8:00am

**Registration**

- 8:30am - 4:30pm, Oct 18
- Marriott 9 & 10
- Registration

9:00am

**1E: Evidence Based Teaching: Principles and Practice**

- 9:00am - 4:00pm, Oct 18
- Santa Fe

1:00pm

**1A: Engineering Education Funding at the National Science Foundation**

- 1:00pm - 4:00pm, Oct 18
- Marriott 9 & 10
- Authors: Elliot Douglas, Abiodun Ilumoka and Heather Watson (National Science Foundation, USA)

The goal of this session is to increase the participants' knowledge of current funding opportunities at the National Science Foundation (NSF) to support projects with potential significant impacts on science, technology, engineering, and mathematics (STEM) education. In particular, the discussion will focus on new and current funding opportunities in the Division of Undergraduate Education (DUE) in the Directorate of Education and Human Resources (EHR) and the Division of Engineering Education & Centers (EEC) in the Directorate of Engineering. During the session, we will provide examples of project activities that support STEM education research opportunities. The session will use a highly interactive format (i.e., team-based activities and discussion) to engage the participants, to clarify misconceptions, and to potentially initiate and share new ideas pertinent to engineering education research and innovations in classroom implementations. This session facilitates idea sharing and interaction amongst peers.

**1D: Project-Enhanced Active Learning Throughout STEM Curricula**

- 1:00pm - 4:00pm, Oct 18
- Lincoln
- Authors: Razi Nalim (Indiana University - Purdue University Indianapolis, USA); Peter Orono (Indiana University, USA)

Project-enhanced active learning (PEAL) is an intervention that integrates STEM concepts and deductive mathematical analysis with concrete and meaningful project experiences. Developed initially for gateway engineering science courses that students perceive as too abstract or unconnected to their professional aspirations, PEAL uses one or two major projects carefully designed to motivate and
scaffold student learning in STEM. A project is structured and mapped to the traditional topic sequence, is based on systems, objects, or activities familiar to students, and is not as open-ended as a typical 'capstone' project. Enhancing rather than replacing the deductive exposition that is indispensable for science and engineering fundamentals, it allows students to also inductively learn from design activity.

An NSF-sponsored evaluation of PEAL found that faculty early adopters were pleased with content learning outcomes, student engagement, and efficiency. This intervention is adoptable with minimal additional workload by typical harried instructors lacking pedagogical training. PEAL also appeared to enhance socialization and self-efficacy, improve motivation, enhance communication and team skills, and inculcate professionalism and project management skills. Unlike with traditional piecemeal homework, team commitment and a sense of ownership thwarted plagiarism. Early feedback on project difficulties and fundamental misconceptions through an online discussion board, led instructors to intervene early and make stronger connections with students.

The expected workshop outcomes are familiarity with the PEAL methodology and rationale, and ideas for project components in one or more courses. Participants are to actively work in pairs or small groups on generating project ideas and materials for a course of interest, after a succinct introduction. Participants will review PEAL strategies and implementation techniques, including alignment of the most challenging course topics with project tasks, use of an on-line discussion forum, substituting project tasks for traditional homework, and giving students ownership while managing workload and divergent thinking. Each group will brainstorm for project ideas for their course, and develop a feasible project outline, task structure, solution verification, and assessment approach. Groups will reassemble to discuss questions, opinions, and ideas.

The presenter is an experienced engineering professor who developed PEAL over a decade, led a multi-disciplinary national coalition to disseminate PEAL, and has presented PEAL workshops globally. The intended audience is college teachers of STEM fundamentals who will become champions of active learning strategies among their peers.

3:00pm

FIE Steering Committee Meeting
⏰ 3:30pm - 5:00pm, Oct 18
📍 Marriott 8

Open to the public. Please join us in order to make the future of FIE the best that it can be.

5:00pm

2A: SMART START: Designing Impact-Driven Projects
⏰ 5:00pm - 8:00pm, Oct 18
📍 Marriott 9 & 10

Authors: Karl Smith (University of Minnesota & Purdue University, USA); Rocio C. Chavela Guerra (American Society for Engineering Education, USA); Russell Korte (George Washington University)

This workshop is designed for researchers and innovators who want to deepen the impact of a project, product, or program to improve STEM education at any level and setting (e.g., formal or informal). The specific goals of the workshop include: • Expanding the impact of your research by identifying who
The FIE conference has throughout its history emphasized work at the frontiers of education. This workshop reflects a policy shift at the National Science Foundation, Department of Education, and Department of Defense, and others who have adopted the I-Corps™ model to extend the longevity and the value of initially funded projects. This cutting-edge workshop introduces the core features of the Lean Start Up process; namely, (1) search for a sustainable and scalable model using the Business Model Canvas, (2) Customer discovery, and (3) Agile engineering (i.e., iterate and increment towards an appropriate product, program or service)—all of which have been identified as essential for maximizing the longevity and impact of research projects and products.

2B: Increase Your Project's Success Through Coordinated Communication: Research and Practice

5:00pm - 8:00pm, Oct 18
Santa Fe

Authors: Ella L Ingram (Rose-Hulman Institute of Technology, USA); Elizabeth Litzler (University of Washington, USA); Beena Sukumaran and Tiago Forin (Rowan University, USA)

Engineering education researchers focus on research, putting research into practice, and creating innovative practice. These foci require meaningful communication that elicits a desired response (e.g. adoption of innovation). Innovation advocates and change agents know that communication is critical to a project's success. Without expertise in rhetoric, communications present significant challenges, but they are known challenges in the organizational change literature. We view a focus on communication as a major empowerment tool for advocates and change agents, thereby positively impacting the reach of innovative practices and research into our engineering classrooms. This workshop centers on providing a framework for communication, allies in communication efforts, and best practices in communicating change.

2D: Building Your Team of Change Champions

5:00pm - 8:00pm, Oct 18
Lincoln

Authors: Jennifer Karlin (Mainely Kaizen, LLC, USA); Cheryl Allendoerfer (University of Washington, USA); Dan Ewert (North Dakota State University, USA); Rebecca Bates (Minnesota State University, Mankato, USA); Ron Ulseth (Iron Range Engineering & Itasca Community College & Aalborg University, USA)

After participating in this workshop, individuals will: • Understand the variety of visible, invisible, and supporting roles on the change team; • Be able to articulate the types of roles central to different levels and sizes of change; • Describe the qualities and attributes needed in the variety of team members and how to train themselves and others in these skills; and • Be ready to scout for new team members among all constituencies.

While many efforts have been made to develop both technical and professional skills in engineering graduates, there has been little change in the pedagogy of most engineering education institutions in the U.S., despite the evolution of engineering education in many countries around the world. Many of
these improvement efforts involve changing only one or two aspects of the curriculum, and are bound to fail in making significant changes in the student learning experience due to the limited change in the curriculum. These failures, then, become the library of stories we tell ourselves about the feasibility of change. We choose, instead, to use a metaphor to insert new stories into the library, changing the expectations of how the story goes and granting a new autonomy to change agents to write their own endings.

This interactive workshop uses the metaphor of a baseball team to illustrate the variety of people-roles involved in making improvements happen, as well as the ecosystem in which these changes occur. When making smaller-scale changes, the members may be more loosely structured like a sandlot team, though core roles still need to be fulfilled. Larger-scale changes may require visible change champions with different specialties, such as managing and coaching staff, and a team maintaining the stadium. This workshop looks at the broad scope of individuals necessary to field a team of change champions and helps participants build their own "roster" and "scouting" processes, whether their current (or envisioned) change is big, small, or somewhere in between. Everyone interested in changing engineering education is welcome. You do not need to have a "big idea" or a team to be part of this workshop.

The presenters/facilitators are the research team whose results created the foundation of this workshop. They have published several papers (ASEE 2015, 2016; FIE 2016) on re-situating the research-to-practice cycle within the context of the engineering education ecosystem, broadening your change team to include administrative constituencies, and successful curricular change at the small and large scale. Two members of this team were part also part of the team which won the 2015 Helen Plants award.

The three hour workshop will be split into three sections: • Defining the Field of Play and the Team o During this section of the workshop, participants will build a shared definition of the baseball metaphor and develop the primary visible, invisible, and supporting roles of the change team members. Additionally, the participants will begin to develop how different types of change (the "field of play") require different sets of team members. o Activities during this session will include group discussion and report-out as well as naming the individual "trading cards" in the change agent set. • All Seasons Training and the Minor Leagues o During this section of the workshop, participants will engage with the roles defined in the first section, change management literature, and the results of the Center of Engineering Learning and Teaching's Pioneers Project to develop the qualities and attributes necessary to develop in each team member given their role in the change process. Participants will also consider ways to develop these skills in individuals and to value the contributions of all team members.

Planning for Your Own Change Pursuit o During this section of the workshop, participants will develop their own plan for implementing what they have learned back home. The action planning will emphasize building teams that will make successful engineering education improvements as well as confirm the narrative of success across the institution. o Activities during this section will include working with a small group to develop an action plan and committing to three actions over the next two months that will move them closer to an engineering education goal.

10 minutes Introductions and Overview 30 minutes Defining the Field of Play and the Team Defining the Field of Play - sand-lot, minor leagues, all-stars Who is My Teammate? Visible, invisible, and supporting roles Naming the Baseball Cards 10 minutes Break 75 minutes All-Season Training and Minor Leagues Qualities and Attributes - results from the Pioneers Project, change management literature, and participant experiences Skills Development - participants will create a set of ways to identify and develop themselves and other change agents Valuing All Team Members - participants will brainstorm ways to demonstrate, privately and publicly, their appreciation for the contributions of all change team members across all roles Change Team Trading Cards - participants work in groups to complete the characteristics for the baseball card-like change team trading cards 10 minutes Break 35 minutes Planning for Your Own Change Pursuit Participants write an action plan toward a new narrative
of change management success 10 minutes Wrap-Up and Final Thoughts

The anticipated audience for this workshop consists of faculty members and administrators interested in improving their ability to create and sustain transformation change in CSET education. In order to maintain the interactive nature of the workshop, we would prefer no more than 35 attendees.

Attendees will understand the variety of visible, invisible, and supporting roles on the change team and determine which sub-set are key to a particular change agenda. Additionally, attendees will be ready to find new members for, and develop all participants on, their change team.

The presenters/facilitators will need a projector, screen, and outlet for a laptop. It is preferred that tables and chairs for participants are either rounds or classroom style. As this workshop is part of the dissemination of funded research, it is preferred that the workshop be free to attendees and any facility expenses instead be charged to the research award.

