

**The Joint Conference of the  
106<sup>th</sup> Mississippi Valley Technology Teacher Education Conference and the  
57<sup>th</sup> Southeastern Technology Education Conference**

Clarion Hotel, Nashville Downtown Stadium, Nashville, TN  
November 14-15, 2019

**Thursday, November 14, 2019**

**9:00 a.m.** Welcome, Introductions and Announcements  
**Dr. Michael Daugherty, Life Chair, MVTTEC**  
**Dr. Keith Besterman, President, STEC**

**9:30 a.m.** **SESSION I: STEC SESSION**

**1. A Model for Identifying At-Risk Students in Engineering and Education (30 min)**

There has been an overwhelming push to get K-12 students from all backgrounds interested in STEM careers, including engineering, so there remains a sufficient workforce to tackle future technical challenges. However, engineering programs and the STEM-related field continue to have an issue with low persistence rates with only around 53% of declared first-year engineering students graduating with a bachelor's degree in engineering (Ohland et al., 2011). This presentation will review the establishment of a protocol to identify at-risk student in undergraduate engineering curricula.

**Dr. Aaron Clark, North Carolina State University**

**Dr. Daniel P. Kelly, Texas Tech University**

**Dr. Jeremy V. Ernst, Embry-Riddle Aeronautical University**

**Dr. Kevin G. Sutton, North Carolina State University**

**2. First-Generation College Students' Intrinsic Motivations for Majoring in Technology/Engineering Education (15 min)**

Deciding which college major is the right fit is a complex process that may be influenced by several factors. Students who are the first in their families to attend college face numerous barriers that stem from the absence of parental experience at a four-year college. Among these is how to select the best major for their skill set and interests. This presentation discusses the intrinsic motivations of first-generation college students at one university when selecting a technology/engineering education major through the Self-Determination Theory of Motivation theoretical framework.

**Diedre Kelly, Graduate Student, North Carolina State University**

**11:00 a.m.                   SESSION II: MVTTEC Research on Engineering Design and Problem Solving**  
**Lunch Session - (lunch provided for MVTTEC/STEC members/guests)**

Presiding:                   **Dr. Raymond Dixon, University of Idaho**  
Session Chair:             **Dr. Lynn Basham, Virginia Department of Education**

**1. Scaffolding Students' Design Experiences in Technology and Engineering Education: Thorough Problem Scoping**

High proficiency, expert engineers thoroughly scope problems by “identifying criteria, constraints, and requirements; framing problem goals or essential issues; gathering information; and stating assumptions about information gathered” in turn promoting the implementation of various outcome driven heuristics. Expert engineers do not tend to go step-by-step through a fixed design process, but they do transition through design stages and several iterative design cycles. Whereas engineering students (i.e. novices) are singularly focused on a solution and not an iterative design process; students spend less time at nearly all stages of the design process. There is pronounced difference between experts and students in time spent at the problem scoping stage. This research addresses increasing the effective time novices spend at the problem scoping stage.

**Dr. Andrew J. Hughes, California State University—Santa Barbara**  
**Dr. Cameron D. Denson, North Carolina State University**

**2. Learning by Evaluating: Using Adaptive Comparative Judgment**

The results from an exploratory project with first-year undergraduate students enrolled in a university design thinking course. The study investigated the potential for using evaluation and comparison practices as a learning intervention toward improving student design thinking. Specifically, the researchers sought to identify the impact of engaging students as judges in adaptive comparative judgments (ACJ) of previous student work. The researchers hypothesized that if students compared and evaluated student artifacts *prior* to completing their own version of the same assignment they would perform better than their peers who were not asked to evaluate prior work. Final results revealed that the 10 highest ranked products were all from students in the experimental group. Further, nine of the bottom 10 ranked products were all from the control group.

