LIGHTNING TALK ABSTRACTS

In Order of Appearance in the Program

Track 1: Classroom Practices that Foster Engagement and Agency

Supporting Learning Through Course Design: Evidence from Structured Notes and Mastery-Based Retakes.

Clara Voorhees, Professor, D'Youville University

High C-DFW rates in introductory STEM courses remain a barrier to student persistence. During Fall 2025, BIO 101 Introduction to Biology I implemented two Title III–supported interventions designed to improve academic performance and retention: structured handwritten pre-class lecture notes and mastery-based quiz retakes. Students earned extra credit for submitting detailed handwritten notes on assigned video lectures prior to class (maximum 50 points; ≥8 submissions required for full credit). Students completing notes performed significantly better than non-participants on quizzes ($t(17)=2.96$, $p=0.0089$) and final course grades ($t(19)=3.13$, $p=0.0055$). Although frequency of note submission (low, medium, high) did not significantly affect quiz averages (ANOVA $F(2)=2.87$, $p=0.069$), students who completed notes at any level outperformed peers who did not participate. A second intervention allowed students scoring < 82% on quizzes to complete a structured "Wrap-Around" metacognitive assignment before qualifying for a capped retake (maximum 82%). Paired t-tests showed significant improvement between first ($M=61.9$, $SD=11$) and second attempts ($M=67.3$, $SD=14$), $t(14)=2.5$, $p=0.025$. Course-level outcomes improved substantially: combined C-DFW rates decreased from 20% (Fall 2024) to 7.5% (Fall 2025), and progression from BIO 101 to BIO 102 increased from 83% to 88%. These findings suggest that structured pre-class preparation and reflective mastery-based reassessment improve student performance and may enhance retention in gateway biology courses.

Enhancing Student Engagement and Active Learning in Chemistry through End-of-Class Engagement Quizzes

Kumudu Peiris, Assistant Professor of Chemistry, Wake Technical Community College

This study examines the implementation of end-of-class engagement quizzes in General Chemistry and Organic Chemistry courses as a strategy to enhance student motivation, participation, and learning outcomes. These low-stakes, graded quizzes are administered at the conclusion of each class session and focus on key concepts introduced that day. Students complete the quizzes individually, with the option to collaborate with designated "success team" peers when additional support is needed. Quiz scores contribute to unit exam grades, reinforcing their importance while maintaining a formative assessment structure.

The quizzes are designed to promote critical thinking and problem-solving by requiring students to apply newly learned concepts in straightforward but meaningful ways. Analysis of student responses enables the instructor to identify misconceptions and areas of difficulty, which are then addressed at the start of subsequent class sessions. This feedback loop fosters a responsive learning environment that prioritizes conceptual understanding.

Findings indicate that the use of daily engagement quizzes significantly improves student engagement, encourages active participation, and promotes consistent study habits. Additionally, increased attendance at office hours, more productive peer discussions, and enhanced academic performance were observed. Students also reported a stronger sense of belonging and collaboration within the classroom. Overall, this approach demonstrates that structured, end-of-class formative assessments can effectively support student success in chemistry education by integrating continuous feedback, accountability, and active learning.

Boosting Engagement in Statistics via Excel and MyOpenMath.

Omar Babun Codorniu, Assistant Professor, Lynn University

Many introductory statistics courses suffer from low engagement due to lecture-heavy, PowerPoint-centered delivery, failing to connect theoretical concepts with practical applications. To remedy this in undergraduate STEM education, I developed a collection of interactive Excel practice worksheets for hands-on, in-class active learning, paired with MyOpenMath assignments. Tested, refined, and expanded over three years in a large-

enrollment course, these tools moved students from passive observation to active engagement with statistical concepts and formulas, reducing distractions. Implementation resulted in significantly higher student participation and improved technological proficiency, alongside consistent, modest improvements in exam performance. During this presentation, I will demonstrate examples of these worksheets and provide implementation tips.

