110ᵗʰ Meeting of the 1909 Conference: Advancing Thought, Research, and Practice in Technology and Engineering Education
Crowne Plaza Downtown, Memphis, TN

Thursday, November 14, 2024

9:00 a.m.	Welcome, Introductions and Announcements **Michael Daugherty, 8ᵗʰ Life Chair, 1909 Conference**
9:30 a.m.	**SESSION I: Innovation in the Classroom**
Presiding:	Tyler Love, University of Maryland Eastern Shore

1. Empowering students through gold-standard problem-based learning in technology and engineering education

This presentation explores the transformative potential of Problem-Based Learning (PBL) to equip both pre-service and in-service technology and engineering educators with the pedagogical skills necessary to foster innovative and critical thinkers. We explore PBL Works (formerly the Buck Institute), framework for Gold-Standard PBL, emphasizing its seven essential elements.

Presenters: Molly S. Miller, Penn Manor High School & Scott A. Warner, Millersville University

2. Weaving indigenous and diverse perspectives into integrated STEM education

Engaging students from diverse backgrounds requires integrating their cultures and languages into STEM education. This presentation explores how to achieve this by focusing on the TRAILS (Teachers and Researchers Advancing Integrated Lessons in STEM) project, specifically its adaptation for the Hawaii cohort in its third year. Hawaii's culturally rich environment presented a unique opportunity to modify the TRAILS project and the presentation will showcase how the program was adapted for this context.

Presenters: Jung Han, Purdue University; J. Geoffrey Knowles, Bryan College; & Todd Kelley, Purdue University

3. Making and doing essentials for STEM education

Since the early 21st century, the Technology Education/Technology Engineering field has evolved to include pre-engineering and STEM concepts, while traditional educator preparation programs have declined, leading to an influx of non-traditional teachers. This shift has created a need for essential "making and doing" skills—creative thinking, problem-solving, visualization, prototyping, and using tools and machines—to ensure continuity with the foundational principles of Technology Education and enhance STEM learning experiences.

Presenters: Steven L. Miller, North Carolina State University & Glenn R. Moore, III, New Hanover High School

4. **From trash to a career: Using post-consumed plastic to spark critical thinking in today's sustainability-minded students**

   Recycling High-Density Polyethylene (HDPE) offers both an environmental solution to plastic waste and a powerful educational tool to inspire future sustainability leaders. By integrating HDPE recycling into curricula, students gain hands-on experience with real-world sustainability challenges, preparing them for impactful careers in recycling, engineering, and environmental science.

   Presenter: Randall W. Jordan Jr, Fort Hays State University

11:30 a.m. – 1:30pm Lunch Break (on your own)

1:30 p.m.   SESSION II: Exploring STEM Capabilities

Presiding: Byron McKay, Pittsburg State University

5. **The potential of children using programmable robot construction kits: A comparative study of expected and actual abilities and skills of primary school children**

   This study involving children and their parents examined the gap between children's actual abilities and their parents' assessments in building and programming LEGO® Education SPIKE™ robots. The results showed that parents consistently underestimated their children's skills, with the underestimation becoming more pronounced from second to fourth grade.

   Presenters: Martin Fislake, Leah Marlene Christ, & Lina Klaes, University of Koblenz, Germany

6. **Investigating cognitive discrepancies between verbalized and written feedback in 9th-grade engineering students' evaluation processes**

   This study investigates the cognitive differences between what 9th-grade engineering students verbalize during Thinking Aloud (TA) sessions and what they write as feedback while evaluating design artifacts. By comparing verbal and written responses, the research aims to uncover insights into students' evaluative thinking, with the goal of enhancing teaching methods that improve critical thinking and the expression of reasoning.

   Presenters: Daniel Bayah, Andrew Jackson, University of Georgia; Nathan Mentzer, Purdue University; & Scott Bartholomew, Brigham Young University

7. **A proposed study on digital vs. physical engineering notebooks and their alignment with the Standards for Technological and Engineering Literacy**

This study explores the integration of digital engineering notebooks in technology and engineering curricula, aiming to provide students with practical documentation skills for future academic and professional settings. By comparing digital and physical notebooks, the research investigates student experiences and challenges, offering recommendations for best practices in aligning digital tools with educational standards.

