not the K-16 student cohorts that enjoy the majority of attention from diversity intervention practitioners and scholars.

We report the career outcomes from two databases of diverse postdoctoral trainees -- the MinorityPostdoc.org email listserv (1000+ individuals) and the DiverseScholar CV Doctoral Directory recruiting database (sample size 200+). Only the latter dataset has comprehensive demographic and career outcome results since individuals responded to our surveys. The email listserv began in 2004 and has been updated continuously whenever a postdoc's email account becomes inactive. Through our live and virtual networking over 10 years, we have found some of these postdoc alumni and have recorded their career move after the postdoc. By contrast, the Doctoral Directory has a more interesting career outcomes dataset since individuals reported in a 2012 survey their desired career choice. Now years later, we can compare a survey respondent's career outcome with their intended goal. For example, 35% of Doctoral Directory postdocs had expressed interest in an academic career while 18% wanted an industry job. We will report on the job outcomes from these same respondents. Examples of the current job titles found from both datasets include: Administrator; Analyst; Cartoonist; Consultant; High School Teacher; Lecturer; Manager; Medical Student; ([Adjunct/Visiting] [Assistant/Associate]) Professor; Policy Analyst; (Staff) Scientist.

We will compare our postdoctoral alumni outcomes to those of strategic diversity interventions. Motivated by the goal of diversifying their faculty population, university senior leadership have created institutional postdoctoral fellowship programs funded by the offices of the Chancellor/President or Provost. These postdoctoral fellows serve in roles similar to visiting faculty with the expectation that home departments hire them for full-time tenure-track positions. Similar fellowships are created through external funds such as from the National Science Foundation (NSF). Representative institutional programs include a system-wide campus (University of California), a flagship school's Postdoc Office (University of North Carolina at Chapel Hill), and an NSF-funded fellowship (University of Maryland, Baltimore County). Two of these programs (UC & UNC) have existed for 30 years and so are rich sources of postdoctoral alumni outcomes which, as expected, are mostly placements in tenure-track faculty positions.

### ***Transitions from 2 to 4-year Colleges: Determinants for Success***

#### **G01: A Research Internship Program for Community College Students: A Summative Evaluation**

*Jan Hodder, Jude Apple, Coral Gehrke, Michael Hadfield, and Itchung Cheung—all of Oregon Institute of Marine Biology, University of Oregon*

Community colleges are an important pathway for students intending to complete a baccalaureate degree, particularly for groups underrepresented in science. Students at these institutions have few opportunities to engage in research and even fewer opportunities to explore the ocean sciences. To address this need the NSF funded Center for Ocean Science Education Excellence - Pacific

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Partnerships (COSEE – PP) developed the Promoting Research Investigation in the Marine Environment (PRIME) internship program. PRIME is an innovative, multi-site program that has placed 75 community college interns with 40 scientist mentors for 8-10 week residential research experiences at marine laboratories in Oregon, Washington, and Hawaii. In addition to their research, interns blog about their experience, attend seminars, and participate in activities that show the broad spectrum of research and education that take place at marine labs and associated informal science education institutions. The program culminates with a symposium during which interns give a final formal presentation of their work. COSEE PP also encourages and supports interns to present their research at local, regional, and national conferences.

A summative evaluation employing a mixed-method approach was designed to ascertain how the internships impacted students' marine science-related interest, research skills and the trajectory of students' academic and career paths. Fifty-four percent of the interns completed the summative evaluation survey and 27% of the interns participated in a structured phone interview. Closed items were analyzed using descriptive statistics and repeated-measures ANOVA. Open-ended survey items and interview responses were analyzed using a structural coding method with codes drawn from the evaluation framework which defined essential features of the internships and linked them to identified outcomes. Key findings are: 1) PRIME interns have demonstrated relatively high persistence and success in ocean science and STEM postsecondary education as compared to other CC students who transfer to four-year colleges. 2) PRIME interns reported an increase in their knowledge of ocean science, the scientific process, lab and field work, and communicating about ocean science. 3) PRIME interns reported an increase in interest, aspirations, and confidence related to ocean science and other STEM education and careers. 4) PRIME interns reported that they increased their ocean science and STEM professional networks, including those with research mentors, other ocean scientists, and science students. 5) PRIME students noted the importance of a strong relationship with their mentors who provided key support and inspiration both during and following the internship.

