2022 North Carolina PKAL Regional Network Meeting

Equity, Diversity, and Inclusion in STEM: Practical Applications for the Classroom

A Virtual Event hosted by North Carolina A&T State University and University of North Carolina at Greensboro

SCHEDULE

9:00 - 9:15 am
INTRODUCTION AND WELCOME

- Kelsie Bernot, North Carolina A&T State University (NC A&T) and Chris Rhea, University of North Carolina at Greensboro (UNC Greensboro)
- Co-Directors of NC PKAL

9:15 - 10:15 am
KEYNOTE PRESENTATION: STICKING WITH STEM: WHO COMES, WHO LEAVES, WHO STAYS?

- Dr. Gail Jones, North Carolina State University

10:15 - 10:30 am
BREAK

10:30 - 11:45 am
LIGHTNING TALKS

- 5 minutes each; in between each group, there will be 5 minutes for questions/discussions

GROUP 1.

1. Beyond ‘Week 5’: Meaningfully Indigenizing Syllabi through Interdisciplinary Materials
   - Zoe Eddy, Worcester Polytechnic Institute

2. An Integrated Social and Biological Diversity Module in a Biology Course
   - Iglika Pavlova and Natalie Swaim, UNC Greensboro

3. Utilizing Competency-Based Education to Integrate EDI within Information Technology Programs
   - Monica Pradip Shukla-Belmontes and Jerry Lege, University of Massachusetts Global

Moderator:

- Siobahn Day Grady

- Tamar Avineri
GROUP 2.

1. **Using Apprentice-style Undergraduate Research as a Success and Retention Tool for Freshman and Sophomores**
   Jackie Swanik, Wake Technical Community College

2. **Student Led Classroom Discussions on Current News Articles Focused on Diversity, Equity, and Inclusion Issues**
   Heather Allmond Barker and Kirsten Doehler, Elon University

3. **Embracing Narrative and Increasing Engagement**
   DeAnne Brooks, UNC Greensboro

Moderator: Crystal Edmonds

GROUP 3.

1. **Faculty Perceptions of STEM Student and Faculty Experiences during the Covid-19 Pandemic: A Fall 2020 Qualitative study**
   Mehdi Lamssali, Alesia Coralie Ferguson, Andrea Nana Ofori-Boadu, and Angela Michelle White, NC A&T

2. **Challenges in Developing a Program for First Generation Students Interrupted by the Pandemic**
   Olufunmilayo Ayobami, Hermine Vedogbeton, Katherine C. Chen, and Kimberly LeChasseur, Worcester Polytechnic Institute

3. **Pivoting in a Pandemic: Enhancing STEM Learning and Expanding the Classroom Community through STEM on Demand**
   Rachel A. Gisewhite, Kendrick Buford, Allison Downing, Julie Cwikla, and Maria Wallace, The University of Southern Mississippi

4. **An Emerging Grounded Theory on Mitigating Diminishing STEM-Self Syndrome (DS3) During Pandemics: The Voices of Undergraduate STEM Students**
   Andrea Nana Ofori-Boadu, Mercy Folashade Fash, Alesia Corale Ferguson, and Angela M. White, NC A&T

Moderator: Jacquelyn Thomas Swanik

11:45 am - 12:00 pm **BREAK**

12:00 - 1:00 pm **LUNCH SESSION FOR NTTFs who earned free registration**
Facilitator: C. Ellen Washington, C2EW Leadership Consulting

All other attendees, lunch on your own

1:00 - 2:30 pm **KEYNOTE WORKSHOP: DIVERSIFYING THE STEM HIGHER EDUCATION ECOSYSTEM**

Moderator: Nyote Jaedah Angelou Calixte

2:30 - 2:45 pm **BREAK**
2:45 - 3:30 pm  
**POSTER SESSION**  
(Posters viewable asynchronously on Padlet and synchronously in Zoom breakout rooms)

3:30 - 4:15 PM  
**LIGHTNING TALKS**

**GROUP 4.**
1. *Bringing Equity Issues into the Civil Engineering Classroom – Infrastructure and Structural Racism*  
Rebecca A. Atadero and Aramati Casper, Colorado State University

2. *The Black Imposter Syndrome: African-American Women and their Quest to a STEM identity*  
Maya Hamer, North Carolina Central University

3. *A Grounded Theory on Advancing Social Self-Concept and Overlay Career Role Development in Undergraduate AEC Women Through More Inclusive Learning Environments*  
Andrea Nana Ofori-Boadu and Saniya Monet Sampson, NC A&T

**GROUP 5.**
1. *Using an Identity Lens to Explore Equity Processes among Latinx Undergraduates in an Emerging Scholars Math Workshop*  
Sarah Oppland-Cordell, Northeastern Illinois University

2. *Implementing The SCALE-UP Active Learning Model in Physics at NC A&T State University*  
Abdellah Ahmidouch, Abebe Kebede, Shiva Phuyal, Bashar Aljawrneh, and Brian Schuft, NC A&T

3. *The Genomics Education Partnership: Reaching Every Student through Course-based Undergraduate Research Experiences (CUREs) Centered in Genomics and Bioinformatics*  
Maria S. Santisteban, University of North Carolina at Pembroke; Vida Mingo, Columbia College; Stephen Klusza, Clayton State University and Catherine S. Key, North Carolina Central University

4:15 - 4:30 pm  
**CLOSING THOUGHTS**

- Kelsie Bernot, NC A&T University and Chris Rhea, UNC at Greensboro  
  Co-Directors of NC PKAL
NC PKAL STEERING COMMITTEE

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SESSION INFORMATION

- Keynote Presentation
- Lightning Talks I
- Keynote Workshop
- Poster Session
- Lightning Talks II
KEYNOTE PRESENTATION

Sticking with STEM:
Who Comes, Who Leaves, Who Stays?