Thu, Oct 19, 2017

7:00am

Registration

โปรแกรมปฏิบัติการ 7:30am - 5:00pm, Oct 19
สถานที่: Registration

Focus on New Attendees Breakfast

โปรแกรมปฏิบัติการ 7:30am - 8:30am, Oct 19
สถานที่: Marriott 5 & 6

8:00am

T1C: Learning Platforms, Apps & Education Technologies

โปรแกรมปฏิบัติการ 8:30am - 10:00am, Oct 19
สถานที่: Marriott 1

Chair:

Maria Altebarmakian
Graduate Research and Teaching Assistant, Brandeis University Computer Science Department

4 Subsessions

- Entrepreneurial Minded Learning in App Development Courses
  โปรแกรมปฏิบัติการ 8:30am - 8:52am, Oct 19

- Signal Processing and Machine Learning Concepts using the Reflections Echolocation App
SimVascular as an Instructional Tool in the Classroom

Persuasive Technology: Applications in education

Beginning to Understand Variation in Teaching Approaches to Game-Based Learning

A Serious Game to support the Drug Misuse Prevention for teenagers students

DataRPG: Improving student motivation in data science through gaming elements

Placating Plato with Plates of Pasta: An Interactive Tool for Teaching the Dining Philosophers Problem

T1D: Game-based Teaching & Learning I

T1E: Educational Frameworks and Curricula Development for ECE, CS and IS Programs
4 Subsessions

- Using Threshold Concepts to Restructure an Electrical and Computer Engineering Curriculum: Troublesome Knowledge in Expected Outcomes
  8:30am - 8:52am, Oct 19

- An Overview of the Microethics and Macroethics Education of Computing Students in the United States
  8:52am - 9:15am, Oct 19

- Design and Implementation of an Enterprise Integrated Project Environment: Experience from an Information Systems Program
  9:15am - 9:37am, Oct 19

- Integrating NEMS/MEMS with IoT Applications into an Innovative ECE Senior Elective Course
  9:37am - 10:00am, Oct 19

T1F: Improving and Assessing Communication Skills
8:30am - 10:00am, Oct 19
Marriott 4

Chair:

Jillian J. Seniuk Cicek
University of Manitoba

4 Subsessions

- Improving communication in multicultural teams - A web-based model and its application in project management education
  8:30am - 8:52am, Oct 19

- Development of a Method to Study Real-Time Engineering Writing Processes
  8:52am - 9:15am, Oct 19

- Using practice architectures to investigate the invisibility of writing practices in the engineering curriculum
  9:15am - 9:37am, Oct 19

- The Efficacy of Hartley’s “Structured Format” in the Teaching and Assessment of Abstract Writing
  9:37am - 10:00am, Oct 19

T1G: Diversity and Inclusivity I
8:30am - 10:00am, Oct 19
Assessing Students' Higher Education Performance in Minority and Non-Minority Serving Universities
8:30am - 8:52am, Oct 19

A Diversity Lens on the Last Decade of the FIE Conference: Role Models for the Engineering Community
8:52am - 9:15am, Oct 19

People Like Me: increasing likelihood of success for underrepresented minorities in STEM by providing realistic and relatable role models
9:15am - 9:37am, Oct 19

Building a Competitive STEM-C Workforce in a Minority Spanish Institution
9:37am - 10:00am, Oct 19

T1H: Educational Research - Scale Development
8:30am - 10:00am, Oct 19

The Development Process for a New Materials Science Conceptual Evaluation
8:30am - 8:52am, Oct 19

Proposal of an instrument for measuring situational motivation with potential applications in educational contexts
8:52am - 9:15am, Oct 19

The Engineering Student Identity Scale: A Cross Disciplinary Exploration of Factor Structure
T1I: Approaches to Learning I

Chair: Theresa Odun-Ayo
Missouri University of Science and Technology

4 Subsessions

1. Stimulating Curiosity and the Ability to Formulate Technical Questions in an Electric Circuits Course Using the Question Formulation Technique (QFT)
   - 8:30am - 8:52am, Oct 19

2. Conducting a Social Constructivist Epistemology for Students of Computing Disciplines
   - 8:52am - 9:15am, Oct 19

3. Visualization Aids for Abstract Concepts Towards Better Learning Outcomes
   - 9:15am - 9:37am, Oct 19

4. Retrieval Practice and Spacing in an Engineering Mathematics Classroom: Do the Effects Add Up?
   - 9:37am - 10:00am, Oct 19

TIJ: Approaches to Learning & Teaching Programming

Chair: Tina Vrieler
PHD Student, Uppsala University

4 Subsessions
● Learning Styles of Computer Science I Students
  8:30am - 8:52am, Oct 19

● Learning Styles in Programming Education: a Systematic Mapping Study
  8:52am - 9:15am, Oct 19

● Unexpected Student Behaviour and Learning Opportunities: Using the Theory of Planned Behaviour to Analyse a Critical Incident
  9:15am - 9:37am, Oct 19

● Understanding the relationships between self-regulated learning and students source code in a computer programming course
  9:37am - 10:00am, Oct 19

9:00am

Exhibits Open
  9:30am - 5:00pm, Oct 19
  Exhibits

IEEE EDUCON Steering Committee
  9:30am - 12:00pm, Oct 19
  Atlanta Room
  This meeting is by invitation only.

10:00am

Exhibit Hall Break
  10:00am - 10:30am, Oct 19

T2C: Panel: Supporting Student Career Development of Undergraduate Engineering
  10:30am - 12:00pm, Oct 19
  Marriott 1

Authors: Jinny Rhee (San Jose State University, USA); Sheri Sheppard (Stanford University, USA); Samantha Brunhaver (Arizona State University, USA); Cheryl Carrico (Virginia Tech, USA); Ruth Streveler (Purdue University, USA)

Jinny Rhee, Associate Dean, College of Engineering, San Jose State University Sheri Sheppard, Professor, Mechanical Engineering, Stanford University Samantha Brunhaver, Assistant Professor, Fulton Schools of Engineering, Arizona State University Cheryl Carrico, Postdoctoral Research Associate, Virginia Tech

Goals of Panel Session The goals of the panel session include the following: • To provide a brief summary of the research to date on the NSF-funded Professional Engineering Pathways Study (PEPS), including preliminary results and future work. • To illuminate the contextual aspect of career
services from the viewpoint of different universities. • To actively apply preliminary findings from the research to the audience members and their institutions and engage in discussion and summary of current practices. • To document the results of the session for dissemination.

Description and Rationale As engineering graduates prepare to enter the workforce, they must navigate an increasingly complex process of knowing where to look for a job, how to look, and how to get hired. Furthermore, 40% of engineering bachelor’s degree recipients leave engineering within three years of graduation (NSF, 2012). In order to build a diverse and highly skilled workforce, research is needed to better grasp the students' decision-making process and the ecosystem of resources and supports they draw upon as they seek their first post-undergraduate job.

To address these concerns, the NSF-funded Professional Engineering Pathways Study (PEPS) is undertaking a three-year, longitudinal, mixed methods study with six diverse U.S. institutions. The study has conducted interviews with student advisors, engineering faculty, and career service staff, i.e., university influencers (UIs), about their perceptions of engineering students and the career resources available on their campuses. Subsequently, student surveys were administered to juniors and seniors at all six institutions to obtain their viewpoints on various aspects of the job search experience, followed by phone interviews to flesh out the details of the survey results. The student surveys are longitudinal, and follow-up surveys will be conducted at the end of their job search with consenting students. The work is guided by the Expectancy-Value Theory (Eccles et al., 1983) and the Cognitive Information Processing Theory (Sampson et al., 1998).

The session will open with a brief summary of the results to date, including the results from the UI interviews, student surveys, and student interviews. This will be followed by a panel discussion and Q and A to illuminate the contextual nature of career services at various types of institutions. Participants will then be organized into small groups to engage in discussion and evaluate the research findings in the context of their own institutions. The outcomes from the small group discussions and workshops will be documented and disseminated to attendees, and will inform the researchers on the PEPS project and their future work. The rationale for holding a panel session for this topic is that the active application of the research findings would not be possible in a Work In Progress paper.

Anticipated Audience The topic will be of interest to a broad range of university personnel serving engineering majors. This group includes: faculty engaged in major advising/mentoring, department chairs, associate deans and deans, student affairs, including student services staff, and career placement staff. An understanding of current challenges and best practices in placing engineering graduates is of interest to the FIE community. The research may influence advising/mentoring, career placement services, and curricular and extra-curricular offerings.

Associated Peer-Reviewed Papers None
4 Subsessions

- **Game based learning in improving students' derivative calculation skills**  
  10:30am - 10:52am, Oct 19

- **Educational games: a contribution to software testing education**  
  10:52am - 11:15am, Oct 19

- **THE POWER OF THE GAME AS A MEDIATOR TOOL PARADIGM OF OBJECT ORIENTED TEACHING-LEARNING PROCESS**  
  11:15am - 11:37am, Oct 19

- **Exploration of Affordances of Visuo-Haptic Simulations to Learn the Concept of Friction**  
  11:37am - 12:00pm, Oct 19

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**T2E: Face-to-Face and Remote Laboratories**  
10:30am - 12:00pm, Oct 19  
Marriott 3

Chair:

Mary K. Pilotte  
1st Year Engineering Program - Faculty Fellow, Purdue University

4 Subsessions

- **Remote Robotics Laboratory as Support to Teaching Programming**  
  10:30am - 10:52am, Oct 19

- **Implementation of Cloud-Based Smart Adaptive Remote Laboratories for Education**  
  10:52am - 11:15am, Oct 19

- **Applying a Common Framework to Develop Undergraduate Control Systems Laboratory Kits**  
  11:15am - 11:37am, Oct 19

- **Flipped classroom instruction using virtual simulation laboratory**  
  11:37am - 12:00pm, Oct 19

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**T2F: Design, Design Thinking and Open-Ended Projects I**  
10:30am - 12:00pm, Oct 19  
Marriott 4

Chair:
4 Subsessions

- Capstone Design Projects as Foundation for a Solar Community
  - 10:30am - 10:52am, Oct 19

- Practical Skills and Design: A Maker Course for ECE Students
  - 10:52am - 11:15am, Oct 19

- An Analysis of Kanban as a Project Monitoring Tool in Undergraduate Courses
  - 11:15am - 11:37am, Oct 19

- Design Thinking as a catalyst for changing teaching and learning practices in engineering
  - 11:37am - 12:00pm, Oct 19

T2G: Diversity and Inclusivity II
- 10:30am - 12:00pm, Oct 19
- Marriott 7

Chair:

- Alison Clear
  - Associate Professor, Eastern Institute of Technology (EIT)

4 Subsessions

- Computing Gender Wars - A New Hope
  - 10:30am - 10:52am, Oct 19

- Using concept mapping to develop inclusive curriculum
  - 10:52am - 11:15am, Oct 19

- Reflections on the Messiness of Initiating a Systematic Literature Review on Broadening Participation in Engineering and Computer Science
  - 11:15am - 11:37am, Oct 19

- Encouraging the Diversity of Graduate Students in Technology
  - 11:37am - 12:00pm, Oct 19

T2H: Using an Educational Research Approach I
- 10:30am - 12:00pm, Oct 19
Marriott 8

Chair:

Craig Goergen
Assistant Professor, Purdue University

4 Subsessions

- **Educational Effects of the Manga Case Method in Online and Offline Environments**
  - 10:30am - 10:52am, Oct 19

- **Applying Social Network Analysis in a Course Supported by a LMS: Report of a Case Study**
  - 10:52am - 11:15am, Oct 19