**Dr. Scott Bartholomew, Purdue University Polytechnic Institute**  
**Dr. Nathan Mentzer, Purdue University Polytechnic Institute**  
**Matthew D. Jones, Graduate Student, Purdue University Polytechnic Institute**  
**Shawn Farrington, Continuing Term Lecturer, Purdue University Polytechnic Institute**  
**Nastasha, Johnson, Graduate Student, Purdue University Polytechnic Institute**  
**Lakshmy Mohandas, Graduate Student, Purdue University Polytechnic Institute**  
**Scott Thorne, Graduate Student, Purdue University Polytechnic Institute**

**1. Emergency Management: A Concentration in Technology Education with Certificates and Certifications to Complement Degree**

Technology education degree programs help program participants to acquire skills in technological processes. These same skills can be an essential asset to emergency managers. Degree programs, certificates, and certification in Emergency Management are experiencing rapid growth in academia, and they have national and international

acclaim. Since typical entry-level education for employment is now a bachelor's degree, a professional certificate of completion or a specialized certification in Emergency Management will further educate students on the basic vocabulary and its usage, and principles, theories, and problems associated with emergency management. Professional certificates and certifications also enable students to develop an emergency procedure plan, develop a framework that will assist in reducing societal vulnerability to hazards and disasters, develop a strong public affairs perspective, comply with the Federal Emergency Management Agency (FEMA) standards of all types of hazards, and apply modern technology to aid in pending emergency/disaster preparedness and response.

**Dr. Jessica L. Murphy, Jackson State University**

### **3. STEM Integrated Lesson and Teacher Collaboration**

In integrated STEM education, teachers need to collaborate to provide learners with an authentic and collaborative learning experience. Research confirms that the integration of knowledge and instruction techniques of the teachers and their cooperation with STEM experts foster learner cognitive development and teacher self-efficacy. During teacher professional development and in-service, researchers, educators, and industry partners cooperated to provide a variety of opportunities to teachers and students to experience STEM content integration. Qualitative and quantitative results from the TRAILS three-year-long project shows the effectiveness of STEM integration in the classrooms, which will guide educators to further investigate how to support teacher collaboration

**Dr. Todd Kelley, Purdue University Polytechnic Institute**

**Dr. Geoff Knowles, Purdue University Polytechnic Institute**

**Dr. Jung Han, Purdue University Polytechnic Institute**

**1:30 p.m.**

**SESSION III: STEC**

#### **1. The Development and Evaluation of Rubrics Used to Assess the Quality of Pre-Service Teachers' Teaching Practices in STEM Education (30 min)**

The need to build a more knowledgeable and skillful professional teaching force is at the forefront of many educational initiatives. In the past decade institutions of higher education (IHE's) have been called to evaluate and improve their teacher education programs to prepare teachers with better knowledge of learners, content, and teaching. However, currently there is tremendous diversity amongst teacher preparation, to identify core high-leverage practices that cut across all of the different domains of teaching. The purpose of this study provides further justification on what these core high-leverage practices are and the potential use of an alternative instrument with promising psychometric properties.

**Dr. Nolan Fahrner, North Carolina State University**

**2. Using collaboration to revitalize the technology teacher preparation programs (15 min)**

TSA has over 250,000 members while the CTETE reports only 240 freshmen in technology teacher preparation programs across the United States. Can a collaboration between CTSOs and universities be the answer to our teacher shortage? My research will investigate 1) if there is collaboration between CSTOs and university teacher preparation programs and 2) what collaboration efforts can be done to increase the number of freshmen entering the university teacher preparation programs.

**M. Kathleen Ferguson, Graduate Student, Old Dominion University**

**3. Professional Teacher Identity Development in Beginning Technology Education Teachers (15 Min)**

Development of dissertation topic seeking to identify aspects of how professional teacher identity is developed during the first five years of teaching for technology education teachers and the effects on future decisions to remain in the classroom after the five-year mark.

**Teena Coats, Graduate Student, North Carolina State University**

**4. Exploring the Relationship Between Empathetic Mentoring and the Mental Health of Graduate Engineering Students (15 min)**

Graduate students experience mental illness at nearly twice the rate of the general population, with the reasons ranging from overwork to unsupportive faculty. In an effort decrease mental illness among the graduate student population, I propose a 3-pronged approach to studying the relationships between engineering graduate students and their primary advisers. This study will explore the support given to/felt by students from their advisers using ethnographic and biological response methods. It will also measure student mental health using clinical evaluations. This will help to define the potential influence that adviser-student relationships have on student well-being.