9:15 - 10:15 AM

Dr. M. Gail Jones is Alumni Distinguished Professor of Science Education at NC State University and a Senior Fellow at the Friday Institute for Educational Innovation. Dr. Jones currently teaches preservice and inservice teachers and conducts research on issues of diversity, technology, and science education. Dr. Jones’ research has been recognized for excellence by the National Association for Science Teacher Education, The NC Association of Research in Education, and the Association of Supervision and Curriculum Development. Dr. Jones has been recognized for her excellence in mentoring with the NCSU Outstanding Graduate Mentor Award. Dr. Jones has made seminal contributions to the study of nanoscale science and nanotechnology. She currently serves as Co-Editor in Chief of the International Journal of Science Education. Dr. Jones’ research group is currently researching new strategies to enhance science capital and family habitus for science. This work has been recently recognized with the Educational Innovation for NC Science Mathematics and Technology Education Center Partnership Award for excellence.
GROUP 1-1. Beyond ‘Week 5’: Meaningfully Indigenizing Syllabi through Interdisciplinary Materials
Zoe Antoinette Eddy, Worcester Polytechnic Institute

Many undergraduate educators have introduced good faith efforts to bring Indigenous voices into STEM classrooms. However, these efforts often fall short along three major lines. Firstly, the under-representation of Indigenous knowledge in STEM renders materials that seemingly suit classroom needs scant. Secondly, educator inclusion of Indigenous materials is often tokenizing: educators relegate Indigenous knowledge to a single week of curriculum, suggesting that Indigenous knowledge is separate from and potentially irrelevant to the wider (settler) canon of scientific knowledge. Finally, educators often fail to recognize that Indigenous knowledge, specifically that relevant to STEM classrooms, is frequently delivered in a way that falls outside of conventional classroom material expectations: in short, Indigenous creators, due to both Institutional barriers and personal choice, often produce materials outside of the standard peer-reviewed journal system. Nevertheless, creative incorporation of interdisciplinary Indigenous materials can help educators build syllabi that a) reflect Indigenous perspectives and b) center decolonial ways of knowing. These interdisciplinary materials include standard peer-reviewed journal articles and research reports, but also include Indigenous literature, arts, multimedia, and oral tradition. Using an ethnobiology classroom space as an example, I will demonstrate how different materials can support syllabi. In addition to my presentation/poster, I will also provide an open-source annotated bibliography that features a range of different Indigenous materials and their potential use in an ethnobiology and/or related classroom space.

GROUP 1-2. An Integrated Social and Biological Diversity Module in a Biology Course
Iglica Pavlova and Natalie Swaim, University of North Carolina at Greensboro; Ben Peterson (not presenting)

We present a module that integrates social and biological aspects of human diversity, race, and intelligence to support anti-racist and growth mindset perspectives with the goal of creating an inclusive learning environment. Critically, students are engaged from the start as active contributors of examples and experiences and in sense-making through reflection and teamwork. Most students reported either not knowing at all or without detail about the value of social diversity in teamwork and science (82%, n=281) or the biology facts related to human race (79%, n= 571). In homework assignments the majority of students were able to present correct biological reasons that challenge the notion that human races exist (95% of students). On the exam, most students were able to identify the correct option in the more formal phrasing as part of multiple-choice questions regarding human diversity and race (range, 76%-91% correct). Students struggled the most with trait variation as largely being on the “inside” (in traits that are not manifested as outside appearance) and determining which factors would lead speciation to occur more or less quickly. The integrated diversity module demonstrates a possible approach to combine the teaching of fundamental concepts in genetics and evolution to achieve biology learning outcomes together with evidence-based strategies for improving the sense of belonging.
Through a data-driven Program Assessment process, our School of Business and Professional Studies found an opportunity to partner strategically with the Office of Diversity, Equity, and Inclusion to incorporate opportunities to teach the principles of EDI within our Information Technology Programs. Specifically, the Program Assessment asked faculty, stakeholders, and the program curriculum committee both how the program could both be framed to ensure accessibility for all learners and how the principles of EDI could be internalized within the framework of the curriculum. This goes beyond presenting students with accessibility to engage with the materials and share their perspectives, to also include how our curriculum is teaching EDI within the context of the industry aligned with the program. This provided an opportunity to gather detailed insights on how our IT courses could better integrate the foundations of EDI and its applications toward the role of a future IT professional. Our competency-based BSIT program aligns directly with industry level certifications and current technological advancements; however, a gap analysis revealed program-level needs going beyond ensuring an EDI framework and instead pulling these concepts into the curriculum. Our IT Faculty members in collaboration with the Office of DEI are analyzing ways in which the IT curriculum can teach inclusion and the value of diverse perspectives as they apply directly to STEM concepts like web development, data mining, computer systems architecture, and other key courses. This approach toward enhancements within the existing IT framework will serve as a model for the other programs at our institution, and could likewise be implemented in any course, program, or institution of higher education.

Our START (STEM Academic Research & Training) Internship program uses apprentice-style, faculty-mentored undergraduate research as a tool for success and retention of freshman and sophomore-level students. Though undergraduate research is not as prevalent at community colleges, we have found students to be very interested in conducting research and that participation helps students to be retained in STEM fields and to be more prepared to transfer to a 4 yr. institution. Participation also helps students to develop a STEM identity early in their academic career and this identity is especially important for our BIPOC students. Our program is currently in our 5th year and we have recently been awarded an NSF grant (award 2133600). This grant provides financial support for the participants and mentors, includes partnerships with three universities, and seeks to examine the effectiveness of START at increasing the diversity of students pursuing STEM careers, increasing transfer rates, and mitigating transfer shock.

Student-led discussions can be a great way for students to learn about diversity, equity, and inclusion-related issues from their classmates. In our introductory statistics courses we have a weekly classroom discussion around an assigned article which has a DEI focus. A group of 3-4 students is responsible for leading one group discussion during the semester. Groups of students present a 15-20 minute lesson to the class based on the article. For example, in the past one group examined an online article which discussed how the prevalence of pregnancy-related deaths of Black mothers is higher than White mothers. Another group presented on an online article about the effects of poverty on young brains.
Each group must summarize the article, explore statistics that are featured in the article, and provide questions for small-group or entire class discussions. Groups are instructed to also look up additional information and data related to the topic. Most student groups utilize a Kahoot (an online quizzing system) during their lesson to help their classmates stay engaged, but other options such as Socrative, Jamboard, or Mentimeter are also encouraged. This type of activity works best when students read the article before arriving to class.