- **Detecting and Comparing Brain Activity in Short Program Comprehension Using EEG**
  - 11:15am - 11:37am, Oct 19

- **You can change the world, but not this homework assignment: the contradictory rhetoric of engineering agency**
  - 11:37am - 12:00pm, Oct 19

Marriott 9

Chair:

Nicole P Pitterson
Virginia Polytechnic Institute and State University

3 Subsessions

- **Studying Mathematics in High School and College: Summer Bridge Program Student Beliefs**
  - 10:30am - 10:52am, Oct 19

- **Motivating engineering students to math classes: practical experience teaching Ordinary Differential Equations**
  - 10:52am - 11:15am, Oct 19

- **Effective Active Learning Tools for an Embedded Systems Course**
  - 11:37am - 12:00pm, Oct 19
T2J: Programming Courses and Concepts

10:30am - 12:00pm, Oct 19
Marriott 10

Speaker:

Rebecca Rosenblatt
Assistant Professor, Illinois State University

4 Subsessions

- **Studying the Phenomenon of Developing Interest in Learning How to Code**
  10:30am - 10:52am, Oct 19

- **A teacher’s view about introductory programming teaching and learning- Portuguese and Macanese perspectives**
  10:52am - 11:15am, Oct 19

- **The Effect of Embedded Questions in Programming Education**
  11:15am - 11:37am, Oct 19

- **A Survey on Problems related to the Teaching of Programming in Brazilian Educational Institutions**
  11:37am - 12:00pm, Oct 19

Exhibitor Showcase: ARM University Program

10:30am - 12:00pm, Oct 19
Austin/Boston Room

**Topic:** ARM Cortex-M Embedded System Development with the ST Nucleo Board and Keil Microcontroller Development Kit

**Speakers:** Profs. David Money Harris & Brian Bryce, Harvey Mudd College

**Description:** In this workshop you will learn how to use an ARM Cortex-M0 development board to create a simple game. We will make use of a ST NUCLEO-F042K6 development board and the industry standard Keil uVision environment. At Harvey Mudd College our introductory digital systems course is ARM based given its ubiquity in industry. We selected the STM32F042K6T6 based Nucleo-32 board for the microcontroller portion of our course for its complete documentation, typical set of peripherals, breadboard compatibility, low cost (10 USD), and compatibility with industry standard tools. Our choice was further influenced by the relatively easy to solder LQFP-32 package of the microcontroller, that enables students to easily use this microcontroller in custom board
level applications. The Nucleo development board handles power, code downloads and debugging over a micro-USB cable. The STM32F042K6T6 has a 48 MHz ARM Cortex-M0 CPU with 32 KB Flash, 6 KB SRAM, timers, serial I/O, a 9-channel, 12-bit ADC, and 26 general-purpose I/Os, and is packaged in a 32-pin LQFP32 operating at 3.3 V. Bring your own Windows laptop to run the development tools. C programming experience is helpful but not essential. **All participants will receive a Nucleo board.**

Speaker:

**David Money Harris**  
Harvey Mudd College

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**Brian Bryce**  
Assistant Professor of Engineering, Harvey Mudd College

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12:00pm  
Lunch  
12:00pm - 1:15pm, Oct 19  
Marriott 5 & 6

1:00pm  
Plenary Session: Karl W. Reid, Ed.D., Executive Director of the National Society of Black Engineers  
1:15pm - 2:30pm, Oct 19  
Marriott 5 & 6

2:00pm  
Exhibit Hall Break  
2:30pm - 3:00pm, Oct 19

3:00pm  
T3A: Special Session: Zui Quan Pedagogy - The art of risk taking in the classroom  
3:00pm - 5:00pm, Oct 19  
Lincoln

Authors: Stephanie L Cutler (Penn State, USA); James Pembridge and Matthew Verleger (Embry-
This special session/workshop seeks to encourage Zui Quan pedagogy and risk taking in everyday classroom practice. The term "Zui Quan" refers to a style of Chinese martial arts that is loosely translated as "drunken fist" or "drunken boxing." To the untrained eye, the practitioner appears uncoordinated, untrained, intoxicated, and vulnerable. However, those trained in Zui Quan are capable of powerful attacks and require a significant amount of skill to proceed with an ease of flow from one movement to another. The same may be said for those practicing innovative pedagogies in the classroom. The overall goal of the session is to address issues that inhibit faculty from taking pedagogical risks and provide tools and support that will aid faculty with implementing these approaches in their course.

T3B: Special Session: A Qualitative Approach to Understanding Variations in Experiences and its Relationship to Learning - An Introduction to Phenomenography

3:00pm - 5:00pm, Oct 19
Sante Fe

Authors: Carla B. Zoltowski (Purdue University, USA); Nicholas D Fila (Iowa State University, USA); Emily Dringenberg (Kansas State University, USA)

Goals of the Session:

Phenomenography has been increasingly used to explore important questions and complex phenomena in engineering education. However, as a relatively new research method (it was introduced in 1981) with unique and nuanced methodological underpinnings, it isn't always well understood. The goal of the proposed session would be to provide an overview of the methodology, as well as an experience in conducting phenomenographic analysis. This special session complements another special session proposed by one of the authors, which will focus not on the methodology itself how a particular phenomenographic study can be utilized within the context of a broader project.

We envision the audience of this session to be researchers and educators with no, limited, or even moderate experience planning and conducting phenomenographic studies. The session will provide them with firsthand knowledge of phenomenography that they can use to better understand phenomenographic research they encounter or to initiate their own phenomenographic studies.

Justification: Phenomenography is a fast-growing research method in engineering education. It has achieved this position because of its ability to unpack and demonstrate nuance within complex topics and phenomena—such as human-centered design, cross-disciplinary teamwork, and innovation—and to clarify ways to assess how students understand these phenomena. These capabilities make understanding phenomenography a valuable tool for engineering education researchers and the efforts of the engineering education community to investigate and improve the complex process of teaching and learning. This session will provide a novel and immersive experience for participants, allowing them to deeply engage with the method and gain first-hand experience.

Explanation of Interaction: This session will offer several types of interaction. First, participants will interact with the session facilitators, each of whom has developed expertise in phenomenography through conducting and planning one or more studies and producing methodological scholarship. The facilitators will act as instructors and then as coaches to participants as they perform phenomenographic analysis. Second, participants will interact with each other as they analyze data, discuss results, and share methodological insights. Finally, participants will interact with phenomenographic data.

Description of Session: The session will begin with an overview of the phenomenographic methodology.
Participants will then break into groups of 4 - 6 and analyze a series of interview excerpts using phenomenographic analysis techniques. Interview excerpts will come from the session facilitators’ own studies, and thus represent authentic phenomenographic data. Facilitators will act as coaches as participants sort the data, form categories, and describe outcome spaces. Groups will report their results to the larger audience and discuss findings from the mini-analysis as well as insights about phenomenographic analysis. The session will finish with a discussion of implications of phenomenographic studies and how they can inform education practice. In particular we will focus on and discussion how phenomenography can provide framework for assessment.

Agenda: - Introductions - 10 minutes - Overview of Phenomenography (history, philosophical perspective and underlying assumptions, comparison to other methods, overview of data collection and analysis) - 15 minutes - Small group analysis of interview excerpts - 30 minutes - Small groups report out results and insights learned - 15 minutes - Discussion of how phenomenographic studies can be used to inform practice and provide a framework for assessment - 10 minutes

T3C: Panel: Perspectives on the Future of Cybersecurity Education
⏰ 3:00pm - 5:00pm, Oct 19
📍 Marriott 1

Authors: Rajendra Raj (Rochester Institute of Technology, USA); Joseph Ekstrom (Brigham Young University, USA); John Impagliazzo (Hofstra University, USA); Steven Lingafelt (IBM, USA); Allen Parrish (United States Naval Academy, USA); Harry Reif (James Madison University, USA); Edward Sobiesk (Army Cyber Institute, USA)

The primary goals of this panel session are to: (1) present diverse perspectives toward curriculum guidelines for rigorous, high-quality, four-year degree programs in cybersecurity, (2) suggest a formalization of the concept of an "undergraduate program in cybersecurity" and (3) garner audience perspectives on the ideas presented by the panelists.

The basis for the panel includes the current endeavor by the ACM joint task force on cybersecurity (CSEC2017), the recently published ACM document on cybersecurity in Europe, the new effort on computing curricula 2020 (CC2020), and other relevant curricular documents. Each of these documents provides a different perspective on the future of cybersecurity education. None of this existing work, however, defines the scope of exactly what an undergraduate cybersecurity program should contain and in what quantities. This void will be filled by program accreditation standards that should be influenced by stakeholders with international considerations from industry, military intelligence and government.

This panel will begin by presenting the distinct perspectives of the panelists, as they relate to formalizing the notion of a "B.S. in Cybersecurity." Ample time will be provided for audience interaction. If the audience is of sufficient size, the panelists will divide it into groups and facilitate discussions within each group, with time to report the results of the groups to the entire audience at the end of the session.

This session needs to be presented as an FIE panel. The panelists, who have diverse expertise in this space, can both inform the audience and solicit feedback from them. Thus, a panel format with sufficient time for direct audience interaction meets the panel guidelines, as it provides the needed engagement with the computing and engineering education community; provides multiple perspectives.
on cybersecurity education, which is on the frontiers of education; and enhances the experience and knowledge of the session participants.

The panel is targeted to college faculty focused on both computing and engineering education, especially those interested in incorporating cybersecurity curricular content into their programs or developing new programs (or modifying existing programs) in cybersecurity. As cybersecurity education falls within the computing and engineering, this panel session is likely to be of interest to a significant fraction of the typical FIE audience.