Presenters: Marissa M.S. Franzen and Erik Schettig, North Carolina State University

8. **Draw a Coder**

The draw a scientist test asks children to draw what a scientist looks like; these drawings are analyzed and the results offer insights into how scientific careers are viewed and how early these perceptions form. Building on this concept, we developed the Draw a Computer Scientist Test to understand perceptions of children related to computer science and computer scientists.

Presenter: Scott Bartholomew, Steven Shumway, Brigham Young University; & Jessica Yauney, Stanford University

3:30 p.m.   Traditional 1909 Conference Group Photo

3:45 p.m.   1909 Conference Business Meeting

Presiding: Michael Daugherty, 8th Life Chair, 1909 Conference

1. Report of the Membership Committee
    a. Vinson Carter, University of Arkansas
2. Consideration of nominations for membership
3. Life-Chair Nominating Committee Report
    a. Kevin Sutton, Appalachian State University
4. Transition Committee Report – STEC/1909 Merger
    a. Dominick Manusos, Appalachian State University
5. 1909 Conference Benefactors
6. Life Chair Transition
7. Other Business

<u>**Friday, November 15, 2024**</u>

8:30 a.m.   Installation of New 1909 Conference Members and New Life Chair

Master of Induction Ceremony: Aaron Clark, North Carolina State University

9:30 a.m.   SESSION III: Supporting STEM Students

Presiding: Steven L. Miller, North Carolina State University

9. **Examining Trends in Technology Teacher Openings in the United States Utilizing Artificial Intelligence**

Technology and Engineering Education (T&EE) in the United States is rapidly evolving, driven by technological advances, changes in state and federal policies, and trends in the educational landscape. Reviewing each state's teacher database system for teacher openings in the 2023-2024 school year, this paper examines the trends seen with these teaching opportunities as well as regional disparities. These trends and disparities can help technology teacher preparation programs in understanding what movements are increasing in their respective regions. By examining this data, challenges are seen for technology teacher preparation programs, such as the continuing need for professional development and the ever-increasing shortage of qualified T&EE teachers in the United States. More importantly, the presenters will provide an overview of the analysis completed by ChatGPT. Demonstrations of how the presenters utilized ChatGPT to analyze the data and how others can create their own GPT to unlock endless opportunities with artificial intelligence. Recommendations for future research will also be presented.

Presenters: Trevor Maiseroulle & Byron McKay, Pittsburg State University

10. **A qualitative comparison of undergraduate student motivation toward making and doing**

This study explores the motivation toward making and doing among undergraduate students at a regional university in the Northeastern U.S., using hermeneutic phenomenology to examine their lived experiences in two hands-on courses. Findings will inform comparisons with a previous study and help technology and engineering educators develop curricula that enhance student engagement and technological literacy.

Presenters: Justin C. Egresitz, Madison Hansen, & Heidi Klosheim, Millersville University

11. **Designing technology for people**

Incorporating ethnographic methods into design technology classrooms equips students to practice human-centered design by fostering empathy and understanding of cultural factors shaping user experiences. Purdue University's course, Designing Technology for People, co-taught by anthropology and design educators, uses ethnographic research to guide students in developing design mock-ups, with this presentation highlighting the specific pedagogical strategies used to teach these methods.

Presenters: Sarah Renkert, Sherylyn Briller, Abrar Hammoud, Jung Han, & Todd Kelley, Purdue University

12. **Reinforcing support for STEM students: retention, persistence, and degree timelines**

This study analyzes STEM students who completed an introductory engineering graphics course at a large land-grant university utilizing elements of student-centered learning. Results highlight the importance of early student-centered support, as most students take longer than the traditional four years to graduate, with recommendations to provide resources throughout realistic degree completion timelines.

Presenters: Erik J. Schettig, Daniel P. Kelly, Aaron C. Clark, North Carolina State University & Jeremy Ernst, Embry-Riddle Aeronautical University

11:30   **SESSION IV: Lunch and Graduate Student Research Poster Session – meal is provided for 1909 Conference members/guests**

Presiding: Philip A. Reed, Old Dominion University

This is a research poster session for graduate students. It is designed to allow graduate students to share completed research and research in progress in a low-pressure environment. Participants will display posters and discuss the research with conference members and guests.