**Group 2-3. Embracing Narrative and Increasing Engagement**
DeAnne Davis Brooks, University of North Carolina at Greensboro

The banking system of education positions instructors as all-knowing experts and students as having nothing of substance or value to contribute to the learning environment. This style of teaching is oppressive, especially to students who are underrepresented in STEM disciplines and whose ideas, traditions, ways of knowing, and experiences are not reflected in textbooks or journal articles. Validating students’ narratives as sources of knowledge directly challenges the banking system of education, and is a theme evident in several critical pedagogy frameworks. Pipe and Stephens (2021) include “embracing narrative” as a part of unlearning, which they note as a step toward achieving a liberated learning spirit; Identity development is a cornerstone of Muhammed’s (2020) equity framework for literacy development; and Freire (1993) notes that a problem posing education that leads to revolutionary change and freedom starts with connecting content with people’s personal histories. Hooks’ (1994) engaged pedagogy also involves narratives of both students and instructors. Instructors who invite narrative into the classroom must take risks and will be responsible for facilitating discussions they may not have planned. However, the potential benefits to student engagement and inclusion are worth the risks. In this session, presenters will provide examples and strategies for inviting student narrative into the classroom. Challenges with sharing instructor narratives will be discussed as well as evidence that these activities increase student engagement.

**Group 3-1. Faculty Perceptions of STEM Student and Faculty Experiences during the Covid-19 Pandemic: A Fall 2020 Qualitative Study**
Mehdi Lamssali, Alesia Coralie Ferguson, Andrea Nana Ofori-Boadu and Angela Michelle White, North Carolina A&T State University

COVID-19 is a continuing global pandemic causing significant changes and modifications in the ways we teach and learn here in the U.S as well as around the world. Most universities, faculty members, and students modified their learning system incorporating significant online or mixed learning methods/modes to reduce in person contact time and to reduce the spread of the virus. Universities, faculty and students were challenged as they adapted to new learning modules, strategies and approaches.

The main objective of this project was to investigate faculty perception of STEM student experiences and behavior during the Fall 2020 semester as compared to the Spring 2020 semester as COVID-19 impacts were prolonged. Through a qualitative methodology of zoom interviews administered to 32 STEM faculty members across six U.S. Universities nationwide and a theming scheme, the opinion and narratives of these faculty members were garnered in a round one and round two set of interviews, in Summer 2020 and then in Spring 2021 (following the semesters of interest).

Some of the main new themes that were detected in faculty interviews during Fall 2020 semester and which reflect faculty perceptions are represented as follow: COVID-19 impact on student and faculty motivation, COVID-19 Impacts on Labs and Experiential Learning, COVID-19 Impact on Mental Health, COVID-19 Impact on STEM students’ involvement in STEM experiential learning opportunities and Research. Other previous themes detected and which are revisited to analyze major differences with those themes obtained during the Spring 2020 are presented.
and not limited to: Extra efforts from professors, Student Cheating behavior, Cheating factors and Prevention, student behavioral and performance changes, student struggles and challenges, University response and efforts to the COVID-19 pandemic. We explored the differences in these themes between the semesters to look at noticed adaptations and modifications.

**Group 3-2. Challenges in Developing a Program for First Generation Students Interrupted by the Pandemic**

Olufunmilayo Ayobami, Hermine Vedogbeton, Katherine C. Chen, and Kimberly LeChasseur, Worcester Polytechnic Institute

The Connecting Mentor Partners for Academic Success in STEM (CoMPASS) is an NSF S-STEM scholarship program developed to create and study an asset-based framework to recruit, retain, and graduate low-income, academically talented, first-generation students earning degrees in STEM fields. The program provides two 10-student cohorts from Worcester Public School District with scholarships for four years at Worcester Polytechnic Institute (matriculating in consecutive years), while also offering evidence-based student success strategies and a supportive network of mentors. Over the past year, the program offered scholars a set of activities designed to help them 1) transition into college, 2) navigate diverse academic resources, 3) receive peer and academic support, and 4) enhance their college experience through mentoring.

To assess the program’s effectiveness, we administered a survey to the first scholar cohort using the Longitudinal Assessment of Engineering Self-Efficacy (LAESE) after their first year of college. LAESE measures the self-efficacy of undergraduate engineering students, their feelings of inclusion, and outcome expectations. Initial results indicate that the scholars are in good academic standing. In addition, the residential, relational, and mentoring aspects of the program fostered an important sense of community, which students attributed as one of the reasons for their first-year success. Although initial assessments demonstrate that the CoMPASS program is indeed achieving its goals, the COVID-19 pandemic has posed a major challenge. Both scholar cohorts have been living on-campus with the appropriate restrictions and a mixture of remote and in-person classes and activities. Much of the CoMPASS programming has been conducted virtually due to campus policies and have impacted the outcomes. In this presentation, we will provide the initial results from our first scholar cohort, the acute challenges we faced in developing an effective program during the pandemic, and ways in which we will mitigate the pandemic effects on our student cohorts long-term.

**Group 3-3. Pivoting in a Pandemic: Enhancing STEM Learning and Expanding the Classroom Community through STEMonDemand**

Rachel A. Gisewhite, Kendrick Buford, Allison Downing, Julie Cwikla and Maria Wallace, The University of Southern Mississippi

STEMonDemand was developed by university STEM Education professors in an effort to address some of these inequities that became glaringly obvious and detrimental to student STEM learning after the onset of COVID-19. STEMonDemand coordinates with STEM faculty and graduate students at the university to develop a large menu of STEM lesson offerings for K-8 MS teachers to choose from. The lessons are aligned to state science standards, often across various grade-levels, and include free supply kits shipped directly to the schools. The synchronous lessons are taught during the school day by university scientists, mathematicians, and STEM educators via Zoom or other comparable virtual communication platforms. Our communities continue to struggle with issues of equitable resources across the board, but especially for educational purposes. The STEMonDemand project utilizes mixed methods to capture the effectiveness of the STEMonDemand lessons for the students and the influence of the lessons on the teachers. Students are asked to take pre- and post-assessments related to the content of the lesson, and teachers are asked to complete a survey after use of the STEMonDemand program. Our participating students
showed gains from pre- to post-assessments, and our teachers saw benefit across three major areas: (a) given the ‘permission to witness’ their students doing inquiry-based science, (b) increased opportunities for professional development; and (c) an extended classroom community. STEMonDemand provides types of opportunities that increase STEM learning and provide authentic STEM experiences for all students despite the ever-changing learning environments and circumstances. Our current results will be discussed during the Lightning Talk.