The PRIME students are beginning to enter science or other STEM fields, with five survey respondents in graduate school and thirteen respondents employed full-time in science fields. Interns also reported that PRIME led directly to additional research internships and jobs during their academic career. While the qualitative data provided by the findings supported a causal link between PRIME and student outcomes, the lack of a control group limits the ability to draw definitive conclusions.

## ***Other***

### **H01: Underrepresented Male Students and STEM Intervention Success: Extending the Theory of Planned Behavior**

*James M. Ellis and Dr. Phillip J Bowman—both of University of Michigan*

There are a growing number of pipeline interventions funded by the National Science Foundation, the National Institutes of Health and other stakeholders designed to promote STEM careers for underrepresented students. These P-20 pipeline programs focus on all levels of education, from preschool to graduate school and careers. While STEM interventions continue to have significant success, they have been much less successful for underrepresented male students (URMS), especially African American males. For example, despite gains in postsecondary educational attainment for Black male college students, significant disparities in STEM degree and career attainment remain. Interventions such as the Summer Research Opportunity Program (SROP)

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provide formal programming to support minority students in their post baccalaureate educational and career goals. URMS continue to experience major difficulties in U.S. colleges and universities, especially in STEM fields. Guided by the theory of planned behavior (TPB), this study explores pivotal social-cognitive motivational factors that might explain difficulties experienced by URMS in SROP and other pipeline interventions.

More specifically, this study seeks to explore how URMS differ from others in pipeline intervention settings on pivotal TPB motivational constructs relevant to STEM outcomes – attitudes, subjective norms, perceived behavioral control, perceived control over behavior, and behavioral intentions. Going beyond the TPB, this study also builds on Blocked Opportunity models to better understand how STEM motivation among URMS may be impeded by objective and perceived barriers to opportunity. To extend the TPB, an objective of this study is to understand how social-cognitive constructs, barriers and social support combine to promote STEM success among URMS in SROP.

Data analysis for this poster will come from an NIH-NIGMS supported study of students in the exemplary CIC-Summer Research Opportunity Program (CIC-SROP) at 12 major research universities. Descriptive and inferential statistical analysis will be conducted to explore the pivotal social-cognitive motivational difficulties faced by URMS interested in STEM careers. Practice and research implications along with policy recommendations based on study results will be discussed.

**H02: Ethnography of a Meyerhoff Scholars Program Selection Weekend: T-shirts and Program Values, Breakfast and Program Goals, Parade of Stars and Lessons Applicants Learned**

*Mariano R. Sto. Domingo, TaShara Bailey, and Kenneth I Maton—all of University of Maryland, Baltimore County (UMBC)*

The Meyerhoff Scholars Program (MYSP), now entering its 27th year, has been one of the most studied undergraduate scholars programs in the country. The program has graduated more than 900 alumni, most of whom proceeded to graduate programs in STEM. About 198 have earned PhDs as of January 2015, many of whom are underrepresented minorities. For African American students who applied between 1989 and 2008, those who accepted the MYSP offer were found to be 5.1 times more likely to enter graduate school in STEM than those who declined the offer. UMBC is now the leading primarily white university in the country producing African American students who received doctorates in science and engineering.

The success of the program is attributed to its comprehensive and multi-component framework, consisting of Advising, Summer Bridge, Selection Weekend, Study Group, Financial Award, Program Community, Program Values, Tutoring, Faculty Involvement, Research Experience, Administrative Involvement, and Parental Involvement. Aside from Summer Bridge, however, none of the other program components has received an in-depth scholarly focus. This study contributes to an understanding of the first component of MYSP that scholars are exposed to: the SELECTION WEEKEND. We begin with the question of whether the selection weekend is just a standard avenue for recruiting and selecting talented students for the program, or, conversely, its additional purposes beyond selecting the students that best fit the program.

Using ethnographic research methods that include participant observation, student surveys and key personnel interviews, and using qualitative data analysis, we will try to elucidate a) the intentions and goals of the MYSP Selection Weekend, b) the planned activities implemented and practices used by staff and others involved to pursue those intentions and goals, and c) post-Selection Weekend impacts, from the perspectives both of program staff and the student participants. Two researchers conducted observation during the first of two selection weekend events held on February 27 and 28, 2015. There were 99 applicants and their parents who

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participated in a series of events that started with an opening program on the evening of Friday, continued with interviews the following morning, and capped by a parent meeting and closing ceremony on Saturday afternoon.

