

102nd Conference

STEC/Mississippi Valley Technology Teacher Education Conference

Clarion Hotel, Nashville Downtown Stadium, Nashville, TN
November 5-6, 2015

Thursday, November 5, 2015

9:00 a.m. Welcome, Introductions and Announcements

9:30 a.m. **SESSION I: Leadership Role for Technology and Engineering Education**

Presiding: **Carl Blue**, University of Maine

Session Chair: **Steve Barbato**, ITEEA

1. How can technology and engineering educators prepare diverse educators to deliver hands-on problem based STEM learning? Over 450 upstate K-12 classroom teachers, K-12 administrators and business/industry leaders in the Upstate of South Carolina have participated in integrative STEM education institutes during the last nine years. Participants are developing knowledge and skills to create and implement relevant and innovative integrative STEM curricular content and activities for use in their classrooms. The integrative STEM education institutes are designed to provide a forum for educators in Upstate South Carolina who share the goal of transforming integrative STEM education in local schools.
 - **William Havice**, Clemson University
2. What role can technology and engineering educators play in providing professional development for other educators? Elementary teachers in northwestern Wisconsin are learning how to use engineering design problems to deepen their students' understanding of science concepts and the science and engineering practices of the Next Generation Science Standards (NGSS). The Advancing Science Learning (ASL) project, funded by a Wisconsin Improving Teacher Quality (WITQ) grant, partnered 12 school districts in northwestern Wisconsin with faculty members in science, engineering, and education from the University of Wisconsin-Stout. This presentation will share how teachers effectively used engineering problems to teach students about a wide variety of science concepts while engaging them in the engineering design process.
 - **Brian McAlister**, University of Wisconsin-Stout
3. In December of 2014 the Millersville University Dean's Council unanimously gave the final approval of the new structure and content for the graduate program offered by the *Department of Applied Engineering, Safety & Technology*. The new program is named a *Master of Education in Technology & Innovation*. All indications are that it is the only program of its kind in the country. The new program offers courses that are built upon concepts that are universal and enduring; patterns of thinking that are integral to one being technologically literate.
 - **Scott A. Warner**, Millersville University

4. How can integrated STEM content and problem/project-based learning influence change, increase student interest, improve student performance, and increase academic achievement in a local elementary school? The Adopt-A-Classroom project paired a doctoral student, specializing in integrated STEM education, with second grade teachers in a partner school's classroom one a month for an entire school year. The project introduced second grade students and second grade teachers to integrated STEM content lessons as well as problem/project-based teaching. Throughout the school year, numerous integrated STEM lessons were taught that targeted specific content from second grade STEM standards. These lessons delivered content in a real-world context while providing hands-on learning and 21st Century skills including problem solving and communication. Using data from two different second grade classrooms, the research attempted to determine whether the integrated STEM lessons impacted student's engagement among the STEM disciplines, their personally efficacy related to the STEM fields, as well as their career aspirations within STEM fields.

- **Lindsey Swagerty**, University of Arkansas

Noon - 1:15 p.m. SESSION II: Research on experiences that influence technology and engineering educators' content selection

(Lunch session – box lunches provided for members and guests)

Presiding: **John Iley**, Pittsburg State University
Session Chair: **Mark Mahoney**, Berea College

1. What preparation experiences that influence technology and engineering educators' teaching of science concepts? The purpose of this research was to investigate the extent of the relationship between T&E educators' select science and T&E preparation experiences, and their teaching of science content and practices. This study, which utilized a fully integrated mixed methods design (Teddlie & Tashakkori, 2006), was conducted to inform the pre- and in-service preparation needs for T&E educators. A random sample of 55 Foundations of Technology (FoT) teachers across 12 school systems within an ITEEA consortium state participated in an online survey, leading to eight teachers being purposefully selected for classroom observations. Data collected from the surveys and classroom observations were analyzed through Spearman's rho tests to examine the strength of the relationships between certain preparation factors and the teaching of science content and practices. These data were corroborated with FoT curriculum content analyses, classroom observation audio recordings and notes, and interview responses to help validate the results. The National Assessment of Educational Progress (NAEP) and the Planned Assessment of Technology and Engineering Literacy.