Using the Curriculum to Introduce Leadership Competencies to Undergraduate STEM Students

Lance Barton, Director, UNC Charlotte; **John Richardson**, Professor and Chair, Austin College; **Ryan Felix**, Associate Professor, Austin College; **Samuel Kroger**, Assistant Professor, Austin College

As scientific and technical knowledge becomes ever more specialized, citizens have become disenfranchised due to lack of understanding and engagement. That means that every STEM major's role in the future must not only include technical prowess, but also leadership skills within both technical and nontechnical environments. Stand alone leadership development courses often do not use STEM examples and the elective nature of such courses limits the effectiveness in building skills among all students. The presenters will describe an interdisciplinary partnership across all STEM departments integrating transferrable skill sets from leadership studies into STEM education will produce future leaders of the scientific community. Focusing on five transferrable leadership competencies that align with STEM effectiveness: communicating ideas, problem solving, collaborative work, foresight and planning, and acting responsibly. This unique pedagogy allows all STEM students to learn and practice leadership competencies throughout multiple courses across the entire STEM curriculum, rather than as a separate course of study. Using modified VALUE rubrics, student skill development was assessed and students demonstrated increased confidence and leadership skills correlated with the number of courses and experiences over their undergraduate education. With an embedded curriculum rich in intentional instruction of technical, interpersonal, and leadership skills, the Austin College STEM Teaching and Research Leadership Program provides the foundation for successful practice of leadership in students' professional lives to promote personal, team, and organizational effectiveness in both the classroom and beyond. This program is transferable to other STEM disciplines and campuses because it integrates with existing curricular content and skill-based learning outcomes.

Enhancing STEM Education Through Peer-Led Active Learning: The STEM Guide Program

Selma Poturovic, Associate Professor of Chemistry and Biochemistry, DePauw University

The STEM Guide Program at DePauw University is a transformative initiative designed to enhance the learning experience for students while fostering faculty collaboration and promoting active engagement through peer tutoring in introductory and core STEM courses. Launched in the Fall of 2018, the program has successfully integrated trained peer tutors, referred to as STEM Guides, into approximately 65-70% of the courses within the STEM division. A key focus of this program is the active participation of underrepresented minority (URM) students as Guides, which plays a crucial role in cultivating an inclusive classroom environment that supports both academic success and personal development. In our session, we will provide an overview of the Program's structure, detailing the responsibilities and contributions of the STEM Guides, alongside their comprehensive pedagogical training that emphasizes inclusive teaching methodologies and effective mentorship. We will also share compelling data and testimonials that highlight significant academic improvements, increased student satisfaction, and a remarkable 100% graduation rate among the Guides themselves. Furthermore, we will discuss specific examples demonstrating how the involvement of Guides has effectively reduced withdrawal rates and improved retention among historically underserved student demographics.

Track 2: Departmental and Institutional Pathways to STEM Achievement

PURE Science: Tracking of place- based undergraduate research experiences at an HBCU

Verleen McSween-Missole, Associate Professor of Biology, University of the Virgin Islands

Evidence-based High-Impact Practices, such as undergraduate research and place-based science education, have been demonstrated to produce positive educational outcomes for learners and promote enhanced student success. However, there is only a small body of literature highlighting the co-occurrence of these two HIPs and the potential amplified effect on the persistence and retention of students in STEM disciplines. The current study longitudinally tracks the co-occurrence of these two HIPs and their prevalence in STEM

disciplines at a Historically Black College and University. We hypothesized that the co-occurrence of place-based experiences and undergraduate research experiences (PUREs) varies over time and that its prevalence varies by STEM discipline. Results indicate that there is a differential prevalence in PUREs among STEM disciplines, notably with PURE experiences in science predominating over technology, engineering, math, and social science. PUREs increased in response to the COVID-19 pandemic and were possibly leveraged as a tool to promote resiliency in undergraduate research training in STEM fields amidst the challenges of the pandemic. Tracking of this phenomenon and its impact may lead to outcomes that support the implementation of this dual impact approach as an evidence-based approach in broadening participation efforts.

Attendees can modify the current approach to expand training opportunities for students at their respective institutions and address institutional resource challenges exacerbated by recent funding cuts.

Engaging Students in Statistical Consulting: A Pathway to Research and Workforce Careers

Andre Waschka, Assistant Professor, Elon University

Higher education is often criticized for not adequately preparing students for the workforce, and that academic training does not reflect the complexity of real-world problems. Many universities have responded by establishing data consulting centers that actively involve faculty and students in providing support for research/industry projects across different STEM disciplines. We describe how the Methodology and Data Consulting Center at Elon University attempts to bridge the gap between the student's academic training and highly demand research and workforce careers. Our approach is to engage students in statistical consulting and enhance student learning by combining technical skill-building with faculty mentoring and applied experiences. Student consultants are mentored and supervised by faculty; they work with real data, diverse research questions, and a range of collaborators, thus developing adaptability and professionalism expected in today's workplace. They assist students from different disciplines as well as faculty on their research projects. Student consultants strengthen their abilities in research experiment design, data analytics, and data visualization. This hands-on, client-facing experience mirrors the collaborative, project-based environments found in many careers, thus contributing to the student consultants' overall workplace readiness. Student consultants also gain a better understanding of the importance of consulting in research projects. They see the range of statistical support that can be needed across the entire research process, from project inception and data collection design,

to data analytics and ultimately publication. The presentation will focus on student-centered statistics consulting, its benefits and challenges, and the exchange of ideas and experiences between participants.