**T3D: Gamification**

- **3:00pm - 5:00pm, Oct 19**
- **Marriott 2**

**Chair:**

**Tony Clear**
Associate Dean Research Faculty of Design & Creative Technologies, Auckland University of Technology

**3 Subsessions**

- **Improved Student Independence Through Competitive Tinkering**
  - **3:30pm - 4:00pm, Oct 19**

- **Use of Role-play and Gamification in a Software Project Course**
  - **4:00pm - 4:30pm, Oct 19**

- **CocoGame: a funny app to learn physics and math**
  - **4:30pm - 5:00pm, Oct 19**

**T3E: Professional Skills Development**

- **3:00pm - 5:00pm, Oct 19**
- **Marriott 3**

**Chair:**

**Kirsten A Davis**
Graduate Assistant, Dept. of Engineering Education, Virginia Tech

**4 Subsessions**

- **Closing the Practice Gap: Studying Boundary Spanning in Engineering Practice to Inform Educational Practice**
3:00pm - 3:30pm, Oct 19

- **Improving Engineering Students Professional Development Skills in the Make to Innovate Program**
  3:30pm - 4:00pm, Oct 19

- **Undergraduate Research Training Workshop**
  4:00pm - 4:30pm, Oct 19

- **Rethinking Engineering Education**
  4:30pm - 5:00pm, Oct 19

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**T3F: Design, Design Thinking and Open-Ended Projects II**

3:00pm - 5:00pm, Oct 19
Marriott 4

**Chair:**

*Imelda Smit*
Lecturer, North-West University

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**4 Subsessions**

- **Does an Open-Ended Design Project increase Creativity in Engineering Students?**
  3:00pm - 3:30pm, Oct 19

- **Engineering Design, A Shift From a Process to a Model-based View**
  3:30pm - 4:00pm, Oct 19

- **Connections and distinctions: Perspectives on design activity from industrial design and electrical engineering**
  4:00pm - 4:30pm, Oct 19

- **Open-Ended Projects Opened Up - Aspects of Openness**
  4:30pm - 5:00pm, Oct 19

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**T3G: Promoting Improvement of Practices for Persons with Disabilities**

3:00pm - 5:00pm, Oct 19
Marriott 7

**Chair:**
A way to promote the development of Autistic teenagers through Programming of a humanoid robot platform
🕒 3:00pm - 3:30pm, Oct 19

A behind-the-scenes look at access setup: a case study of the Deaf Professional / Designated Interpreter model in engineering education research
🕒 3:30pm - 4:00pm, Oct 19

Inclusion in computing and engineering education: perceptions and learning in diagram-based e-learning classes with blind and sighted learners
🕒 4:00pm - 4:30pm, Oct 19

A Comparative Study of Deaf and Non-deaf Students' Performance When Using a Visual Java Debugger
🕒 4:30pm - 5:00pm, Oct 19

Hidden in Plain Sight: Masculine Social Norms in Engineering Education
🕒 3:00pm - 3:30pm, Oct 19

Critical Mass or Critical Culture? Gendered Perceptions of Women and Men in an Engineering School
🕒 3:30pm - 4:00pm, Oct 19

Student Attitudes about Diversity: "If the field of engineering were more diverse, what would that mean for you?"
🕒 4:00pm - 4:30pm, Oct 19

A Narrative Approach to Understanding Underrepresented Students' Pathways Into Engineering
4:30pm - 5:00pm, Oct 19

**T3I: Use of Blended Learning Environments with a Focus on the Inverted Classroom**

3:00pm - 5:00pm, Oct 19
Marriott 9

Chair:
Sharareh Kermanshachi
University of Texas at Arlington

4 Subsessions

- **Flipping Introductory Programming Classes using Spinoza and Agile Pedagogy**
  3:00pm - 3:30pm, Oct 19

- **Investigating Psychological Safety in a Flipped Engineering Course**
  3:30pm - 4:00pm, Oct 19

- **Longitudinal Analysis of Instructor Actions in an Active, Blended, and Collaborative Classroom Environment**
  4:00pm - 4:30pm, Oct 19

- **The Impact of Learning Styles on Student Performance in Flipped Pedagogy**
  4:30pm - 5:00pm, Oct 19

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3:00pm - 5:00pm, Oct 19

**T3J: Introductory CS I**

3:00pm - 5:00pm, Oct 19
Marriott 10

Chair:
Tony Lowe
Purdue Engineering Education

4 Subsessions

- **"I wish I could rank my exam's challenge level!": An Algorithm of Bloom's Taxonomy in Teaching CS1**
  3:00pm - 3:30pm, Oct 19

- **Most Common Fixes Students Use To Improve The Correctness Of Their Programs**
3:30pm - 4:00pm, Oct 19

- Levels of Active Learning in Programming Skill Acquisition: From Lecture to Active Learning Rooms
  - 4:00pm - 4:30pm, Oct 19

- The Impact of Placement Strategies on the Success of Students in Introductory Computer Science
  - 4:30pm - 5:00pm, Oct 19

5:00pm

Special Session on Puerto Rico
- 5:30pm - 6:30pm, Oct 19
  - Marriott 8

Join us to discuss what we can do to help with the present crisis and future, similar situations after natural or man-made emergencies.

6:00pm

Reception at Eiteljorg Museum (Sponsored by Purdue University College of Engineering)
- 6:30pm - 9:30pm, Oct 19
  - 500 W Washington Street, Indianapolis, IN 46204

Fri, Oct 20, 2017

7:00am

Registration
- 7:30am - 5:00pm, Oct 20
  - Marriott 5 & 6

Breakfast
- 7:30am - 8:30am, Oct 20
  - Marriott 5 & 6

8:00am

F1A: Special Session: Critically Thinking About Engineering Through Kinesthetic Experiential Learning
In recent years, use of and interest in active learning techniques has been on the rise. In this special session, participants will be immersed in kinesthetic experiential learning activities that emphasize the "active" in active learning. Participants will be guided through a number of in-class activities and the underlying pedagogical philosophy. The session will end with open discussion and Q&A, allowing participants to consider how they may incorporate these activities into their own courses and explore opportunities to develop kinesthetic experiential learning activities to suit their own classroom needs.

F1B: Special Session: Fostering Change - Application and Implications of Palmer's Movement Approach to Change

According to change literature, the multiplicity of levels and structures that exist within an organization makes organizational change a difficult process. Similarly, many challenges face any attempt to foster change in engineering education, due to the various layers that make up the field. Looking at the evolution of engineering education research (EER) as a field and the individual pathways of engineering education researchers, EER scholars have discussed a model for engineering education reform that draws from Palmer's Movement Approach to change. This special session introduces Palmer's approach as a framework to look at reforms that have already occurred, and envision possible paths for action toward desired changes.

F1C: Using Learning Platforms, Apps & Education Technologies

Chair:

Joshua Nwokeji
Assistant Professor, Gannon University, Erie PA

3 Subsessions

- Effects of Lightboard Usage on Circuit Problem Skills
  8:30am - 8:52am, Oct 20

- Guided Selection of IT-based Education Tools
  8:52am - 9:15am, Oct 20
An Interactive Visualization Tool for Teaching ARP Spoofing Attack

<table>
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<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>9:15am - 9:37am, Oct 20</td>
<td>F1D: Internet of things</td>
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</tbody>
</table>

Chair: Ziad Youssfi
Ohio Northern University

4 Subsessions

- **Enchanting Education from Student Input**
  8:30am - 8:52am, Oct 20

- **A Comprehensive Approach to Educating Students About the Internet-of-Things**
  8:52am - 9:15am, Oct 20

- **Innovative laboratory model based on partnerships and active learning**
  9:15am - 9:37am, Oct 20

- **Teaching Wireless Networking Technologies in the Internet-of-Things Using ARM based Microcontrollers**
  9:37am - 10:00am, Oct 20

F1E: The First-Year in ECE or Computer Science

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<tr>
<th>Time</th>
<th>Session</th>
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<tr>
<td>8:30am - 10:00am, Oct 20</td>
<td>F1E: The First-Year in ECE or Computer Science</td>
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</table>

Speaker: Mahesh Banavar
Assistant Professor, Clarkson University

4 Subsessions

- **A Two Tier Approach to Chalkboard Video Lecture Summary**
  8:30am - 8:52am, Oct 20

- **The use of Comic Strips in the teaching of Software Engineering**
8:52am - 9:15am, Oct 20
- Variations in student learning in an inquiry-based freshmen electrical engineering course
  9:15am - 9:37am, Oct 20
- Assessing Student Preparedness for Introductory Engineering and Programming Courses
  9:37am - 10:00am, Oct 20

F1F: The First-Year in Engineering I
8:30am - 10:00am, Oct 20
Marriott 4

Speaker:

Laura Farinetti
Researcher, Politecnico di Torino

4 Subsessions
- LEarning with Academic Partners (LEAP): Success and Growing Pains in the First Year
  8:30am - 8:52am, Oct 20
- Connecting Environmental Engineers to the Klamath River via a Placed Based Learning Community
  8:52am - 9:15am, Oct 20
- Investigation of Spatial Visualization Skills across World Regions
  9:15am - 9:37am, Oct 20
- Exploring the Impacts of a First-Year Engineering Study Abroad Program on Subsequent College Experiences
  9:37am - 10:00am, Oct 20

F1G: PK12 STEM Education - Hands on Learning I
8:30am - 10:00am, Oct 20
Marriott 7

Speaker:
4 Subsessions

- **STEM PROJECT ACTIVITIES FOR pK-12 STUDENTS: WHAT IT TAKES TO MAKE IT HAPPEN**
  8:30am - 8:52am, Oct 20

- **Moving from STEM to STEAM: The Effects of Informal STEM learning on Students’ Creativity and Problem Solving Skills with 3D Printing**
  8:52am - 9:15am, Oct 20

- **GUPPIE Program - A Hands-on STEM Learning Experience for Middle School Students**
  9:15am - 9:37am, Oct 20

- **Introducing University Laboratory Tools Into K-12 Classrooms: Benefits and Challenges**
  9:37am - 10:00am, Oct 20

**F1H: Teaming Research & Strategies**
8:30am - 10:00am, Oct 20
Marriott 8

Chair:

- **Heydi Miura Machado**
  Federal University of Technology - Paraná

4 Subsessions

- **The Archetype Learning Method - Scaffolding Teamwork Competences in the Engineering Classroom**
  8:30am - 8:52am, Oct 20

- **Identifying Peers to Form an Effective Team in a Project-Based Course**
  8:52am - 9:15am, Oct 20

- **A Mixed Methods Analysis of Student Experiences in Diverse Teams**
  9:15am - 9:37am, Oct 20

- **Fostering Development of Teamwork Skills in an Introductory Engineering Course**
  9:37am - 10:00am, Oct 20
### F1J: Introductory CS II

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
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<tr>
<td>8:30am - 10:00am</td>
<td>Analysis of the Teaching-Learning Methodology Adopted in the Introduction to Computer Science Classes</td>
<td>Marriott 10</td>
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<tr>
<td>8:30am - 10:00am</td>
<td>Challenges to integrate software testing into introductory programming courses</td>
<td>Marriott 10</td>
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<tr>
<td>8:30am - 10:00am</td>
<td>Learning Java in a New York City Immigrant Engineer Retraining Program</td>
<td>Marriott 10</td>
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**Chair:**

**Tony Clear**  
Associate Dean Research Faculty of Design & Creative Technologies, Auckland University of Technology

### 4 Subsessions

1. **Empirical study of training needs for different occupational groups in the context of the increasing spread of electric vehicles**  
   - **Time:** 8:30am - 8:52am, Oct 20
2. **Team-based, transdisciplinary, and inclusive practices for undergraduate research**  
   - **Time:** 8:52am - 9:15am, Oct 20
3. **Develop a TBL-facilitated BIM Education Framework for Civil Engineering and Management**  
   - **Time:** 9:15am - 9:37am, Oct 20
4. **Learning Autonomous Systems - an Interdisciplinary Project-Based Experience**  
   - **Time:** 9:37am - 10:00am, Oct 20
IEEE Education Society Board of Governors meeting

9:00am - 12:00pm, Oct 20
Atlanta Room

This meeting is by invitation only.