### Group 3-4. An Emerging Grounded Theory on Mitigating Diminishing STEM-Self Syndrome (DS3) During Pandemics: The Voices of Undergraduate STEM Students
Andrea Nana Ofori-Boadu, Mercy Folashade Fash, Alesia Corale Ferguson, and Angela M. White, North Carolina A&T State University

The COVID-19 pandemic continues to have negative impacts on STEM learning environments across U.S. institutions. STEM students, faculty, administrators, and staff struggle to keep up with the continuous changes needed to sustain STEM learning. Nevertheless, COVID-19 impacts on undergraduate STEM learning and decision-making are yet to be fully understood for improved STEM learning and resiliency. The purpose of this nationwide research is to explain decision-making processes in STEM students during the COVID-19 pandemic. Data was collected through interviews, surveys, and academic transcripts. Adopting the Charmaz constructivist grounded theory approach and purposive sampling, 63 STEM students from six U.S. institutions were engaged in two rounds of interviews. Interview transcripts with narratives on STEM learning experiences during COVID are being analyzed using the NVivo qualitative analysis software and Microsoft Excel for coding, categorization, constant comparative analysis, memoing, theme and theory development. Also, 183 STEM students from six US institutions participated in a Qualtrics survey generated from preliminary interview findings.

Preliminary coding and constant comparative analysis revealed an emerging theory on mitigating diminishing STEM-self syndrome (DS3) in undergraduate STEM students. DS3 is defined as the lack of intrinsic motivation to engage in STEM learning due to the STEM disconnection generated from salient COVID-related experiences. This theory explains how interactions among undergraduate STEM student risk characteristics, STEM learning disconnections, emotions, and STEM adaptation strategies influence STEM performance. Four STEM student mitigation styles (NAVIGATING, CRUISING, FATIGUED, and DRIFTING) capture how the effectiveness and persistence of STEM learning adaptation strategies influence STEM performance. STEM classroom, program, and institution-wide best practices for improved STEM learning and resilience during pandemics are recommended. Recommendations are also made on STEM employer strategies to ease the transition of COVID graduates into new STEM employment positions.
Dr. Angela Michelle White has an extreme passion for teaching and learning science. She earned a Bachelor of Science in Biology from the University of North Carolina at Chapel Hill, a Master of Science in Biology from North Carolina Agricultural and Technical State University, and a Doctor of Philosophy in Curriculum and Instruction with a concentration in Educational Psychology from North Carolina State University. Dr. White has served as an educator for 17 years at various levels and currently serves as the Assistant Dean of Student Success for the College of Science and Technology at North Carolina Agricultural and Technical State University. In this role she strategically develops and implements initiatives that promote the participation, academic achievement, and success of students within the College. Her current research interests, publications, and presentations give attention to racial identity, science identity, science self-efficacy, metacognition, and STEM achievement of African American students. As a strong advocate for the participation of African American females in STEM, Dr. White continuously engages in discourse and research that will promote greater access to STEM-related opportunities and recognition of African American females. Dr. White is also the co-founder of NoireSTEM, an educational consulting firm that seeks to increase access and achievement of African Americans in STEM degree programs and careers.
#1. The Faculty Innovation Factor: Unpacking Faculty Developed Mindset Interventions for STEM Classrooms

Cummings, Lawanda, The University of the Virgin Islands; Asha Brunings and Stefanie Waschull, Santa Fe College; Camille McKayle, University of the Virgin Islands; Brian Lee, Verleen McSween, Vasudha Sharma, and Ross Brooks

Institutions of higher learning have been charged to prepare STEM savvy students prepared to enter into rapidly growing STEM industries to contribute unique perspective and innovation. A variety of approaches have been taken to scaffold student performance such as bridge programs, undergraduate research opportunities, STEM mentoring, and institutional academic support (Haeger & Fresquez, 2016; Estrada et al., 2016). These traditional efforts to bolster student performance focus primarily on academic domains which gives an incomplete view of the barriers for URM inclusion in STEM.

The Louis Stokes Alliances for Minority Participation (LSAMP) program assists universities and colleges in diversifying the science, technology, engineering and mathematics (STEM) workforce by increasing the numbers of students from historically underrepresented minority populations to successfully complete high-quality degree programs in STEM. The Florida-Caribbean Louis Stokes Regional Center of Excellence (FL-C LSRCE) seeks to enhance the success of students from traditionally underrepresented minority populations in STEM by developing, testing, and disseminating intervention protocols and training faculty in research based strategies. Facilitating a model of customization for the 6 partnering institutions allows integration of each institutions’ population(s) of focus and their specific systemic and psychological barriers. Additionally, faculty members from these institutions have actively developed in-class interventions to address noted psychological barriers for their students. Many of these were showcased as research studies in the 3rd Annual Mindsets for STEM Conference in 2021.

The Mindsets for STEM Conference is a 2-day event with faculty and LSAMP partners showcasing Growth Mindset approaches at the class and institutional levels. Accepted proposals focused on the utilization of psychosocial interventions within STEM classrooms to promote student achievement. The current proposal will review faculty generated innovations focused on Mindset to understand instructional practice/tools used to create learning spaces that promote student success.