**Liesl Krause, Graduate Student, Purdue University Polytechnic Institute  
Dr. Greg Strimel, Purdue University Polytechnic Institute**

**5. Designing Teacher Preparation Courses for Evolving Technology Education Content (15 min)**

The twenty-first-century work environment requires an ever-increasing level of technological literacy and competency. These continually evolving requirements necessitate rethinking what and how we prepare courses for many Technology Education subjects. This presentation recounts the voyage of creating "An Introduction to Coding

for Educators," a course constructed and delivered in just six weeks. This presentation will cover what was done and why, and recommendations on how to create a similar course for yourself.

**John W. Howe, Graduate Student**

**3:15 p.m.                   SESSION IV: MVTTEC Teacher Preparation**

Presiding:               **Dr. Andy Klenke, Pittsburg State University**  
Session Chair:       **Dr. Dan Kelly, Texas Tech University**

- 1. Alternative Teacher Licensure Requirements and Teacher Shortages in Our Field**  
Career and technical education, which includes engineering and technology education, continues to face an annual shortage of qualified teachers in the profession. This shortage has caused an increase in the use of alternative certification/licensure pathways across the United States. The National Research Center for Career and Technical Education found there were 105 alternative licensure pathways in the 50 states and District of Columbia. These alternative pathways are highly divergent from state to state. The results of this study indicate, despite the increased use of alternative routes to CTE teacher certification and the loosening of state policy requirements, efforts to combat the CTE teacher shortage are failing.

**Dr. Britton H. Devier, Ohio Northern University**

- 2. How Can Career Switchers and/or Teachers without Formal Training Be Quickly Prepared to Teach Engineering and Technology Education?**  
Old Dominion University provides an eight-hour, hands on workshop to train teachers in design-based learning, production laboratory safety, and laboratory management. The teachers are provided with information about technology education content and pedagogy as well as safety contracts, legal liability, and machine use and maintenance. Teachers in the program learn important laboratory safety procedures and tool skills through instruction, demonstrations, and an active learning project. The workshop is co-hosted by the ODU Technology Education Program and the Virginia Technology and Engineering Education Association (VTEEA).

**M. Kathleen Ferguson, Old Dominion University**  
**Dr. Philip A. Reed, Old Dominion University**

**4:30 p.m.                   SESSION V: MVTTEC Business Meeting**

Presiding:               **Dr. Michael Daugherty, Life Chair, MVTTEC**

1. Report of the Membership Committee
  - a. **Dr. Vinson Carter, University of Arkansas**
3. Consideration of nominations for membership

4. Other Business

**4:30 p.m. STEC Past Presidents and Officers Meeting**  
Clarion Hotel Lounge

**6:00 p.m. MVTTEC/STEC Reception: Hotel Lounge/Bar**

**Friday, November 15, 2019**

**8:30 a.m. Installation of New MVTTEC Members**  
**Master of Induction Ceremony: Dr. Aaron Clark, North Carolina State University**

**9:00 a.m. SESSION VI: STEC Sessions**

**1. The Impact of Interactive Science Notebooks on Self-Efficacy and STEM Career Interest (30 min)**

As a follow-up to a graduate presentation from STEC 2018, the results of one study which explored how Interactive Science Notebooks, used as a learning tool during instruction, will be revealed as it relates to student self-efficacy in expressing science content knowledge and interest in pursuing a STEM-related career. This presentation discusses the results of the integration of interactive notebooks into elementary school instruction as a useful practice and includes a unique follow-up of both the researcher and perspective from her current administration.