The observations captured the messages the program communicates to applicants and their families, including a) the cohort mottoes printed at the back of the current Meyerhoff students' t-shirts, i.e. "We become our expectations," b) the content of the after-breakfast exchanges between Meyerhoff alumni and applicants about the former's Meyerhoff experience and how they benefit them in graduate school, and c) the sharing of lessons learned and weekend highlights during the "Parade of Stars," an MYSP Selection Weekend innovation in which the applicants talk on stage about themselves, their achievements and what they learned from the weekend. Pre-weekend interviews with program staff focused on the formal goals and intentions of Selection Weekend and the plans for the 2-day event. Finally, the student survey administered provides information on applicant demographics, interest in STEM and other relevant characteristics. Taken together, the various sources of data provide insight into the nature and multi-faceted impact of Selection Weekend, the entry experience of future Meyerhoff scholars.

### **H03: Integrating targeted Core Competencies with Biology, Chemistry and Physics Course Assignments using E-portfolio**

*Na Xu, Joby Jacob, Jennifer Vance, Kevin Mark, Allyson Sheffield, Ian Alberts, and Jaime Nieman—all of LaGuardia Community College (CUNY)*

Competencies are a combination of the knowledge and skills needed to effectively perform a role in a society. Developing core competencies and abilities in specific areas, including inquiry and problem solving and oral, written and digital communication, is a crucial part of community college education to help students become critical thinkers and informed responsible global citizens. This work showcases a departmental and college wide collaboration to integrate core competencies with Biology, Chemistry and Physics course assignments using E-portfolio. In response to a college wide effort, we developed a series of meetings, activities and professional development (E-portfolio) workshops to promote a department wide revision of assignments to target new college competency rubrics. The objective of this work is to improve student core competencies through a variety of assignments. Here we showcase three sample assignments for Chemistry and Physics courses, targeting competency development in problem solving and oral, written and digital communications. LaGuardia Community College is a minority serving-community college of CUNY (City University of New York) system. Our institution has been the leader in using E-portfolio in curriculum development. This practice not only helps student develop important skills and abilities in learning, but also sheds light on helping community college students, especially the minority students, in the critical transition to senior college institutions.

### **H04: Eliminating Inequality: Using a Self-affirmation Intervention to Increase the Performance of Underrepresented Minority Students in Biology**

*Hannah Jordt, Sarah Eddy, and Scott Freeman—all of University of Washington*

Evidence suggests "high-structure" course formats that incorporate a large amount of active learning and frequent formative assessments (e.g. daily reading quizzes, weekly practice exams, and in-class clicker questions) can disproportionately benefit underrepresented groups in college STEM classes. Other studies indicate that small psychosocial interventions can lead to a reduction in the achievement gap via the alleviation of stereotype threat (the fear of being judged based on negative stereotypes of one's group). In this study we suggest that a combination of both strategies can eliminate the achievement gap experienced by underrepresented minority (URM) students (i.e.

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African Americans, Latinos, Native Americans, and Pacific Islanders) in an introductory biology course.

Biology 180, a large-scale (~700 student), introductory biology class at the University of Washington, has a “high-structure” design format. In previous quarters, this strategy has been effective at reducing the achievement gap experienced in this course for some historically underrepresented groups. To reduce the gap still further, we implemented a version of Cohen’s values affirmation intervention during three separate quarters. This intervention has been shown to effectively reduce stereotype threat. In the treatment, students spent approximately 15 minutes writing about values that were most important to them from amongst an established list. Students in the control treatment wrote about values on the list they felt were least important.

Using linear regression and controlling for a measure of student ability, we found that assigning this exercise twice, spaced five weeks apart, increased the exam achievement of URM students by 2.4% above URM students in the control treatment. This increase in performance due to the values affirmation intervention closed the achievement gap between White and URM students matched by ability. There was no effect of the intervention for women, Asia or White students. In summary, our treatment significantly eliminated the achievement gap between URM and non-URM students against the backdrop of a high-structure course. Our results suggest that instructors and institutions should consider using these intervention strategies when designing courses and enacting policies in order to promote an environment that is optimally conducive to all learners.

#### **H05: The National Research Mentoring Network (NRMN): Mentoring to Diversify the Biomedical Workforce**

*Christine Pfund, Jamboor K. Vishwanatha, David A. Burgess, and Kolawole Okuyemi—all of University of Wisconsin-Madison*

Effective mentors can provide guidance to emerging scientists regarding career options and opportunities within the NIH-supported biomedical workforce facilitate development of the necessary experience and skills needed for successful biomedical research careers. Yet, the lack of adequate mentoring is a problem for trainees at all stages in their career path.