#2. STEM Professor-Student Interactions, Learning Challenges Faced and Student Adaptation Decisions during COVID-19 Pandemic

Fash, Mercy Folashade, Andrea Nana Ofori-Boadu, Alesia Coralie Ferguson, Angela Michelle White and Rabiatu Bonk, North Carolina A&T State University

The COVID-19 pandemic impacted learning environments across U.S. institutions. However, its impacts on learning are yet to be fully understood for improved resiliency during future pandemics. This study is part of a larger nationwide research to explain decision-making in STEM students during COVID-19. A mixed-methods approach with purposive sampling was utilized to enroll 63 students from six institutions. Data was collected through surveys,
academic transcripts, and interviews. Through interviews, research participants (RPs) narrated salient experiences. Data was analyzed using the NVivo software for coding and constant comparative analysis. The analysis of 30 coded interview transcripts revealed an emerging theme - Professor-Student Interactions Impact Learning and Adaptation Decisions. Salient Professor-Student Interactions are coded as: Online Instructional Delivery Methods; Professor Caring Attitudes; Professor Leniency; Professor Availability; Student Workloads; Professor Technology Proficiency; and Professor Teaching Resources. Negative interactions worsened learning challenges coded as: Illusion of Time, Procrastination; Lack of Focus; Challenge of Asking Questions; Poor Understanding; Poor Quality Assignments; Poor Intermediate Grades; Stresses; and Lowered Motivation. While most RPs experienced high stresses, a few experienced low or no stresses. To minimize the negative impacts of challenges, RPs made adaptation decisions coded as: Refined Scheduling; Alternate Learning Resources; Professor Office Hours; Teaching Assistants; Peer Collaboration; Relaxation Strategies; and Pass/Fail Options. Compared to their fall 2019 GPAs, improved STEM performance is partially attributed to professor leniency, pass/fail option, and cheating. Findings indicate that while professors were adjusting to modified teaching environments, STEM students were developing a sense of self-discipline, self-teaching, and independence. Students relied on various professor and non-professor generated resources to improve learning and performance. Recommendations for improved interactions and adaptation decisions are discussed for potential replication in STEM communities for improved adaptability and resiliency during future pandemics. Future research will focus on quantifying the long-term effect of the COVID-19 pandemic on STEM performance.

#3. Using POGIL to enhance equity and inclusion in Computer Science classroom
Feng, Li, Capital University

This poster is based on the author’s experiences of gradually implementation of an active learning methodology called POGIL (Process Oriented Guided Inquiry Learning) on her computer science courses over the years. It will describe how POGIL is implemented and be able to enhance equity and inclusion in her classroom using concrete example.

The author comes from a small liberal arts institution: Capital University in Columbus, Ohio. In Capital, Computer Science Department is affiliated with Mathematics and Physics and offered Computer Science Major and Minor. As one of two Professors in Computer Science Department in Capital, the author taught a variety of courses in Computer Science area in a small class size (usually around 12 to 30 students per class). POGIL is student-centered, process-oriented, and featured with group discussion learning guided by well-designed activities. It has been widely applied in Chemistry, Biology and Mathematics but lack of appropriate available materials in Computer Science to satisfy author’s need. After attending a POGIL workshop in a computer science education conference, the author started to gradually implement POGIL in her classes. In this presentation, the author will cover what POGIL is and what POGIL is good at. It will focus on how POGIL helps to engage the learning process and ensures all student’s voices being heard through the concrete examples (activities carefully designed by the author following POGIL format in her “Introduction to Database System” class). Based on the past five years of teaching (in-person as well as online teaching), assessment results and feedback from the students, the author believes that POGIL not only helps student learn the course more successfully but effectively creates an excellent equity and inclusive classroom environment for all the students.
Global challenges require interdisciplinary approaches that are often confined to studies focused on one discipline. Furthermore, students in course-based undergraduate research experiences (CUREs) can be transformative for students but are usually limited to those who can take these courses. Thus, training and exposure to cutting-edge technologies and scholars from other disciplines and campuses remain a challenge. Open pedagogy practices encourage open sharing and co-creation, and significant research has been done to evaluate CUREs. The new Biotechnology and Sustainability course we developed is grounded on pillars of successful CURE and open pedagogy to foster student connections, sharing, and responsible innovation through ethical reasoning and inclusive practices. We created this course to connect a dozen participants to numerous campus resources, national and international researchers, and students in other courses to empower them to develop new approaches and brainstorm strategies for the sustainable recycling of electronic waste. Collaborating with researchers focusing on sustainability, library sciences, open pedagogy, ethical reasoning in courses (NSF ENCOUR), and assessment of CUREs (E-CURE), we strive to promote inclusion and emphasize the importance of diversity in research. Student ambassadors will help connect the course to other courses at other campuses through ‘Science Sprint’ events open to the public. Our objective of this session is to share resources and encourage participants to seek interconnected student experiences beyond the class or lab to enrich interdisciplinary experiences for all. Inclusion, interdisciplinarity, and learning can be enhanced through open practices.

In our Math courses, we aim to apply appropriate classroom-level teaching strategies to weave EDI principles into our courses as part of our mission to make learning more effective and achieve excellence in teaching. Our college with the university serves working adult students, mainly women and minorities who are typically underserved in STEM education, in Math courses we are developing one special kind of course materials which connect our students in the classroom with mathematical or statistical theorems they are learning to address EDI issues. The first step to develop our course materials is to choose some students and let them complete the designed surveys, from which we collect some data sets for the theorems or formula. Instead of choosing students randomly, we use certain statistical ways such as Cluster methods to include diverse students. Standards of data collection are built up according to the learning contents.

The second step is to make the predictions when we use the collected data sets in the theorems or formula, all students and instructors invest in the class by active participation. Students learn far more deeply by applying theorems or formula to these real data sets that if they are merely ‘spoon-fed’ the materials, and instructors build such practices organically for student success.

The last step is to compare the predictions students calculate by theorems with the outcomes from the real life. Because we choose diverse students in the first step, the data sets and different outcomes showcase a variety of inclusive perspectives. Every student sees the gaps between their prediction and the real outcomes, instructors let all students say or write their opinions. Students are encouraged to discuss and exchange different ideas when they realize that diversity can make the different opinions and outcomes.
#6. Employing Teaching Practices for Exchanging Faculty-Student Engagement
Latif, Marwa K. Abdel, Jamie Sinutko and Eva Nyutu, University of Detroit Mercy

The researchers are faculty that work hard to support student learning inside and outside the classroom. Many faculty have focused on instructional design towards improving student-faculty communication and sense of belonging. The work will address implemented practices and the assessments of their effectiveness including instructions on cognitive learning, group help sessions, journal discussions, note taking, and management skills using detailed weekly rhythm. These added aspects has shown to create an inclusive and equitable environment with clear expectations, to strengthen student-faculty engagement, to reduce the effects of imposter syndrome for at-risk and first-generation students, and to enhance sense of belonging and self-confidence in the STEM discipline. The assessments were performed via self-assessment surveys provided to students at the end of the each term.