Exhibit Hall Open

9:30am - 4:30pm, Oct 20
Exhibits

F2A: Special Session: Learning Design Thinking Using Engineering Case Studies

10:30am - 12:00pm, Oct 20
Lincoln

Authors: Larry Richards (University of Virginia, USA)

The dominant mode for teaching engineers about design thinking is project-based learning. We give students things to design - individually or in teams, and then evaluate the products they produce. But another way to learn about engineering design is to study real-world examples. Case studies provide one way to do so. Cases have been used in schools of business for many years; the case study method is the dominant approach for MBA programs at schools like Harvard Business School and the Darden Graduate School of Business at the University of Virginia. Design case studies in engineering have been used sporadically since the 1950s. Stanford University produced a number of these early cases - that then became part of the ASEE case library. Cases have since been used in a number of engineering disciplines; some with great success; others less so! A primary focus of previous work has been on ethical issues in engineering practice.

Design thinking is a current buzzword in many fields, but of course engineers have always done design. It is the fundamental mode of thinking in engineering. The new course on the Fundamentals of Design Thinking has been introduced at the University of (…..). An essential feature of this course is its use of case studies of engineering design. Four of the cases focus on design firms: IDEO, DEKA, Edison II, and the Khan Academy. Students in the class conduct background research on these firms, their methods, and products; and then come to class prepared to discuss what they have learned and
debate key issues about the companies, their methods, tactics, and strategies, and their successes and failures. They must also learn about the key people in each company, and seek to understand their roles, personalities, and motivations. We also use cases that involve analyses of existing products and their redesign, intellectual property concerns, and issues of product liability.

A brief history of design thinking, and its use in various disciplines and endeavors, will be presented; followed by a review of the use of cases in engineering education. We will involve the session participants in two case studies - one of a product design firm, and the other the redesign of an existing product. Finally we will review the experiences of our students with using case studies, and their reactions to doing so.

F2B: Special Session: STEM Faculty Development Research Agenda

© 10:30am - 12:00pm, Oct 20
♀ Santa Fe

Authors: Shannon Stefl, Julie Martin, Sandra Linder, Cindy Lee and Karen A High (Clemson University, USA)

Goals of the session: Expectations for faculty members are high: STEM faculty are expected to establish a sustainable research trajectory, a teaching practice, and a service/leadership role all while pursuing tenure and promotion success. Many colleges and universities have established faculty development programs, but there remains a deficiency in holistic professional support that integrates these disparate professional activities and aligns them with individual and institutional goals, especially for faculty in STEM. This session will involve participants to continue the work that is designed to bring together multiple stakeholders in academia, government, and industry to begin to establish a research agenda for STEM faculty development. The audience includes those interested in furthering this research agenda. The specific goals of this session are to: 1) Present a process developed for creation of a draft research agenda (NSF grant #EEC-1551605) and used for an additional NSF workshop (NSF grant #EEC-1638888). 2) Describe the research agenda initiated for STEM Faculty Development that focuses on holistic areas of teaching, research, service, leadership. 3) Engage participants in reviewing and revising the agenda 4) Involve participants in determining next steps for agenda; how to involve more in the community for input on the agenda; and how to disseminate.

Justification of novelty This topic is unique in that will engage participants in looking at further development of a draft research agenda that is focused on holistic STEM faculty development. Many current efforts for faculty professional development focus on teaching and learning in the STEM classroom. The research agenda is organized around the inputs to, the processes, and the outputs from faculty development. This new agenda proposes research topics that address all areas of expectations for faculty. Research that is pursued in these areas will work to examine the procedures and policies that will ensure future faculty success.

Explanation of the interaction: Initially, participants will be made aware of the process that was used in creating the draft research agenda as well as the agenda for STEM Faculty Development. The predominant part of the participant involvement will then be to provide input and feedback on the draft agenda using round table group time. This input allows for the engagement of additional stakeholders in the process. The session participants will also consider and propose those additional avenues for input on the research agenda. Finally, the participants will suggest areas for future work and dissemination of the STEM Faculty Development research agenda.

Topics/subjects/content of the session: The session will focus on the process used to create a draft research agenda on holistic STEM faculty development. The research agenda has been organized around three threads 1) inputs 2) mechanisms and processes and 3) outputs for holistic STEM faculty
development as described here. 1) The thread of holistic faculty development inputs focuses on topics related to the characteristics of faculty members and institutions that serve as barriers or supports to the adoption and implementation of holistic STEM faculty development programs. 2) The mechanisms/processes thread focuses on topics related to the actual implementation of STEM faculty development and we consider the potential models or structures of STEM faculty development that are currently in place or conceptualized in theory. 3) This thread focuses on identifying and refining research questions, potential methods and pathways for exploration, and potential limitations for topics related to how to best understand the influence of STEM faculty development on various factors. These factors include, but are not limited to, STEM faculty identity in relation to faculty development, and how faculty development influences overall faculty well-being, career satisfaction, and work-life balance. The participants will have an opportunity to review and provide input on the agenda and the three research threads through group interactions. Additionally, the participants will provide feedback on others to consider as part of the agenda development process. Finally, avenues for dissemination of the research agenda will be generated by the participants.

Session agenda/outcomes and future work: The session will be organized as follows: 1) Description of process to develop a research agenda (10 minutes) 2) Presentation of draft STEM Faculty Development research agenda including discussion of the three threads - inputs, processes/mechanisms, outputs (10 minutes) 3) Group work on research agenda/three threads (each tables will focus on one of the threads) (40 minutes) 4) Tables report out on main topics of discussion (10 minutes) 5) Discussion of others to involve in revising agenda; avenues for dissemination (10 minutes) Session outcomes will be the group work presented as well as future plans for research agenda revision and dissemination.

F2C: Panel: Software Requirements Engineering Education in a Changing world

10:30am - 12:00pm, Oct 20
Marriott 1

Authors: Joshua Nwokeji and Stephen Frezza (Gannon University, USA); Vladimir Uskov (Bradley University, USA); Terry Holmes (Gannon University, USA)

One of the biggest challenges of organizations in contemporary times is the ability to manage rapid changes in business environment. Software and expert information systems can help to manage changes and thus contribute to addressing this challenge. The initial, and perhaps, most important activities in software and expert systems development are to elicit, analyze, specify, and validate requirements. The methods, processes, tools, and techniques for performing these activities is called 'Requirements Engineering' (RE). The aim of this panel is to bring together RE academics, practitioners, and researchers to discuss innovative ways of educating and training RE professionals that would develop software and information systems to address rapid changes in business environment. Additionally, this panel intends to identify and examine various challenges of RE education in our changing world, and proffer possible strategies to address them. We hope that the discussions from this panel will inform RE and REE practice.

F2D: Digital Logic

10:30am - 12:00pm, Oct 20
Marriott 2

Chair:
4 Subsessions

- **Using the Logic Design Course as a Dress Rehearsal for the Major Design Experience**
  - 10:30am - 10:52am, Oct 20

- **Dynamic Reconfiguration in FPAA and its use in Education**
  - 10:52am - 11:15am, Oct 20

- **Training Students' Practical and Innovation Ability in Hardware Experiment**
  - 11:15am - 11:37am, Oct 20

- **Introducing Parallel Computing Concepts in Computer System Related Courses**
  - 11:37am - 12:00pm, Oct 20

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**F2E: Academia-Industry collaboration**

- 10:30am - 12:00pm, Oct 20
- Marriott 3

4 Subsessions

- **Transitions Between Cooperative Educational Experiences to the University**
  - 10:30am - 10:52am, Oct 20

- **Industry-University Collaboration in Workforce Development: Results from a Short Course on IEEE Standard 762**
  - 10:52am - 11:15am, Oct 20

- **Novel Approach to Bridge the Gaps of Industrial and Manufacturing Engineering Education: A Case Study of the Connected Enterprise Concepts**
  - 11:15am - 11:37am, Oct 20

- **Case Study and Apprenticeship Pedagogy for Training Construction Engineering Students**
  - 11:37am - 12:00pm, Oct 20

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**F2F: The First-Year in Engineering II**

- 10:30am - 12:00pm, Oct 20
- Marriott 4

Chair:
Major Choice in First-Year Engineering Program
10:30am - 10:52am, Oct 20

Longitudinal Outcomes of a Requirement for Student-owned Laptop Computers Across a College of Engineering
10:52am - 11:15am, Oct 20

End of Semester Software Problem Solving and Design Projects in a First-Year Engineering Course
11:15am - 11:37am, Oct 20

Are Introductory Courses Suitable Pathways for Success in the BE(Hons)
11:37am - 12:00pm, Oct 20

A Human-Interactive Robotic Program for Middle School STEM Education
10:30am - 10:52am, Oct 20

Student Outcomes from the Evaluation of a Transdisciplinary Middle School Robotics Program
10:52am - 11:15am, Oct 20

Development and Results from User Testing of a Novel Robotics Kit Supporting Systems Engineering for Elementary-Aged Students
11:15am - 11:37am, Oct 20

Hello World: Bootstrapping Cyber Security education In Indian Rural High Schools
11:37am - 12:00pm, Oct 20
F2H: Using an Educational Research Approach II
⏰ 10:30am - 12:00pm, Oct 20
📍 Marriott 8

Chair:

Brian Faulkner
Research Assistant, University of Illinois at Urbana-Champaign

4 Subsessions

- **Using Self-Determination Theory to Understand Engineering Student Motivation During Innovation Projects**
  ⏰ 10:30am - 10:52am, Oct 20

- **Exploring Meaning-making and Innovation in Makerspaces: An Ethnographic Study of Student and Faculty Perspectives**
  ⏰ 10:52am - 11:15am, Oct 20

- **The Calculus Dashboard - leveraging intelligent tutor techniques to provide automated fine-grained student assessment**
  ⏰ 11:15am - 11:37am, Oct 20

- **Identifying Student Communication Strategies Involving Spatial Information**
  ⏰ 11:37am - 12:00pm, Oct 20

F2I: Pedagogical Approaches & Teaching Strategies II
⏰ 10:30am - 12:00pm, Oct 20
📍 Marriott 9

Chair:

Bruce Maxim
Professor, CIS and Professor, Engineering, UM Dearborn

4 Subsessions

- **A Spiral Approach to Teach Value Propositions Using the NABC Framework in Core Engineering Courses**
  ⏰ 10:30am - 10:52am, Oct 20

- **Challenge Problems: A Method to Improve Critical Thinking Skills**
  ⏰ 10:52am - 11:15am, Oct 20
Just-in-Time Teaching improves engagement and academic results among students at risk of failure in Computer Science Fundamentals

11:15am - 11:37am, Oct 20

The Engineer of 2020 is Here: Using Innovative Kinesthetic Activities as Tools to Fulfill the NAE Vision

11:37am - 12:00pm, Oct 20

F2J: MOOCs in CS and STEM Education

10:30am - 12:00pm, Oct 20

Marriott 10

Chair:

PK Imbrie
University of Cincinnati

4 Subsessions

- Aspects on Finding the Optimal Practical Programming Exercise for MOOCs
  10:30am - 10:52am, Oct 20

- Massive Open Online Courses in Software Engineering Education
  10:52am - 11:15am, Oct 20

- Prof. CI: Employing Continuous Integration Services and Github Workflows to Teach Test-driven Development
  11:15am - 11:37am, Oct 20

- Instructor Outcomes of Teaching a STEM MOOC
  11:37am - 12:00pm, Oct 20

Exhibitor Showcase: ARM University Program

10:30am - 12:00pm, Oct 20

Austin/Boston Room

Topic: Multi-Threaded Event-Based Programming for IoT and Robotics with mbed OS

Speaker: Prof. Bhaskar Krishnamachari and Jason Tran, University of Southern California

Description: Since the release of ARM mbed OS 5, it has a Real-Time Operating System (RTOS) at its heart. This workshop shows how to create an event-based application by leveraging the core features of the RTOS API. We will show examples of how one can use the Thread and Mail classes as well as the dispatcher design pattern to simplify code for IoT and Robotics applications. We have found that this...
programming framework has empowered many students to not only simplify their code, but also to evolve their code beyond the rudimentary polling while loops that check for some event/condition to occur. While students often learn how events work in the context of interrupts and interrupt service routines, they are often unaware of how to create event-based code that uses both blocking and non-blocking designs. We also discuss how event-based programming fits within the broader IoT curriculum at the University of Southern California.  