Attendees will be able to replicate the approach and introduce statistical consulting within their program or broader at the University level.

Mentorship for Persistence: A Low-Cost, Scalable Intervention to Improve Retention and Success in Undergraduate Computer Science

Ericka Mochan, Associate Professor of Mathematics and Computer Science, Carlow University

Improving persistence in undergraduate computer science (CS) requires more than strong curriculum design and fun electives. Increased persistence and retention requires structures that help students feel seen, supported, and capable of succeeding in a field where many, especially women and students from historically marginalized communities, often report feeling isolated or unsure of belonging. At Carlow University, we developed a layered mentorship program to address these barriers by connecting students with industry mentors in addition to their on-campus faculty advisors who collectively reinforce academic identity and community. The initiative aims to strengthen identity and belongingness in tech, normalize help seeking behaviors, and build supportive community networks.

Over the past three academic years, 40 students in CS majors and minors were invited to participate; 20 elected to join for at least one semester. We assessed program outcomes through academic performance, retention data, and qualitative feedback. The impact on persistence has been significant. Of the 20 students who joined the mentorship program, 17 have remained in the CS program or have since graduated, yielding an 85% retention rate. In contrast, only 9 of the 20 non participants have persisted in the major. Academic performance shows a similar pattern: participants maintain an average GPA of 3.52 (SD 0.44), compared with 2.32 (SD 1.62) for those who declined to participate. Non participants were far more likely to leave the university prior to graduation (6), or switch out of the CS program (3). Qualitative feedback suggests these personalized and professional contacts can improve persistence trajectories for students who might otherwise feel disconnected from STEM pathways and careers. Our mentorship model may serve as a low-cost, adaptable, and scalable model for other CS programs.

Track 3: Technology, Innovation, and Emerging Tools in STEM Pathways

AI Prompt Development to Create Personal Learning

Thomas Harnden, Professor of Biology, Georgia Highlands College

Students at open access institutions of higher ed have limited funds and resources to help them progress and succeed in college. By teaching students six critical inputs to develop prompts that can be used in free generative AI chatbots, they can create tutoring experiences as well as assessments that can give rich feedback and create a personal learning experience that will enable them to become more successful in their college courses. With this said, students in two biology courses were taught the six critical inputs for AI prompt development prior to the midpoint of the semester. Each were given the task to create assessments identical to the format of assessments of that were already administered in the course. The assessments that students generated were handed in and graded using a rubric. A questionnaire was also administered to the students to gauge their thoughts regarding the use of AI as well as if it had any positive impact in their assessment preparation and grades.

Innovation Without Replacement: Leveraging Existing Technologies to Strengthen STEM Learning Pathways

Carla van de Sande, Associate Professor of Mathematics Education, Arizona State University

As artificial intelligence becomes increasingly prominent in conversations about STEM education, innovation is often framed in terms of adopting cutting-edge technological tools. This presentation argues that strengthening STEM pathways does not always require replacing existing systems with new and emerging ones, but rather redesigning how familiar tools are used to support engagement, persistence, and learning transfer.

This lightning talk introduces the AppLE (Apply and Learn) a Day Initiative, a course-connected learning design innovation that repurposes widely available online survey software as a daily retrieval-practice and metacognitive engagement structure in undergraduate mathematics during academic breaks and other gaps between instruction. The design uses structured problem pathways, immediate feedback, and recognition systems that reward initiative and persistence alongside correctness. The approach draws on principles from retrieval practice research and self-regulated learning.

Observations from implementation in large-enrollment undergraduate courses suggest this approach increases voluntary participation in review activities, normalizes help-seeking behaviors, and creates low-stakes opportunities for students to revisit prior learning while maintaining a sense of connection with their instructors. Because the approach relies on existing institutional technologies, it offers a low-cost, scalable, and immediately adoptable model.

Audience engagement will occur through a brief reflective tour of a typical AppLE activity, during which participants will be guided through key design decisions that shape student pathways, feedback opportunities, and persistence supports. Attendees will leave able to (1) identify one opportunity to repurpose an existing tool for daily engagement and (2) apply one design principle for supporting persistence between instructional terms.