#7. Challenging Disparities and Inequities in STEM assignments at an HBCU Micro College
McLucas, Karla M. and Sara C. Wrenn, Bennett College

The need to integrate equity, diversity and inclusion (EDI) practices with practices promoting academic rigor and excellence has become especially pressing since the COVID-19 pandemic forced colleges and universities to rely heavily on online and remote course delivery. Efforts to address problems with learning loss, academic rigor, and keeping students engaged online must be approached with EDI in mind. In addition, the lived experiences of students, faculty, family, peers, and community members demand that we examine how to collaborate with and incorporate diverse perspectives in the academic environment in ways that are actively inclusive and relevant to diverse students rather than simply non-discriminatory. Bennett College’s EDI statement speaks to the integration of academic and personal excellence in our students’ life-long learning and cooperative community engagement; these concepts have been incorporated into Bennett’s general education curriculum and are also addressed across the curriculum. The authors designed an assignment that promotes inclusiveness and equity in the classroom by encouraging students to consider how inequities are reflected in the disparate impacts of COVID-19 in their communities and present their findings in an inclusive, respectful manner. Introductory statistics students are assigned accurate data from the CDC and state health departments. Students must use basic descriptive statistics to identify individuals and groups most at risk for COVID-19 and least likely to be vaccinated, using variables such as race, gender, age, SES, geographic location, and community size. Based on their analysis, students then develop a presentation of the data for the high-risk audience who have been hesitant to schedule COVID-19 vaccinations. Encouraging students to draw on their lived experiences and their newly learned skills with descriptive statistics to create and communicate understanding affirms that all students’ perspectives are intrinsically valuable and compatible with rigorous scientific thinking and analysis.

#8. Structures for Equitable and Scalable Undergraduate Research
Sonnenberg-Klein, Julie and Edward J. Coyle, Georgia Institute of Technology

Nationally, black and Hispanic students participate in undergraduate research experiences at lower rates than white and Asian students. This inequity is shaped by multiple factors including: student access to information on research opportunities (publicly posted or only available through networks, passively or aggressively promoted); inequitable student-faculty networks (who faculty invite to do research, and who students know and feel comfortable approaching); and the interaction between GPA inequity and perceived prestige of (or GPA needed for) undergraduate research. The Vertically Integrated Projects (VIP) Program is a team-based model for undergraduate research in place at over 40 colleges and universities. The Georgia Tech VIP Program was not established with an
explicit equity mission, but it achieved representative participation among black and Hispanic students (equity in initial participation) as well as parity in student re-enrollment rates by race/ethnicity (equity in long-term engagement). The program was designed to allow all students to do research with faculty by removing barriers, shifting the focus from networks to projects, and easing faculty into new mindsets. The GA Tech VIP Program now enrolls over 1,300 students on 85 VIP teams each semester, and it continues to grow. This lightning talk will summarize research on equity in participation, identify structural elements and processes that support equity in the program, and profile resources that other colleges and universities have leveraged to establish sustainable programs.

#9. Establish and Promote STEM Synergies through Engineering Laboratory and Project Activities
Sundaram, Ramakrishnan, Zachary Dickinson, and Tyler Seelnacht, Gannon University

This poster discusses the use of engineering laboratory and project activities for pK-12 STEM students as part of the outreach program to recognize and exploit the links between the pK-12 STEM curriculum and the undergraduate engineering degree programs. Hands-on laboratory and project-based experiences are among the most effective means to introduce and reinforce concepts in engineering disciplines. The faculty and students from undergraduate engineering programs interact with pK-12 students either by (a) organizing visits by the pK-12 students to the engineering laboratories or by (b) travel to the STEM school to demonstrate and engage pK-12 students in engineering laboratory and project activities at the school. The engineering laboratory and project activities for middle and high school students comprise the assembly and testing of wireless sensor networks for radio frequency imaging of space. Radio frequency signals can be used to perform non-invasive and device-free target localization of objects or entities in space. Radio tomographic imaging uses wireless sensor networks to form images from the attenuation of the radio frequency signals. The radio tomographic imaging system is comprised of three subsystems: the wireless sensor network, the command and data collection platform, and the user interface. Broadly speaking, the STEM activities for the students comprise the following major steps.

- Assemble each node of the wireless sensor network
- Execute software and hardware tests on the functionality of each node
- Configure the wireless sensor network grid using an organized collection of nodes
- Set up of the communication with the command and data collection platform to collect the received signal strength data from each transmitting node in the network
- Identify and display the entities in the space enclosed by the wireless sensor network

The distinction between the two groups of students – middle school and high school – is made through the complexity of the steps outlined above.

#10. Sharing Multimodal Writing Strategies Utilized in a First-Year STEM Course
Trocki, Aaron, Elon University

Numerous educational researchers have documented the role of metacognitive strategies in achievement of students in STEM higher education. Furthermore, metacognitive strategies combined with evidence-based writing-to-learn strategies have proven indispensable for promoting the success of students from diverse backgrounds. The purpose of this lightning talk is to share a course design that infused multimodal writing-to-learn metacognitive strategies and students’ perceptions of learning and success in an applied calculus course. In this study, writing-to-learn materials and activities were grounded in a complementary perspective of constructivist and sociocultural theories of learning as conceptualized by Cobb (1994) who accounts for both what students learn and how they learn through communication. The foci of disciplinary content, student writing, and metacognitive strategies were intended to address the intense learning demands of an early undergraduate course in STEM. Course activities
included students reading the book, Teach Yourself How to Learn: Strategies You Can Use to Ace Any Course at Any Level (McGuire, 2018). Strategies for incorporating multimodal writing-to-learn into STEM classrooms will be shared and discussed.