All participants will receive a NXP LPC1768 development board.

Speaker:

**Bhaskar Krishnamachari**  
Professor of Electrical Engineering, University of Southern California

**Jason Tran**  
University of Southern California

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**12:00pm**

**Lunch**  
12:00pm - 1:30pm, Oct 20  
Marriott 5 & 6

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**1:00pm**

**F3A: Special Session: Leading and Administering Transformative Change in Education beyond Disciplinary Boundaries**  
1:30pm - 3:00pm, Oct 20  
Lincoln

Authors: Jeffrey J. Evans, Justin Seipel and Michael Smith (Purdue University, USA)

One of the first artifacts produced by a massive multi-year education transformation effort has been the launching of a one-of-a-kind program focused on transdisciplinary studies that goes well beyond conventional notions of disciplines. One of the main thrusts of the transformation was to intentionally and repeatedly integrate STEM and Humanities learning and outcome assessment of skills and abilities needed for the 21st century. The challenges of creating and sustaining systemic shifts in culture and operational systems at a large campus have been many, and sometimes controversial. This special session will provide attendees with information and active engagement in a dialog about the motivations, design, and implementation of significant systemic change. Attendees will take away insights not only from what is presented, but also active engagement in transdisciplinary conversations. This session aligns with FIE's focus on innovations in program design and classroom techniques.

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**F3B: Special Session: Using pattern recognition techniques to analyze educational data**
Computational science has been described as "the application of computer science to solve problems across a range of disciplines" (ACM, 2013, p. 68). Science and engineering disciplines are now taking advantage of computers' capabilities to process large amounts of data, create complex visualizations of data, and simulate complex phenomena. As this shift occurs, educational researchers have started to identify different ways in which they can use computation to support their inquiry process to supplement traditional educational research methods in the social sciences. This special session will provide participants with hands-on experiences on how to use pattern recognition methods in the context of engineering education research.

This special session will introduce novel approaches to analyze educational data by taking advantage of the affordances of pattern recognition techniques. Participants in this special session will have a hands-on experience in using computational tools and methods to analyze qualitative or quantitative educational data and supplement the analysis with pattern recognition methods. By the end of this session, the participants will be able to describe different approaches to analyze educational data, and the conditions under which these approaches work.

The activities will be divided into three parts: • Introduction (20 minutes): o The organizers will introduce the session and themselves, and will provide a context for the workshop. (10 minutes) o Participants will be asked to discuss in small groups their own experiences using computational tools and methods for data analysis (5 minutes), and will share the most interesting and innovative with the whole group (5 minutes) • Implementation of the Methods (50 minutes): The participants will work collaboratively to understand, implement, and evaluate three different computational methods to analyze qualitative and quantitative educational data: (1) clustering qualitative data; (2) add-on preferential groups; and (3) creating visualizations of educational data. o The organizers can provide a maximum of eight laptops with the required software installed: the most recent version of R and R Studio. The participants are welcome to bring their own computer with the software already installed. o The organizers will provide sample data sets and scripts for the participants to implement these three methods. • Reflection (10 minutes): Participants reflect and share with the group how they can use the methods in their own practices.

Description

This session will be focused on the use of pattern recognition techniques to analyze, understand, and represent educational data. For instance, different clustering methods can be used to group students based on their grades or the perceived usefulness of a set of instructional methods. This approach allows researchers to understand the educational phenomenon beyond summative values (e.g. mean and standard deviation), or correlational values (e.g. Pearson correlation). Figure 1(a) shows how we can compare students' perceived usefulness about two instructional methods, and identify six different clusters of students. For instance, students in the lower right corner (17.86%), found Method One more useful than Method Two. Conversely, students in the higher left corner (1.19%) found Method Two more useful than Method One. However, there is still a group of students in the lower left corner (4.76%+2.38%) that did not consider either method as useful. Furthermore, we can validate these clusters using non-traditional statistical techniques such as the permutation test.

We can also use clusters to group students based on a qualitative coding process, which often becomes a high dimensional problem. For instance, Figure 1(b) shows how students (rows) were grouped based on the characteristics of their written comments within a sample Python code. Students' in-code comments were first analyzed using a coding scheme that involved 21 categories (columns). Then, using a binary distance between students, we conducted a hierarchical cluster analysis to identify
the different ways in which students explained this code. The colors in the plot correspond to each type of explainer that we identified.

Both examples presented here were developed using the statistical software R. The special session will include hands-on activities with R programming, where the participants will conduct their own analysis and create their own visualizations of qualitative and quantitative educational data. The R code that is required to create these and other visualizations will be made freely available to the participants.

Figure 1 - Sample visualizations of clusters of students based on quantitative (a) and qualitative (b) educational data [available in the complete document]

Time - Outcomes/Future work

The special session will last for 80 minutes. During the first 20 minutes, the organizers will provide background information about the topics to be discussed during the session, its relevance, and sample contexts in which this could be applied. During the next 50 minutes, the participants will work collaboratively on their own computers, analyzing sample data provided by the organizer. By the end of the session, participants will be able to describe different pattern recognition techniques and how they can be used to analyze quantitative and qualitative educational data. Participants will also be able to create a simple program in R to analyze this data.
4 Subsessions

- **CE2016: Updated Curricular Guidelines for Computer Engineering**
  - 1:30pm - 1:52pm, Oct 20

- **A Web-based Curriculum Engineering Tool for Investigating Syllabi in Topic Space of Standard Computer Science Curricula**
  - 1:52pm - 2:15pm, Oct 20

- **Using Spectrums and Dependency Graphs to Model Progressions from Introductory to Capstone Courses**
  - 2:15pm - 2:37pm, Oct 20

- **Novel gateway stay/add policy used to increase student success rates in an introductory circuits class**
  - 2:37pm - 3:00pm, Oct 20

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**F3E: Assessing Learning I**

- 1:30pm - 3:00pm, Oct 20
- Marriott 3

**Chair:**

**Elsa Villa**

UTEP

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4 Subsessions

- **Student Assessed Integrated Learning: SAILing to a Holistic Design of Holistic Engineering Education**
  - 1:30pm - 1:52pm, Oct 20

- **Development and Implementation of Rapid Feedback Using a Cloud-Based Assessment Tool**
  - 1:52pm - 2:15pm, Oct 20

- **Comparison of Partial Credit and Mastery Assessment on Student Learning and Retention**
  - 2:15pm - 2:37pm, Oct 20

- **The Authenticity of 'Authentic' Assessment: Some Faculty Perceptions**
  - 2:37pm - 3:00pm, Oct 20

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**F3F: Faculty Development I**

- 1:30pm - 3:00pm, Oct 20
### Marriott 4

**Chair:**

**Catherine Berdanier**  
The Pennsylvania State University

#### 4 Subsessions

- **Understanding faculty decisions about the integration of laboratories into engineering education**  
  1:30pm - 1:52pm, Oct 20

- **The Changing Role of the CSET Professorate in University-Based Value Creation**  
  1:52pm - 2:15pm, Oct 20

- **Teaching Mentoring Program for the application of active methodologies and ICT tools**  
  2:15pm - 2:37pm, Oct 20

- **Leveraging Institutional Data to Understand Student Perceptions of Teaching in Large Engineering Classes**  
  2:37pm - 3:00pm, Oct 20

### F3G: PK12 STEM Education - Programming Concepts

**Chair:**

**Saeedeh Ziaeeafard**  
Michigan Technological University

#### 4 Subsessions

- **Evaluating Algorithmic Thinking Ability of Primary Schoolchildren Who Learn Computer Programming**  
  1:30pm - 1:52pm, Oct 20

- **Graph-based Analysis of Computer Science Curricula for Primary Education**  
  1:52pm - 2:15pm, Oct 20

- **Music Maker: Using music to introduce coding and concurrency to young learners**  
  2:15pm - 2:37pm, Oct 20
This paper introduces the Gatekeepers Study, a three-year project with the goal of examining variation in enrollment in postsecondary engineering programs for students from Virginia high schools. Our research takes a macroscopic, systemic view of an entire state's high school-to-postsecondary engineering pathway to understand how each high school performs in terms of having its students from underrepresented groups who fit an engineering academic profile actually choose to enroll in an engineering postsecondary program. We frame our research holistically to understand how the variety of potential gatekeepers—including the people, places, programs, and policies—might be positioned, tweaked, or trained to support a more diverse population of students who choose to enroll in postsecondary engineering programs. This mixed-methods research design is organized into three sequential phases and will be grounded theoretically using Social Cognitive Career Theory to guide variable identification and qualitative protocol development. We are currently in Phase 1 and will describe preliminary results.
F3J: MOOCs: a Miscellany
1:30pm - 3:00pm, Oct 20
Marriott 10

Chair:

Rick Martin
Professor, Air Force Institute Of Technology

4 Subsessions

- Inverting VARK What are the possibilities?
  1:30pm - 1:52pm, Oct 20

- A Study of Engagement and Collaborative Learning in a Virtual Environment
  1:52pm - 2:15pm, Oct 20

- Implementing an active learning platform to support student learning in a numerical analysis course
  2:15pm - 2:37pm, Oct 20

- Relationship between Time Management in Courses with Online Interactive Textbooks and Students' Performance
  2:37pm - 3:00pm, Oct 20

F3J: MOOCs: a Miscellany
1:30pm - 3:00pm, Oct 20
Marriott 10

Chair:

Rogerio Garcia
Professor, UNESP

4 Subsessions

- Collusion in Educational Peer Assessment: How Much do We Need to Worry about It?
  1:30pm - 1:52pm, Oct 20

- MOOCEP: A Method for Building Massive Open Online Courses for Elderly People The Analysis Activity
  1:52pm - 2:15pm, Oct 20

- Using pre-course survey responses to predict sporadic learner behaviors in advanced STEM MOOCs
Bringing physical construction and real-world data collection into a Massively Open Online Course (MOOC)

IEEE Education Society Strategic Planning meeting

IEEE Education Society 60th Anniversary Celebration

F4A: Special Session: A Framework for Engineering Student Innovation that Connects Cognitive, Psychological, and Cultural Aspects of Learning
Engineering is inherently an innovative profession with design at the center of its core practices. Over the last decade, its importance for engineering students has heightened with the emergence of policy efforts and the rise of collegiate programs developed to support student innovation. Yet, research on how engineering students approach and experience innovation has been limited. During this special session, our goal is to present a framework for engineering student innovation along with research findings that informed the development of this framework. We will engage the audience in discussion of how this framework and related studies can inform teaching and student learning.