**Jessica Krachenfels**  
**Christine Sherretz, Principal, Camp Lejeune Schools**

**2. Expansion of a K12 Engineering Epistemic Frame for Peer Assessment via Mobile Applications (30 min)**

The EEFK12 is a frame consisting of 5 components (Skills, Knowledge, Identity, Values, and Epistemology, heretofore known as SKIVE). Each of those components has sub-codes (components). The EEFK12 was developed to observe K-12 students during interactions to capture how they express certain examples (instances) of knowledge. To further expand its use, a web mobile application has been developed so that students will be able to serve as peer judges and decide when other students are displaying any of the SKIVE elements. This presentation will describe its development and allow for a demonstration.

**Dr. Tamecia Jones, North Carolina State University**

### **3. Using Math Talks to Drive Student Inquiry (15 min)**

Within my Fifth Grade Math classroom, we use math talks daily to connect Math Language and Schema through discussions. These discussions drive instruction which help build a supportive foundation for students in their Math learning.

**Rebekah Baughman, Graduate Student, Virginia Tech University**

**10:30**

## **SESSION VII: Future Directions and Opportunities**

Presiding: **Dr. Stephen Fardo, Eastern Kentucky University**

Session Chair: **Dr. Ryan Brown, Illinois State University**

### **1. Program Revision: Preparing Technology and Engineering Teacher Candidates for Teaching in Diverse Classrooms**

In what ways are Technology and Engineering Education students prepared with the methods and knowledge to effectively teach underserved populations? The nature of the technology and engineering classroom continues to change, especially in the urban setting. Students' language, cultural identity and disabilities are at the forefront of the increasingly diverse student population witnessed in most schools systems. How can a teacher education program assist teacher candidates with the development multicultural awareness that is infused in their pedagogies? The Feinstein School of Education and Human Development at Rhode Island College revised its programs to provide solutions for fulfilling the need for more culturally responsive novice teachers through a combination of practices, including: early career experiences in urban classrooms, Special Education and Teaching English as a Second Language endorsements, and professional sequence revisions that embed multi-cultural themes.

**Dr. Charles McLaughlin, Rhode Island College**

### **2. International Implications for STEM Education: Building Botswana Capacity to Transform from a Resource-Based to a Knowledge-Based Economy**

For developing countries, a key factor in economic growth is the improved teaching and learning of science, technology, engineering and mathematics (STEM) content. In fact, preparing the next generation of STEM workers may be the key to creating a globally competitive economy. Those working in STEM careers will have a direct impact on the economic growth of a country. For countries with an eye towards building a globally competitive economy there has been a renewed international focus on STEM education. This new focus stresses innovation and the applied process of designing solutions to complex contextual problems. This is particularly important for a country like Botswana as it seeks to fundamentally change the driving forces of its economy. This presentation will explore some of the STEM research taking place in Botswana.

**Dr. Cameron Denson, North Carolina State University**

**Dr. Andrew Hughes, California State University—Santa Barbara**

**12:00 p.m.**

**SESSION VIII: STEC Session**

**Lunch Session - (lunch provided for MVTTEC/STEC members/guests)**

**1. No Debate About It: Addressing Socio-technological Issues (30 min)**

The affective domain is often overlooked in technology and engineering education. Learn how debates can be used to have students research and engage in complex socio-technological issues. A simple debate format will be shared as well as strategies for strengthening student research, debate, and assessment skills.

**Dr. Philip A. Reed, Old Dominion University**

**M. Kathleen Ferguson, Graduate Student, Old Dominion University**

**2. Exploring the Impact of Computational Labs in a Business Calculus Course (15 min)**

Students from a variety of majors often leave their introductory calculus courses without seeing the connections and utility it may have to their discipline and may find it uninspiring and boring. To address these issues, there is a need for educators to continue to develop and research potentially positive approaches to impacting students' experience with calculus. This presentation discusses a method of doing so, by studying students' understanding of and attitude toward calculus in a Business Calculus course using computational labs to introduce students to calculus concepts often in context of a business scenario.