#11. Inclusion, Diversity, Equity and Accessibility in STEM: A Course to Transform the STEM culture
Wheatly, Michele G., Syracuse University

Science, Technology, Engineering and Mathematics (STEM) fields are the bedrock of the knowledge economy and innovation. Yet women, people of color, people with disabilities and those with lower socioeconomic status remain underrepresented in the study and practice of STEM. This course proposal addresses the need to change the STEM culture from within, through educating and engaging STEM students who will be the practitioners of the future. As higher education institutions seek to address diversity and inclusion through curricular requirements, the presenting author discusses a proposed new course for STEM intended students that addresses Inclusion, Diversity, Equity and Accessibility aimed at internal self-reflection and transformation of future STEM professionals. A syllabus will be shared for a new course for STEM majors that will explore the history of exclusion and bias that has led to underrepresentation of women, people of color, people with disabilities and those with lower socioeconomic status in STEM fields and actionable steps that will promote inclusion, diversity, equity, and accessibility. Through engagement with primary literature and multimedia, personal reflection, discussion with peers, and independent research, students will explore theories of race, class, gender and ability in STEM education, research and practice. The presenting author seeks input from peers on the proposed learning objectives, range of resources and course requirements.

#12. STEM Identity in Undergraduate Students: Does CURE and Service-Learning Play a Role?
Williams, Erika L. and Kelsie M. Bernot, North Carolina A&T State University; Michele K.H. Malotky, Guilford College; Breanne Bygrave, North Carolina A&T State University; Allana N. Matthews, North Carolina A&T State University, Mike Wilton, University of California Santa Barbara, Eduardo Gonzalez-Nino, University of California Santa Barbara, Angela M. White, North Carolina A&T State University; Maura B. Nsonwu, North Carolina State University

STEM majors have a high dropout and transfer rate among colleges and universities, particularly among PEERS (Persons Excluded because of Ethnicity and Race) and URMs (Underrepresented Minorities). One reason is that PEERS have been documented to have a lower sense of science identity, which is the feeling that one “is a scientist”. The purpose of this inquiry is to determine whether service-learning, combined with Course-based Undergraduate Research Experiences (CURE) will lead to an increased sense of science identity among undergraduate students. Students at three different universities (a large Hispanic Serving Institution, a Small Liberal Arts College, and a Mid-Sized HBCU) were enrolled in either a class that was CURE only (control n=28) or had a service-learning component in addition to the CURE component (experimental n=24). Students were assessed at the beginning of the course and again at the conclusion of the course. Of particular interest were the questions centered around science identity. Our preliminary data analysis will assess whether there was a change in science identity and will compare two different science identity instruments. This information could help us better understand how CURE and Service-Learning may alter students’ sense of science identity.
The transition to remote teaching and learning in March 2020 highlighted existing sources of SES, disability, and gender-related inequities in science classrooms, including lack of reliable internet access; difficulty obtaining course materials; lack of access to technology; home conditions not conducive to academic work or online class participation; and pressure to work or take on additional responsibilities in the home. Due to initiatives already under development in spring 2020, Bennett College was well-positioned to support students and faculty through the transition from ad hoc remote teaching to designing and implementing virtual and hybrid courses. Student outcomes and retention data for STEM classes (spring 2019-fall 2021) will be presented, with a qualitative summary of lessons learned and future directions for promoting inclusivity and access that are applicable in virtual, hybrid, and face-to-face classes.
Group 4-1. Bringing Equity Issues into the Civil Engineering Classroom – Infrastructure and Structural Racism
Rebecca A. Atadero and Aramati Casper, Colorado State University

Engineering education has a historic and ongoing culture of depoliticization. Often, engineering topics are taught in ways that are divorced from the social and political implications of the work. When societal impact is considered, usually only the most basic areas of life safety or cost are included. As a result of this long-standing culture, most of today’s engineering faculty and instructors have not experienced engineering classrooms where socio-technical interactions are explicitly considered and do not have models of how to engage in conversations about equity or justice in the context of engineering. In this presentation we describe the use of an assignment in a civil engineering materials course where the themes of infrastructure and sustainability and the case of a large regional highway reconstruction project are used to discuss the meaning of equity, how structural racism is present in the literal structures around us, and the ways civil engineering work can be used to reduce or ameliorate historic harm. This activity has been used in different variations three times. Student responses to a post class survey indicate a range of attitudes. Some students describe learning for the first time how community interaction is an important part of civil engineering, others remain less prepared to acknowledge the social impacts of engineering, indicating that “something (technical) must be done.” A question explicitly about the impact of resident race and wealth on the engineering decision process produced minimal pushback, but many students focused on socio-economic conditions rather than race as a deciding factor. Assignments and activities such as this are viable in a wide variety of civil engineering courses, but engineering faculty need to participate in professional development to prepare themselves for these assignments. Our findings further support the recommendation that students should repeatedly engage with engineering justice content throughout their degree program.

Group 4-2. The Black Imposter Syndrome: African-American Women and their Quest to a STEM Identity
Maya DeAndrea Hamer, North Carolina Central University

Having a place at the table has been the goal for black women since entering the STEM field. But now that they have arrived are they convinced they should be there? This paper takes a look at the phenomenon, “Imposter Syndrome” and its effect on Black faculty, administrators, mentors, professors, and change-makers in the Computer Science field. Doubt can have a detrimental impact on how one performs and can lead to decisions being made based on a personal view of one’s capabilities rather than fundamental skills. Black women in this field do not hold a majority and have often felt they have no voice. This, combined with the lack of predecessors, may lead to a feeling of not belonging, leading to someone leaving the field due to a false identity. How can we create a STEM Identity that inspires and builds up a young black female interested in STEM courses and future careers? Are black women experiencing this syndrome more than other races and genders? This paper looks at the Computer Science field to see how the imposter syndrome has impacted black women and their success rate in positive outcomes after entering the collegiate environment and subsequent workforce. The approaches in this paper take a look at techniques and methods that will combat this feeling of doubt and uncertainty, discovering steps one can take that can lead to giving yourself a STEM identity. This could inspire confidence and resilience in a person in a field where one may feel alone and unheard.
Group 4-3. A Grounded Theory on Advancing Social Self-Concept and Overlay Career Role Development in Undergraduate AEC Women Through More Inclusive Learning Environments
Andrea Nana Ofori-Boadu and Saniya Monet Sampson North Carolina A&T State University