**F4B: Special Session: Workshop - A Narrative Approach to Broadening Schema about Engineering Professors**

- **Date:** Oct 20
- **Time:** 4:00pm - 5:30pm
- **Location:** Santa Fe

*Authors: Natascha Trellinger, Brent Jesiek and Swetha Nittala (Purdue University, USA)*

What images come to mind when you encounter the word “professor”? In many cases, our notion of a professor leads us to think of someone conducting research and teaching classes. However, our understanding of professors is in part limited by the professors we have been in contact with through our own educational experiences. Most people with PhD degrees attended a Doctoral University with Highest Research Activity, and therefore possess schema of professors in line with the professor at this type of institution. In this session, participants will be introduced to the narratives of twelve professors affiliated with institutions other than a Doctoral University with Highest Research Activity. These institution types include Baccalaureate Colleges, Master's Institutions, Doctoral Universities with Moderate Research Activity, and Doctoral Universities with Higher Research Activity. Through the use of personal narratives, the experiences of twelve assistant engineering professors will be considered. Session attendees will gain a broader understanding of what it means to be a professor by studying the experiences of professors at universities with varying focus on research and teaching.

**F4C: Panel: Influencing Culture and Curriculum Via Revolution**

- **Date:** Oct 20
- **Time:** 4:00pm - 5:30pm
- **Location:** Marriott 1

*Authors: Kelly Cross (University of Illinois Urbana Champaign, USA); Tiago Forin (Rowan University, USA); Amit Jain (Boise State University, USA); Lisa D. McNair (Virginia Tech, USA); Marina Miletic (University of Illinois, USA); Mani Mina (Iowa State University, USA); Elsa Villa (The University of Texas at El Paso, USA); Ella L Ingram (Rose-Hulman Institute of Technology, USA)*

The goal of this panel session is to introduce audience members to the challenges and successes of significant cultural and curricular change as enacted by awardees in the NSF program Revolutionizing Engineering and Computer Science Departments (RED). This panel will explore how organizations go about the process of cultural investigation and how they embark on culture change, using RED awardees of 2016 as the featured panelists (the second cohort). These teams are engaged in high-risk, high-trust-required activities focused on both the organizational and operational structure of their departments, and on re-envisioning engineering and computer science curricula to create professionals able to solve 21st century problems. A panel session allows the wider community to peek into these projects to see from the inside what's happening, even if only a bit. This paper captures short narratives on different themes of interest, developed by the individual teams and aggregated here as a first glimpse into the operations, challenges, and successes of these projects.
F4D: Entrepreneurship and Innovation

Chair: Shraddha Sangelkar
Penn State Erie

4 Subsessions

- Do Engineering Creativity/Innovation Courses Impact Engineering Innovativeness?
  4:00pm - 4:22pm, Oct 20

- Working on a Start-Up: A Case for an Applied Entrepreneurship Oriented Course for Senior Undergraduates
  4:22pm - 4:45pm, Oct 20

- Embedding Problem-Based Learning and Entrepreneurially Minded Learning into Fluid Mechanics and Thermodynamics Courses through Fluid Power Based Modules
  4:45pm - 5:07pm, Oct 20

- The First Cohort in a New Innovation, Leadership, and Engineering Entrepreneurship B. S. Degree Program
  5:07pm - 5:30pm, Oct 20

F4E: Assessing Learning II

Chair: Victor Nelson
Professor and Assistant Chair, Electrical and Computer Engineering, Auburn University

4 Subsessions

- Validating & Implementing Engineering Graduate Attribute Rubrics in a Biosystems Engineering Curriculum
  4:00pm - 4:22pm, Oct 20

- Visual Attention based Evaluation for Multiple-choice Tests in E-learning Applications
  4:22pm - 4:45pm, Oct 20
Direct Evidence of Engineering Students' Generic Skills Learning: From Research to Practice in an Undergraduate Course in Information Engineering
- 4:45pm - 5:07pm, Oct 20

Behavior Detection and Analysis for Learning Process in Classroom Environment
- 5:07pm - 5:30pm, Oct 20

F4F: Faculty Development II
- 4:00pm - 5:30pm, Oct 20
- Marriott 4

Chair:
Antoni Perez-Poch
- Deputy Director - Institute of Education Sciences at Universitat Politècnica de Catalunya, Universitat Politècnica de Catalunya

4 Subsessions

- Investigating strategies of pre-tenure women engineering faculty to overcome microaggressions in the classroom
  - 4:00pm - 4:22pm, Oct 20

- The Curmudgeon Counterexample: Seeking Sustainable STEM Transformation
  - 4:22pm - 4:45pm, Oct 20

- Aspects that influence curricular change capacity: characterizing the transferability, openness, and literacy of individual changemakers
  - 4:45pm - 5:07pm, Oct 20

- Why are we here? Student perspectives on the goal of STEM higher education
  - 5:07pm - 5:30pm, Oct 20

F4G: PK12 STEM Education - Understanding and Building Pathways
- 4:00pm - 5:30pm, Oct 20
- Marriott 7

Speaker:
Larry Richards
- University of Virginia
4 Subsessions

- **Seeing Engineering Everywhere: Culturally Relevant Engineering Activities with Rural and Appalachian Youth**
  4:00pm - 4:22pm, Oct 20

- **Building the K-12 Engineering Pipeline: An assessment of where we stand**
  4:22pm - 4:45pm, Oct 20

- **Using a Virtual Learning Environment for Problem-Based Learning Adoption: A Case Study at a High School in India**
  4:45pm - 5:07pm, Oct 20

- **Developing an Understanding of the Implementation and Impacts of High School pre-Engineering Programs: Making the Case for a Benefit-Cost Analysis**
  5:07pm - 5:30pm, Oct 20

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**F4H: Educational Research - On Inclusion II**

- **4 Subsessions**

  - **Social and Latent Identities that Contribute to Diverse Students' Belongingness in Engineering**
    4:00pm - 4:22pm, Oct 20

  - **Social responsibility in undergraduate engineering programs**
    4:22pm - 4:45pm, Oct 20

  - **Moderating Cultural Effects in a Higher e-Education Context? Supervisor's Tone of Voice in Recorded Audio Feedback**
    4:45pm - 5:07pm, Oct 20

  - **Methods Matter: Contrasting Undergraduate Research Experience Outcomes based on Surveys and Interview Methods**
    5:07pm - 5:30pm, Oct 20

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**F4I: Pedagogical Approaches & Teaching Strategies III**

- **4 Subsessions**

  - **Building the K-12 Engineering Pipeline: An assessment of where we stand**
    4:22pm - 4:45pm, Oct 20

  - **Using a Virtual Learning Environment for Problem-Based Learning Adoption: A Case Study at a High School in India**
    4:45pm - 5:07pm, Oct 20

  - **Developing an Understanding of the Implementation and Impacts of High School pre-Engineering Programs: Making the Case for a Benefit-Cost Analysis**
    5:07pm - 5:30pm, Oct 20

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**Chair:**

**Sukumaran Beena**
President's Fellow, Rowan University
### 4 Subsessions

- **Enhancing Collaboration Among Undergraduates in Informatics: A Teaching and Learning Process Based on Crowdsourcing**  
  4:00pm - 4:22pm, Oct 20

- **The Apprenticeship Project for educating a STEM-based workforce and the Dissemination of Learning Technology**  
  4:22pm - 4:45pm, Oct 20

- **An impact comparison of two instructional scaffolding strategies employed in our programming laboratories: Employment of a supplemental teaching assistant versus employment of the pair programming methodology**  
  4:45pm - 5:07pm, Oct 20

- **A Modification to the Case Study Method to Teach Students to Read Academic Papers**  
  5:07pm - 5:30pm, Oct 20

### F4J: Computational Thinking I

- **Exploring Computational Thinking Assessment in Introductory Programming Courses**  
  4:00pm - 4:22pm, Oct 20

- **An Exploratory Study on Inclusion of Visual Representations of Thermodynamics-related Problems**  
  4:22pm - 4:45pm, Oct 20

- **The Use of Computational Thinking in Digital Fabrication Projects A Case Study From the Cognitive Perspective**  
  4:45pm - 5:07pm, Oct 20

- **Computational thinking in mathematics education: A Joint Approach to Encourage Problem-Solving Ability**  
  5:07pm - 5:30pm, Oct 20

### ASEE ERM Division Business Meeting
4:00pm - 5:30pm, Oct 20
Austin/Boston Room

5:00pm

Puerto Rico: What can we do to help?
5:30pm - 6:30pm, Oct 20
Marriott 8

Attendees from Puerto Rico will give a brief 20-minute presentation, followed by Q&A and open discussion on education, research, and outreach activities that could be helpful, not only in the present crisis in Puerto Rico, but in future, similar situations after natural or man-made emergencies.

7:00pm

Reception and Awards Banquet (additional ticket required)
7:00pm - 10:00pm, Oct 20
Marriott 5 & 6

Sat, Oct 21, 2017

7:00am

Registration
7:30am - 3:00pm, Oct 21
Marriott 5 & 6

Breakfast
7:30am - 8:30am, Oct 21
Marriott 5 & 6

8:00am

FIE Steering Committee Meeting Executive Session
8:00am - 9:30am, Oct 21
Atlanta Room

S1B: Special Session: Engaging with the Multiple Institution Database for Investigating Engineering Longitudinal Development (MIDFIELD)
8:30am - 10:00am, Oct 21
Santa Fe
Authors: Susan M. Lord (University of San Diego, USA); Matthew W Ohland and Russell Long (Purdue
University, USA); Marisa K. Orr (Clemson University, USA); Catherine E. Brawner (Research Triangle Educational Consultants, USA); Richard Layton (Rose-Hulman Institute of Technology, USA)

The Multiple Institution Database for Investigating Engineering Longitudinal Development (MIDFIELD) dataset is expanding from 14 to about 100 institutions across the USA. This special session aims to introduce participants to MIDFIELD, explore how to conduct research with such a resource, and explain how participants can access MIDFIELD.