- **Tyler Love**, University of Maryland Eastern Shore

1:45 p.m. SESSION III: Research

Presiding: **Richard Seymour**, Ball State University
Session Chair: **Myron Eighmy**, North Dakota State University

1. Is the United States still a nation of doers, or have we become a nation of passive viewers who stay glued to the computer screen, television, or some other form of diversion—rather than being active tactile learners who could be learning by doing? Our nation's classrooms may also reflect an absence of doing by the lack of students' practicing hands-on/tactile, problem-solving activities. It appears that over the past several decades the approach to education has been to prepare students for standardized (high-stakes) tests versus teaching them how to apply the knowledge that they are expected to learn. To what extent are U.S. public school elementary and secondary education science, technology, engineering, and mathematics (STEM) students *doing* activities in their classrooms?

- **Johnny J. Moye**,

2. Transforming Teaching through Implementing InquiryT2I2 is an NSF funded research and development project that explores the use of cyberinfrastructure to significantly enhance the delivery and quality of professional development (PD) for grades 8-12 engineering, technology, and design teachers. The overall goals for the project is to study whether the use of highly interactive cyberinfrastructure increases this target audience's understanding of: engineering design concepts and ability to effectively teach them; addressing student learning needs; ability to manage, monitor, and adjust the learning environment; and the use of self-assessment to enhance teaching ability and engagement in a community of practice. The content is grounded in the vision and mission of the National Board for Professional Teaching Standards and with a minor objective to enhance the National Board "pipeline" for technology, engineering, and design educators. The online professional development system uses an object-oriented generic system design so that it can be reusable, adaptable, and scalable for about any situation or technology infrastructure.

- **Aaron C. Clark**, North Carolina State University

- **Jeremy Ernst**, Virginia Tech

3. What are the characteristics of exemplary teaching practice in technology and engineering education? This presentation will present an overview of the literature on exemplary teaching practices within subjects that emphasize project- and inquiry-based learning, with a specific emphasis on linking teaching strategies to desired student learning outcomes through formative and summative assessment. Examples are drawn from across multiple disciplinary fields, particularly science, with suggestions for how these can be used in the technology and engineering classroom. The implications for technology teacher education will be addressed.

- **Marie Hoepfl**, Appalachian State University

4:30 p.m. SESSION IV: Business Meeting

Presiding: **Michael Daugherty**, University of Arkansas

1. Report of the Membership Committee
 - a. **Jenny Daugherty**, Purdue University
3. Consideration of nominations for membership
4. Other Business

Friday, November 6, 2014

8:30 a.m. **Installation of New Members, Mississippi Valley Conference**
Ray Diez, Western Illinois University

9:00 a.m. – 10:30 p.m. **STEC Research Session I**

1. There are several reasons for exploring the potential of color information and its effects on improving spatial visualization ability. Color is one of the fundamental properties of objects and detected preattentively with other primary properties like brightness and line. Even though the role of color in object constancy and depth perception is clear, the value of adding redundant color as a spatial stimuli has attracted very little. A large amount of research has been done in this domain; however, the psychological processes through which color operates have not been explored fully. As a result, the field has observed certain conflicting results. To add to the related body of knowledge the following study was conducted. The following was the primary research question: Is there a difference in spatial visualization ability, as measured through technical drawings, among the impacts of visual cues (adding blue color) on dynamic visualizations for engineering technology students?

Petros Katsioloudis, Old Dominion University

Millie Jones, Old Dominion University Graduate Student

2. MonarchTeach is a unique collaboration between the College of Education and the College of Sciences at Old Dominion University. Through this innovative teacher preparation program, students majoring in mathematics or science are able to receive teacher licensure while still earning their degree in their content area. This is the first program to also use this model for the preparation of technology teachers.

Philip Reed, Old Dominion University

3. This presentation describes the initial efforts of a community of practice in design and creation to prepare pre-service teachers for teaching engineering and engaging in and with the community mediated by modeling artifacts. This project incorporates the latest research on inverted classrooms and best practices for online learning in an effort build a Maker Community of Practice. This CoP has been designed in a manner that makes it unique in the area of instructional technology and web-based learning. This project recognizes the importance of engaging community in the teaching and learning of engineering-based content. Service learning projects provide students - in this case pre-service teachers - with authentic real-world experiences which helps secure buy in from the student, teacher, and the CoP. Where this CoP is able to distinguish itself from other service-learning projects is the use of an inverted classroom format to facilitate instruction and the emphasis on modeling artifacts as a representation of student learning. Students learn from resources on the web and in turn develop their own resources and share them as tutorials and videos. Furthermore, the students not only publish what they have made and learned, but also are able to receive feedback from the community of practice as well.