In addition to workforce shortages and lack of racial diversity in the architecture, engineering, and construction (AEC) industry, women are underrepresented in AEC classrooms, programs, and professions. Identity theorists advocate that professional identity development improves persistence into professions. However, little is known about AEC professional identity development (AEC-PID) in women. As part of a larger nationwide research project, the purpose is to explore interactions among identities, lived experiences, and AEC-PID in undergraduate AEC women. Adopting the Charmaz constructivist grounded theory approach, women from five U.S. institutions were engaged in two rounds of interviews and one survey. Interview transcripts with AEC-PID process narratives from 40 research participants were analyzed using the NVivo qualitative analysis software and Microsoft Excel for coding, categorization, constant comparative analysis, memo-ing, theme and theory development. Also, 23 research participants completed Qualtrics surveys by ranking 16 overlay AEC career roles.

An emerging theory explains how salient social self-concept interacts with pre-college and college learning experiences to influence overlay AEC career development coded as Feminist, Humanitarian, Globalist, Minority Advocate, Entrepreneur, Environmentalist, Youth Advocate, Immigrant Advocate, Regionalist, Researcher/Professor, Culture-Inspired Consultant, Teacher/Professor, Disability-Inspired Consultant, Missionary, Politician, and Public Official. These motivate decisions towards dual program enrollment, minors, electives, specializations, student organization memberships, internships, volunteering, graduate education, entrepreneurship, and employment that advance overlay role development. Gender inclusive learning strategies and transformations in AEC classrooms, programs, institutions, and industry learning environments will maintain interest and support overlay role development. Future work involves investigating how social self-concept continues to interact with AEC learning experiences to advance overlay AEC career role development in women as they transition from the freshman year into senior year. In the long term, more inclusive and gender friendly AEC educational and industrial transformations will reduce AEC workforce shortages, improve gender diversity, and foster the innovation of gender friendly AEC products and services.

Group 5-1. Using an Identity Lens to Explore Equity Processes among Latinx Undergraduates in an Emerging Scholars Math Workshop
Sarah Oppland-Cordell, Northeastern Illinois University

This presentation summarizes findings from a qualitative multiple case study that used identity as an analytic lens to explore how equity processes evolved for two Latinx undergraduate students in a culturally diverse Emerging Scholars Program (ESP) Calculus I workshop at a predominately White urban Midwestern university. Drawing on Gutiérrez’s (2012) equity definition, findings indicate that equity processes became strengthened for the participants through four dimensions (access, achievement, identity, and power) over time. Drawing on critical race theory and Latina/o critical theory, findings reveal that participants’ participation through their complex identities (math, racial, gender, and class) aided in strengthening these equity dimensions. The findings support that understanding how race, gender, and class function in Latinx students’ math experiences and identities, including in math classrooms, expands knowledge about how to develop equitable math practices. Suggestions for how STEM teachers can design identity-affirming, equitable mathematical learning environments will also be provided.

Group 5-2. Implementing The SCALE-UP Active Learning Model in Physics at NC A&T State University
Abdellah Ahmidouch, Abebe Kebede, Shiva Phuyal, Bashar Aljawnneh, and Brian Schuft, North Carolina A&T State University

The Department of Physics at North Carolina A&T State University seeks to transform course delivery of introductory physics courses and associated labs by adapting and implementing the Student-Centered Active Learning Environment with Upside-down Pedagogies (SCALE-UP) model. The SCALE-UP format is a student-centered active learning method that promotes active learning and integrates lecture and laboratory work into one. We piloted several versions of the SCALE-UP model, including a full SCALE-UP and a hybrid form of SCALE-UP, which include all the interactivity and engagement of the SCALE-UP method with the exception that the labs are not integrated into the lecture. Student performance and attitude toward learning were measured through gains on the Force Concept Inventory (FCI) standardized test, analysis of the Colorado Learning Attitudes About Science (CLASS) survey data, student class attendance, and overall student grades. This paper describes the methods used, the preliminary results of the SCALE-UP project, as well as the project future plans.

Group 5-3. The Genomics Education Partnership: Reaching Every Student through Course-based Undergraduate Research Experiences (CUREs) Centered in Genomics and Bioinformatics
Maria S Santisteban, University of North Carolina at Pembroke; Vida Mingo, Columbia College; Stephen Klusza, Clayton State University and Catherine S Key, North Carolina Central University

The Genomics Education Partnership https://thegep.org is a nationwide collaboration of faculty from more than 150 institutions which aim to integrate active learning into the undergraduate curriculum through Course-based Undergraduate Research Experiences (CUREs) centered in genomics and bioinformatics. The GEP virtual community of faculty promotes and supports student intellectual engagement, active learning, and undergraduate research that requires nothing more than a computer with internet access. Inclusive practices include scaffolded curriculum, custom tools that provide immediate feedback, support of virtual peer-mentors for all GEP students 7 days a week, virtual training and mentoring for new faculty members. Indeed, our virtual TAs were especially effective during the pandemic in providing support to all students, including those with special needs. We are also currently piloting translation of curriculum modules in the Spanish language to make our materials more inclusive and equitable for Puerto Rico students and faculty who are non-native English speakers, with a long-term goal of facilitating translation into additional languages.

In 2017, the GEP shifted from a centralized model to a distributed leadership model with various committees such as Professional Development and mentoring, Curriculum, Science and IT, Assessment, and our newest Diversity, Equity and Inclusion (DEI) Committee. Our DEI is facilitating inclusive STEM practices to help increase faculty engagement in this transformative pedagogical practice. Literature has shown that students who have positive interactions tend to be more engaged and more likely to be remain in their STEM major and become a member of the STEM workforce. The DEI committee of GEP has developed a “Fireside Chat” series that strategizes monthly discussions of culturally relevant pedagogical practices with faculty to enhance their sense of agency in creating inclusive classrooms and learning experiences for students. This is based on modeling for faculty what they want their students to experience.