The National Research Mentoring Network (NRMN) is a nationwide consortium designed to enhance the training and career development of individuals from diverse backgrounds, communities, and cultures who are pursuing biomedical and behavioral, research careers through enhanced networking and mentorship experiences. A primary goal of NRMN is to address the inequities in the full participation of biomedical research by underserved populations. Though scholars from disadvantaged backgrounds, whether by race, ethnicity, socio-economic status, sexual orientation, or disability, have demonstrated scientific curiosity and overcome many barriers to attain the proficiencies required for a career in the biomedical workforce, they still carry the burdens of disadvantage and discrimination. By facilitating long-term, culturally responsive interactions among mentees and mentors, NRMN is working to establish a sustainable process whereby diverse mentees successfully progress in their research careers, becoming the effective mentors and scientific leaders of tomorrow.

Working synergistically through four Cores: Administrative, Professional Development, Mentor Training and Mentorship and Networking, NRMN is striving to increase the participation and success of underserved groups in biomedical research. The NRMN consortium brings together leaders in novel, evidence-based strategies for forming and maximizing mentoring relationships. Specifically, NRMN is 1) developing a highly networked set of motivated and skilled mentors from a variety of biomedical research disciplines matched to mentees from the undergraduate to early career faculty level across the country; 2) developing best practices for mentoring; 3) providing training opportunities for mentors and mentees, 4) providing networking and professional

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development opportunities for mentees; 5) addressing the lack of full participation of underrepresented minorities across all biomedical, behavioral, clinical and social science research careers.

The overall structure of NRMN, implementation timeline and available resources, and opportunities for partnership will be presented.

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### **H06: Mentor and Mentee Perspectives on Race/Ethnicity and Gender in Biology Research Mentoring Relationships**

*Angela Byars-Winston Patrice Leverett, Christine Pfund and Janet Branchaw—all of University of Wisconsin-Madison*

Research has shown that mentored undergraduate research experiences can beneficially impact the career trajectories of women and racial/ethnic minorities being trained in science, technology, engineering, and mathematics (STEM) and that research mentoring relationships are an essential component of these experiences. The effectiveness of these research mentoring relationships are often complicated by cultural diversity factors, such as gender and race/ethnicity, which are commonly not addressed in science disciplines where objectivity is highly valued. Perceptions of how factors such as gender and race/ethnicity may influence the research mentoring relationship have remained largely unexamined. Thus, the purpose of this qualitative study was to investigate how mentors and mentees, who are engaged in laboratory or field-based biology research, experience and understand cultural variables, namely race, ethnicity (referred together as race/ethnicity hereafter), and gender, in their research mentoring relationships. Interview data from mentor and mentee participants were collected from responses to four questions regarding the role of culture in their mentoring relationships: 1) Does gender play a role in the mentoring relationship? 2) Does race/ethnicity play a role in the mentoring relationship? 3) Should you address culture directly in the mentoring relationship? 4) Should you intentionally draw on cultural diversity in the lab? Interview transcripts were analyzed using phenomenological methods. The themes that emerged will be presented, describing both the content of participants' experiences and their beliefs about their experiences, as well as nuances in how participants responded to the questions. Although similarities were present, the perceptions of mentors and mentees were not always aligned. Implications of the findings for policy and training interventions to enhance the effectiveness of research mentoring will be discussed, with the goal of positively impacting the retention of female and underrepresented racial/ethnic minority students pursuing science careers.

### **H07: Integrative Learning: A Model for Student and Faculty Development**

*Jill J. Keith and Tennille D. Presley—both of Winston Salem State University*

We will present results from a pilot involving Integrative Learning in the General Biology I course since many students who learn basic biological concepts have difficulty connecting them to other disciplines. Thus, certain concepts of physics were incorporated into the course, including metabolism, cell communication, cellular respiration, and biomolecules. The students' knowledge and their beliefs towards biology were assessed using AACU's "Integrative Learning VALUE Rubric" and the Colorado Learning Attitudes about Science Survey (CLASS) to connect indirect and direct assessments. For comparison, these same assessments were given to students in a General Biology class that did not use Integrative Learning. We learned that there are some correlations with the students' attitudes towards the subject and their overall understanding of the material. For

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example, statistical significance ( $p < 0.05$ , chi squared test) was evident between the two groups when surveyed for their passion towards science, cognition, and integrative thinking).