Matthew Lammi, North Carolina State University

10:30 a.m. – 10:45 p.m. Break

10:45 a.m. – 12:15 p.m. STEC Research Session II

1. The success of a Generation III Engineering Research Center (ERC) is the collaboration among industry, education (pre college, undergraduate, and graduate programs), and research. Students and industry partners are key players to the Center's success. Industry has become proactive in the areas of K-12 outreach to ensure a trained workforce with the critical skills needed to succeed. Teacher participation in this area is important to ensure that they provide students with the necessary tools and skills for their future. Industry partners play a critical role in student learning and success (guest speakers, mentors, internships, feedback, industry tours, etc.) Industry advisory boards provide guidance for curriculum and new and existing programs. From the education perspective, it has been the interaction with industry to assist in building these working relationships. Identifying the key players who have the time and are willing to serve, finding their niche within the Center, and identifying a specific role for them. In Education, we need to be more involved with industry and those stakeholders outside the realm of education to gain a different perspective on how to conduct our work and most importantly how to best benefit our students. Students need the 21st century workforce skills and what is most important is to be able to have technical skills, communicate effectively, and collaborate in interdisciplinary and multicultural settings.

Pam Page Carpenter, NSF FREEDM Systems Center

2. Design challenges are often used as a pedagogical approach within Technology, Engineering, and Design Education and are commonly cited as addressing the design process that standard 11 of the national standards for Technological Literacy. Design challenges are also commonly cited as supporting constructivist pedagogical approaches. Where some students thrive in these design experiences, there are some students that become stuck in a particular step such as designing and constructing their prototype and do not have time to test their design until the project is being assessed on the due date. This presentation will report on an ongoing study investigating potential ways for teachers to enhance student success in semi-structured design challenges.

Cameron Denson, North Carolina State University

Kevin Sutton, North Carolina State University Graduate Student

3. In the pursuit of "Digital Literacy", the departments of Art, Communication and Media Studies, and Technology at the University of Southern Maine have been developing a "collaboratory" of course offerings with the goal of providing students with a balance of practical knowledge and advanced technology skills, as well as theoretical foundations to thrive in the digital world. This cooperation began with discussions with an interdisciplinary, affinity group of faculty met to discuss educational trends in "new media" and how those developments should be addressed by representatives from the Departments of Art, Communication and Media Studies, and Information and Communication Technology reviewed the barriers and difficulties students encountered in surveying cross-curricular explorations between the programs of study. This association incorporates not only cross-departmental collaborations, but also form cross-college connections between College of Arts, Humanities and Social Sciences, and the College of Science, Technology and Health. This presentation will discuss the development and obstacles of creating a cross-college partnership. The "Digital Media

and Design Minor.” Collaboration of courses in digital literacy, students are required to take two courses from outside their major in two of the disciplines as prerequisites prior to taking three course electives in which two are from outside their major for a total of 15 credits. At present, Fall 2015, these collaborative programs have developed an interdisciplinary minor for students in any major interested in the use of modern digital technology. The ambition of developing a new major within the USM that has potential to be delivered system wide.

Carl Blue, University of Southern Maine

12:15 p.m. – 1:00 p.m. Lunch/Joint Membership Committee Meeting MVC/STEC
(box lunches provided for members and guests)

1:00 p.m. – 3:00 p.m. STEC Graduate Research Session

1. STEM Teacher Efficacy in Inverted Classrooms
Daniel Kelly, North Carolina State University Graduate Student
2. Development of a Career Awareness Measurement Instrument
Wendy Grimshaw, Virginia Tech Graduate Student
3. Problem-Based Learning in Technical Graphics Courses
Nolan Fahrer, North Carolina State University Graduate Student
4. Evaluation for Gifted STEM Programs
Krista Stith, Virginia Tech Graduate Student
5. STEM and ESL Best Practices Alignment
Keith Besterman, Virginia Tech Graduate Student
6. Flipped Instruction for Technology and Engineering Educators
Daniel Kelly, North Carolina State University Graduate Student
Kevin Sutton, North Carolina State University Graduate Student
Aaron Clark, North Carolina State University

2:30 p.m. – 3:00 p.m. Graduate Research Q & A

3:00 p.m. – 3:15 p.m. break and new member nomination submissions

3:15-4:00 STEC Business Meeting, New Member Initiation and Closing Remarks

Presiding: **Jennifer Buelin-Biesecker**, STEC President 2014-2015, ITEEA

Incoming STEC President’s Charge: Paul Camick, DeKalb County Schools

Future Mississippi Valley Conferences:

103rd Conference, November, 2016, Chicago, IL

104th Conference, November, 2017, St. Louis, MO

Other Conferences:

ITEEA Conference, March 2-4, 2016, Washington, DC