Vertically Aligning Novel STEM Workforce Contexts Across Schools: Bringing Microelectronics & Semiconductors to K-12 Classrooms

Workforce concerns have driven STEM initiatives in K-12 education, including a new program focused on vertically aligning semiconductor and microelectronics education across school districts. This study examines the vertical alignment process of the initiative, aiming to provide lessons and examples for integrating such content across grades and disciplines.

Presenters: Tori Constantine, Deana M. Lucas, Yubin Lee, & Greg J. Strimel, Purdue University

Challenges and Experiences of High School Technology Teachers in the Republic of Korea

In the Republic of Korea, high school technology education is offered as an elective called *Technology and Home Economics*, with a revised curriculum set to launch in 2025 to better meet societal demands. This study examined the curriculum's status and teacher experiences, finding a decline in technology education offerings and an increase in career-related electives, providing insights for the future of Korea's technology education.

Presenters: Yubin Lee & Greg J. Strimel, Purdue University

Surveying the Landscape of Engineering and Technology Education

Engineering students often face elevated academic stress due to rigorous coursework and pressure to maintain high grades, which can lead to addictive behaviors toward technologies like generative AI tools. This study will use the I-PACE model to examine the relationship between academic stress and reliance on generative AI, with trust in AI as a moderating factor and anxiety as a potential mediator.

Presenter: Niloufar Bayati, North Carolina State University

12:30 p.m. SESSION V: Looking Toward the Future

Presiding: Leah R. Cheek, University of Arkansas

13. Addressing STEM workforce shortages with AeroEducate: Program development and growth

AeroEducate is a collaborative initiative addressing workforce shortages in aviation by providing youth, educators, parents, and counselors with resources to explore aviation careers. This presentation will highlight the program's development, growth to over 60,000 users, and how it serves as a model for workforce development in other industries, offering attendees free access and partnership opportunities.

Presenter: Kevin Sutton, Appalachian State University

14. Simulations training: Advancing technological training and practice in emergency management technology

The proposed research will address Emergency Management supports the functions, its integration with technology will further advance efforts in creating a sounder infrastructure for executing an emergency response to assist communities in becoming resilient after the devastation. Technology simulations will improve planning, forecasting, detecting/securing, and information sharing.

Presenter: Jessica L. Murphy, Jackson State University

15. Surveying the landscape of engineering and technology teacher preparation

Recent research highlights the ongoing critical shortage of teachers entering engineering and technology education (ETE), with declining teacher education programs and insufficient graduates to meet demand. To address this, the Council on Technology and Engineering Teacher Education (CTETE) is launching a comprehensive survey to assess certification programs and gather insights from state-level leaders, aiming to better understand both the supply and demand for ETE teachers.

Presenters: Joshua Brown, Daniel Kelly, Joseph Furse, Andrew Jackson, Steven Miller, Emily Ruesch, Erik Schettig, Euisuk Sung, David White

16. Responding to declining numbers of teacher education programs and enrollments

Despite challenges such as teacher shortages and declining technology teacher education programs, there is growing excitement around Technology and Engineering (T&E) education, thanks to increasing participation in the Technology Student Association and its rising importance in STEM programs. This positive momentum presents a great opportunity to brainstorm creative solutions, as educators and leaders come together to explore ways to revitalize T&E education and inspire the next generation of students and teachers.

Presenter: Clarke Green, Buffalo State University

3:00 p.m.   Conference Awards Program

Presiding: **Michael Daugherty**, 8th Life Chair, 1909 Conference
Session Chair: **Kevin Howell**, Epsilon Pi Tau

During this session, members and guests will vote to select the *Epsilon Pi Tau Outstanding Conference Presentation Award* recipient and that award will be presented by *Epsilon Pi Tau*.

Following this presentation, the *Technical Foundation of America* will present the *Outstanding Publication Award*—which was determined prior to the start of the conference.

3:30 p.m.   Report from the Conference Pollution Committee

Presiding: **Kevin Sutton**, Appalachian State University

Although not officially connected to the Pollution Committee, Dr. Sutton will share the infractions from the 2024 - 1909 Conference. All members and guests should remember that you can and will be fined for attempting to ascertain the names of members of the Pollution Committee.

4:15 p.m.   Conference Life Chair Transition and Conference Adjournment

Presiding: **Michael Daugherty**, 8th Life Chair, 1909 Conference