Personalizing Learning via AI: NotebookLM as a Study Buddy, Tutor, and Course Assistant

Oscar Fernandez, Professor of Mathematics, Wellesley College

Research shows that personalized instruction (PI) improves achievement by up to 2 standard deviations (compared to traditional learning). This interactive presentation will showcase NotebookLM's PI features via demos of notebooks for calculus and differential equations courses.

Track 4: Identifying and Addressing Barriers to STEM Success

System-Level Solutions to STEM Barriers: A Resource Allocation Perspective Across Universities and Community Colleges

Jessica Bennett, Doctoral Candidate, NC A&T State University; **Dr. Kristen Rhinehardt**, Associate Professor/Assistant Chair, Computational Data Science and Engineering, NC A&T State University

This talk examines how higher education resource allocation, across both community colleges and four-year institutions, shapes the identification and mitigation of barriers to STEM student success. It argues that equity gaps, preparation disparities, and financial constraints are not solely student-level challenges, but systemic outcomes rooted in how resources are distributed within and across institutions.

The presentation highlights community colleges as critical entry points in the STEM pipeline, particularly for first-generation, low-income, and historically underrepresented students. Despite serving students with the greatest needs, community colleges often operate with fewer resources for advising, tutoring, laboratory infrastructure, and faculty stability, exacerbating preparation gaps and limiting persistence in STEM pathways. Strategic investment at this level, such as funding corequisite math and science models, structured transfer pathways, and early academic support can significantly improve STEM readiness and transfer outcomes.

Together, the presentation frames STEM success as a system-wide responsibility, arguing that equity-centered resource allocation, is a powerful lever for transforming barriers into pathways and strengthening STEM attainment across the higher education ecosystem.

From Individual AI Fluency to School Wide AI Capability: Building AI Centers of Excellence

Joseph Wehbe, Chief AI Ecosystem Builder, Massachusetts AI Ecosystem by DAIMLAS

Higher education institutions face increasing pressure to integrate artificial intelligence (AI) into undergraduate STEM education, yet most efforts remain fragmented and dependent on individual faculty initiative. This limits scalability, creates inconsistent adoption, and constrains the ability to prepare students for AI-driven economies. This work addresses that gap by shifting from isolated AI fluency efforts to institution-wide capability through AI Centers of Excellence (CoEs).

The approach is grounded in a four-pillar AI fluency framework: how to work with AI, teach with AI, research with AI, and learn with AI. This is paired with an operational model for deploying AI CoEs, including identifying departmental AI champions, mapping high-value use cases across STEM disciplines, and establishing a centralized platform to curate validated AI tools and workflows. The methodology is vendor-agnostic and aligned with institutional priorities such as curriculum innovation, research productivity, and workforce readiness.

Evidence of effectiveness comes from implementations across academic settings, where this model has increased faculty engagement, accelerated identification of high-impact use cases, and improved instructional efficiency. Results indicate that combining AI fluency with structured governance enables a shift from ad hoc experimentation to systematic adoption.

Audience engagement will include a live demonstration of an AI-enabled workflow, a guided exercise to identify high-value use cases, and a practical blueprint for launching an AI Center of Excellence.

Participants will leave with a clear framework for scaling AI adoption, a replicable CoE model for undergraduate STEM contexts, and actionable strategies to enable sustainable, institution-wide AI capability.

A Cross-Sectional Exploration of STEM Persistence in College and throughout Career

Srebrenka Robic, Charles A. Dana Professor of Biology, Agnes Scott College; **Bonnie Perdue**, Professor of Psychology, Agnes Scott College; **Destiny Tisdale**, Assistant Director, CRM & Admission Operations, Agnes Scott College

Agnes Scott College (ASC), a private liberal arts college for women in Decatur, Georgia, seeks to understand persistence of women in STEM both during undergraduate years and as they continue in their STEM careers. Funded by NASA MUREP WCU program, the College developed the Alumnae Network and Career Resources program (ANCR) to explore the challenges facing women in STEM careers. Research methods included surveys and a focus group centered around the overarching research question: What is the likelihood of women leaving STEM careers at different points in their career and in their life cycle, and what factors contribute to these decisions? Study participants included current students and alumni. The goal of this project is to determine how responses to this question differ across age and employment status and according to the various demographic differences represented by ASC alumni. We also examine the role of self-efficacy and science identity, as well as exposure to and participation in high impact practices, such as full-time research experiences. We plan to highlight a few strategies that this research has identified to potentially increase persistence for women in STEM, and to engage the audience in a brief discussion of their experiences. Participants in our sections will

1. Identify key factors influencing retention of women in STEM in various stages of career development
2. Compare and contrast challenges faced by students to those faced by women in STEM after graduation
3. Explore the development of career mentoring opportunities between students and alumni