**Brielle Spencer-Tyree**

**3. Expanding Adaptive Comparative Judgment Assessments for Learning in Business**

Adaptive Comparative Judgment (ACJ) assessments have been used in many disciplines, particularly in technology and engineering education with student portfolios. ACJ has been shown to work well not only as a formative and summative assessment, but also as a platform to enhance learning. This study is the first time ACJ has been used in an accounting classroom using student-created spreadsheets. Using the typical business case method approach to learning, student teams will use ACJ at three intervals throughout the course to enhance learning. Student and team psychological safety will be assessed as they navigate the new challenge of comparing and judging each other's work.

**Matthew Jones**

**Dr. Scott Bartholomew, Purdue University Polytechnic Institute**



**4. Bridging the Gap of 2+2 Programs: The Impact of REU Programs for Community College Students (Proposed Dissertation)**

Undergraduate research experiences can be a life-changing opportunity for professional, technical, and research skill development. However, it can be geared towards four-year institutions and not community colleges. At FREEDM, the Research Experience for Undergraduate (REU) program has created an inclusive culture between community-college and four-year institute students. Community college REUs, especially 2+2 students, gain additional benefits and skills that allow them to be more successful entering a four-year institution and when entering the workforce. Proposed is a phenomenological case study on the impact of undergraduate research on community college students in the 2020 REU Program for a dissertation.

**Megan Morin, Graduate Student, North Carolina State University**

**5. Innovative Thinking - an Essential 21st Century Skill (30 min)**

Innovation is considered the currency of modern-day industry. To best prepare students to be marketable and globally competitive, they need the skill of innovation. This presentation will demonstrate the curriculum to teach innovation, and highlight the research and statistics resulting from teaching this curriculum over the past 7 years.

**Dr. Geoff Wright, Brigham Young University**

**6. What the Next Generation Thinks About Manufacturing (15 min)**

Manufacturers in the United States continue to express concerns about talent shortages, citing the career misconceptions held by students as one of the major contributing factors. To address this concern, several manufacturer-driven outreach initiatives have been developed, launched, and expanded within a multi-county region of Indiana. However, research efforts were necessary to determine how such initiatives influence children career perceptions. Accordingly, this presentation will highlight preliminary results from the analysis of data collected before and after these manufacturing events and discuss how this information can be used for enhancing outreach and preparing children for the future of work.

**Chidubem Nuela Enebechi**

**Liesl Krause, Graduate Student and Fellow, Purdue University Polytechnic Institute  
Sydney Serban, Undergraduate Researcher, Purdue University School of Aerospace and Aeronautics Engineering**

**Filothei Lagos, Undergraduate Researcher, Purdue University**

**Dr. Greg Strimel, Purdue University Polytechnic Institute**

Presiding: **Dr. Charles McLaughlin, Rhode Island College**  
Session Chair: **Dr. John Flanagan, Goodheart-Wilcox**

**1. Cognitive Apprenticeship in Technology Education Using Spatial Analysis of Positions and Movements of Classroom Participants.**

Recent educational reforms in the United States have attempted to transform classroom instruction from teacher-centered methods to student-centered learning approaches using inquiry, design, hands-on, collaborative problem-solving techniques. The cognitive, behavioral, and social merits of learning through making in technology education should not be overlooked, but little is investigated about how making activities are different from traditional classroom practices. The primary goal of this study is to examine how design-based instructions support students' learning by analyzing the positions and movements of teacher and students. This study adopted a spatial analysis approach to capture the positions of teacher and students at intervals of 120 seconds.

**Dr. Euisuk Sung, New York City College of Technology, Career and Technology Teacher Education.**

**2. Leadership: The Long and Winding Road**

Insights into the 43-year career path of a technology education professional's road to the presidency. This journey wound its way from high school shop teacher to grad school to three university faculty appointments including full professor with tenure to community college technical Dean to university college Dean to community college VP/Provost and finally to community college President. The intent is to enlighten future leaders concerning the road ahead.

**Dr. David H Devier, President, Glen Oaks Community College**

**3:00 p.m. MVTTEC Adjournment**  
Presiding: **Dr. Michael Daugherty, Life Chair MVTTEC**

**3:15 p.m. STEC Business Meeting**  
Presiding: **Dr. Bryanne Peterson, Virginia Tech University**