The results were shared with Winston Salem State University's faculty from various disciplines at a Faculty STEM Institute. These Institutes allowed us to receive insights concerning the data from colleagues in psychology, chemistry, biology, physics, math, behavioral sciences, education, and nursing. They also served as a venue for forming interdisciplinary partnerships.

Our next steps are to track the General Biology students as they progress into other science courses, to ensure faculty use this model, and form new collaborations within and across disciplines.

#### **H08: Preparing Critical Faculty for the Future: A Professional Development Program to Enhance STEM Education**

*Louise Wrensford, Rhonda Porter, Janis Carthon, Hema Mason, and Joyce Johnson—all of Albany State University*

Effective professional development to enhance knowledge of evidence based teaching practices among faculty and for successful implementation of these strategies as integral components of courses, is essential to transforming teaching practices for enhanced student learning and retention in STEM. With the heavy teaching loads and commitments that exist at many institutions especially HBCUs, this is an on-going challenge. The establishment of the NSF funded Preparing Critical Faculty for the Future (PCFF) program at the institution to implement an effective faculty development program in this existing environment will be described. The professional development model components include instructional planning, implementation, assessment and continuous faculty support utilizing faculty mentors and technology integration. This model is moving the institution forward towards transformational change in how STEM is taught at the institution. Assessment of program components including faculty training and implementation shows an overall positive impact on faculty and students. Ways that institutions can leverage resources to sustain professional development efforts, to encourage faculty and to increase faculty use of these strategies will also be discussed. Participants will gain information on components of an effective professional development model as well as strategies that can be implemented in courses to enhance student learning and retention by other institutions.

#### **H09: Preparing Critical Faculty for the Future: A STEM Faculty Learning Community for Online Course Instruction**

*Gail P. Hollowell, Yolanda B. Anderson, and Carlton E. Wilson—all of North Carolina Central University*

North Carolina Central University (NCCU) is the nation's oldest public liberal arts institution for African Americans; an institution with a strong tradition of teaching, research, and service. Many of the students entering the university come underprepared in the basic mathematics, science, and general education courses, necessary for persistence to the STEM degree. Thus, new approaches are needed to address basic mathematics, science, and general education course requirements of our entering freshmen in order for them to become successful learners (Saritas and Akdemir, 2009). Whereas student success is paramount, the professional preparation of faculty members to effectively communicate and transfer information to students is also essential. This becomes especially important as institutions like NCCU place increasing emphasis on online course delivery as a means to accommodate increasing course enrollment in the face of constraints on physical infrastructure. Recent studies have shown that students had an advantage in the online environment  $+0.40$  ( $p < .001$ ); when they were exposed to a different curriculum and/or instructional methods from students in the face-to-face condition. When these factors were equivalent across the online and face-to-face conditions, it was  $+0.13$  ( $p < .05$ ). This finding suggests

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that the positive effects of using online technology in education are enhanced when an instructor adapts curriculum and instructional approaches to the use of technology (Means, 2010). Over the past decade, faculty learning communities have emerged as a practical and pedagogically sound approach to address the challenges faced in higher education today (Shapiro, et. al., 1999). To that end, NCCU created a faculty learning community comprised of 10 STEM faculty from 4 disciplines - Biology, Chemistry, Mathematics, and Environmental, Earth, and Geospatial Science. All faculty completed a 2 week online Quality Matters (QM) 'Applying the Quality Matters Rubric' introduction course and participated in a STEM higher education conference to enhance their effectiveness for their online instruction. Outcomes measured compared QM online STEM courses vs non-QM online STEM courses vs traditional face-to-face classes.

### **H10: Teaching Tools for Improved Learning and Retention in Organic Chemistry**

*Steven A. Fleming, Chung Tran, Quianna Enang, and A. Baris Gunersel—all of Temple University*

The D/F/W/I rate for the traditional organic chemistry course is high and the class grade point averages (GPAs) are typically low. Recently the Temple University classes' GPAs for organic chemistry have increased. We will discuss the reasons for the change. In spite of our efforts to help all students move forward in the chemistry major, the subject of organic chemistry remains a roadblock for too many students. Efforts to develop teaching tools for organic chemistry have resulted in students gaining a better understanding of the material. This improvement in learning has been measurable, but the improved learning may not be sufficient to retain all STEM majors. The ultimate goal for the new tools is to enhance critical thinking and the role these tools play in improving critical thinking is more difficult to assess. Our measured improvement in learning and other efforts directed at improved STEM teaching at Temple University will be addressed.