S1C: Visual Learning Platforms, Apps & Education Technologies
☐ 8:30am - 10:00am, Oct 21
📍 Marriott 1

4 Subsessions

- **Development of Signal Processing Online Labs using HTML5 and Mobile platforms**  
  ☐ 8:30am - 8:52am, Oct 21

- **Teaching Software Quality via Source Code Inspection Tool**  
  ☐ 8:52am - 9:15am, Oct 21

- **Sketchnoting: A new approach to developing visual communication ability, improving critical thinking and creative confidence for engineering and design students**  
  ☐ 9:15am - 9:37am, Oct 21

- **VREX: Virtual Reality Education Expansion could help to improve the Class experience**  
  ☐ 9:37am - 10:00am, Oct 21

S1D: Cultivating Entrepreneurial Mindsets
☐ 8:30am - 10:00am, Oct 21
📍 Marriott 2

Chair:

[Image of Amit Jain]

**Amit Jain**  
Associate Professor and Associate Chair, Boise State University

4 Subsessions

- **Fostering an Entrepreneurial Mindset in "Digital Systems" Class through a Jigsaw-Puzzle Model**  
  ☐ 8:30am - 8:52am, Oct 21

- **An Entrepreneurial Approach to a Senior Design Course**  
  ☐ 8:52am - 9:15am, Oct 21
<table>
<thead>
<tr>
<th>Session</th>
<th>Title</th>
<th>Time</th>
<th>Location</th>
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<tbody>
<tr>
<td></td>
<td>Cultivating an Entrepreneurial Mindset in an Undergraduate Engineering</td>
<td>9:15am - 9:37am,</td>
<td>Marriott 3</td>
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<td>Statistics Course Using Project-based Learning</td>
<td>Oct 21</td>
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<td></td>
<td>Teaching Entrepreneurship in Computer Science: Lessons Learned</td>
<td>9:37am - 10:00am,</td>
<td>Marriott 3</td>
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**S1E: Student Retention I**

- **Theme**: Student Retention
- **Time**: 8:30am - 10:00am, Oct 21
- **Location**: Marriott 3

*Chair:*

**PK Imbrie**

University of Cincinnati

**4 Subsessions**

1. **Moving from Managing Enrollment to Predicting Student Success**
   - **Time**: 8:30am - 8:52am, Oct 21
   - **Location**: Marriott 3

2. **Predicting Students' Graduation Outcomes through Support Vector Machines**
   - **Time**: 8:52am - 9:15am, Oct 21
   - **Location**: Marriott 3

3. **A Comparison of Statistical Methods for Examining Persistence in Engineering**
   - **Time**: 9:15am - 9:37am, Oct 21
   - **Location**: Marriott 3

4. **Beyond Academic Quality: Lessons from the creation of a new Engineering Degree**
   - **Time**: 9:37am - 10:00am, Oct 21
   - **Location**: Marriott 3

**S1G: PK12 STEM Education - By Design**

- **Theme**: PK12 STEM Education
- **Time**: 8:30am - 10:00am, Oct 21
- **Location**: Marriott 7

*Chair:*

**Hideo Nagumo**

Professor, Niigata Seiry University

**4 Subsessions**

1. **Empathy in Middle School Engineering Design Process**
   - **Time**: 8:30am - 10:00am, Oct 21
   - **Location**: Marriott 7
Students' Science Talk During Engineering Design in Life Science-Focused STEM Integration Units
8:52am - 9:15am, Oct 21

Enabling Access to Engineering Education Materials Everywhere By Design
9:15am - 9:37am, Oct 21

Student Conceptions of 'Conducting Tests' in Design in the middle school classroom
9:37am - 10:00am, Oct 21

S1H: Everything About Self-Efficacy
8:30am - 10:00am, Oct 21
Marriott 8

Chair:
Kyle F Trenshaw
Educational Development Specialist for STEM, University of Rochester

4 Subsessions
Development of a self-efficacy scale for digital competences in schools
8:30am - 8:52am, Oct 21

Investigating Undergraduate Students' Communication Self-Efficacy during an Engineering Design Course
8:52am - 9:15am, Oct 21

Self-Efficacy of Teaching Engineering: Does TEK8 Help or Hinder?
9:15am - 9:37am, Oct 21

Nanotechnology Experiences for Students and Teachers (NEST): Enhancing teachers' self-efficacy and their understanding of STEM career opportunities
9:37am - 10:00am, Oct 21

S1I: Pedagogical Approaches & Teaching Strategies IV
8:30am - 10:00am, Oct 21
Marriott 9

Chair:
Learning by Teaching strategy to improve learning outcomes from undergraduate students
8:30am - 8:52am, Oct 21

Practice of Model-based Development for Automotive Engineers
8:52am - 9:15am, Oct 21

The Influence of Teaching Assistants in an Undergraduate Engineering Laboratory Course
9:15am - 9:37am, Oct 21

Professional and Ethical Deliberation: Educating Engineering Students in Responsible Wellbeing
9:37am - 10:00am, Oct 21

Design of a MATLAB-based Teaching Tool in Introductory Fractional-Order Systems and Controls
8:30am - 8:52am, Oct 21

An Operationalized Model for Defining Computational Thinking
8:52am - 9:15am, Oct 21

Where does the calculus go? A follow up investigation of how calculus ideas are used in core engineering coursework
9:15am - 9:37am, Oct 21

Computational Modeling of Abductive Reasoning: an experimental study employing the CHR language in an educational context
9:37am - 10:00am, Oct 21
I. DESCRIPTION OF SESSION CONTENT

The term "mindset" is often used in layman's terms to refer to the set of characteristics (knowledge, skills, or attitudes) that a person possesses. According to the Merriam-Webster dictionary, mindset refers to a "mental attitude or inclination." While the layman's use of the term mindset makes its way into engineering education research, such as in the phrase "entrepreneurial mindset," the construct of mindset is defined in the psychology literature in a slightly different manner. For example, the psychological literature typically categorizes mindset into the two categories of growth or fixed [1]. Individuals with a growth mindset believe that "basic qualities are things you can cultivate with your efforts" (p. 7). While every individual has varying strengths regarding different abilities, success on tasks can be influenced by effort and practice. In contrast, individuals with a fixed mindset believe that one's performance on tasks is the result of innate, immutable characteristics. Students who have a growth mindset are more likely to put greater effort into their work and to take on challenges. While many of the studies on growth versus fixed mindset have been conducted in the K-12 population, teachers at any level can implicitly promote a growth versus fixed mindset through the messages that they provide to their students, such as language in the course syllabus, feedback given to students, and conversations with students about progress. This session will be an interactive conversation about the growth versus fixed mindset and how instructors may unknowingly promote one mindset or the other through their instructional strategies.

II. GOALS OF THE SESSION

The intended goals of the special session follow: Participants will

• Gain an understanding of growth versus fixed mindset, including an awareness of both classic and current research related to the constructs.

• Identify subtle ways that instructors may promote a fixed versus growth mindset in their courses.

• Reflect upon their own teaching to explore where they may have promoted a fixed versus growth mindset and consider what changes they may want to pursue.

The intended audience for the workshop is quite broad and would include any engineering instructor who teaches or researchers interested in the growth versus fixed mindset. In addition, because mindset is such a popular topic right now in the entrepreneurship education community, we would expect that instructors and researchers in this domain may be interested as well.

III. EXPLANATION OF INTERACTION

The special session will incorporate a number of interactive elements. First, participants will be asked to complete an "impossible puzzle," a brain-teaser puzzler that is challenging for most individuals to figure
out, particularly under severe time constraints. This puzzle might be something like the Hanayama metal disassembly puzzles, where metal shapes are linked to one another and require specific movements to disentangle them. Prior to working on the puzzle, participants will receive a message that may prime them to pursue the puzzle according to either growth versus fixed mindset. For example, participants may receive the notice such as, "Research has shown that most engineers have innate skills that allow them to succeed at puzzles such as these and can solve them easily with little to no practice," a message which could promote a fixed mindset. Alternatively, participants may receive a message intended to prompt a growth mindset, such as one that says, "Research has shown that being an engineer has no impact on solving puzzles such as these. Rather, the amount of effort a person takes, regardless of career, is more likely to predict whether a person can solve the puzzle." A variety of messages will be crafted to demonstrate various ways the fixed versus mindset can be prompted. After a very restricted time period, participants will come together as a group to discuss how the message impacted their effort and mindset towards working on the puzzle.

Following a large group discussion of the puzzle challenge and its relation to classic and contemporary research relating to growth and fixed mindset, the workshop organizers will use a role play activity replicating a very common situation in academia: a student attending office hours to get help on a particular problem. Attendees will be asked to identify statements made by the student that indicate whether or not he/she has a growth versus fixed mindset and to identify statements made by the instructor that promote one or the other mindset.

After the role play activity, participants will be placed in small groups and ask to generate other ideas where messages from an instructor might promote a fixed or growth mindset. Additionally, the participants will be asked to generate ideas on how to handle a situation where it is clear that a student is approaching a task with a fixed mindset. The workshop will conclude with a reflective activity in which the participants are asked to identify their own instructional strategies, areas where they feel they need improvement, and identify changes they would like to make.

IV. SESSION AGENDA

(0:00-0:05) Introduction and Overview

(0:05-0:10) Puzzle challenge

(0:10-0:30) Large group discussion of puzzle challenge and how the messages received impacted effort and performance; Discussion of literature on growth vs. fixed mindset

(0:30-0:50) Role play activity and discussion

(0:50-1:10) Small group idea generation discussion regarding messages that instructors give to students on growth versus fixed mindset

(1:10-1:20) Reflection activity

V. JUSTIFICATION OF NOVELTY

The interactive elements of this session will create a novel experience for our participants. Participants will directly experience the impact of implied fixed or growth mindset promotion through the impossible puzzle activity. Participants will have time to reflect on their current practices and brainstorm specific strategies for moving forward. This will be a very practice-oriented session where participants will walk away with concrete strategies they can use when interacting with their students.

REFERENCES

S2B: Special Session: Fostering Metacognition Development in a STEM Context
⊙ 10:30am - 12:00pm, Oct 21
📍 Santa Fe

Authors: Jeffrey J. Evans, Justin Seipel, Michael Smith and Amy S Van Epps (Purdue University, USA)

An educational incubator in Purdue University's Polytechnic Institute has been experimenting with highly integrated methods to facilitate, assess, and evaluate student learning. Comprised of transdisciplinary faculty and students, one of the basic covenants is to intentionally and repeatedly balance Humanities and STEM concepts by way of open-ended problems affecting humanity and the planet. The learning experience environment tries to integrate faculty and students from widely different disciplines in scenarios where cognitive and metacognitive development is encouraged and explored. This special session will engage attendees in examples of activities that can help students become self-aware of the power of music on their physiology and imagination while also integrating problem-solving and other STEM related concepts. Participants will take away ideas and techniques that they can add to their own palette for fostering integrated learning and metacognitive development. This session aligns with FIE's focus on innovations in classroom techniques.

S2C: Panel: FIE 2017 Reviewing the past, predicting the future
⊙ 10:30am - 12:00pm, Oct 21
📍 Marriott 1

Authors: Larry Richards (University of Virginia, USA); Susan M. Lord (University of San Diego, USA); Cynthia Finelli (University of Michigan, USA); Elizabeth A. Eschenbach (Humboldt State University, USA); P Imbrie (University of Cincinnati, USA); Larry Shuman (University of Pittsburgh, USA); Karl Smith (University of Minnesota & Purdue University, USA); Ann McKenna (Arizona State University, USA); Cynthia Atman (University of Washington, USA)

Frontiers in Education has a long and distinguished history. Much of the early history is reviewed in papers by Ed Jones posted on the FIE clearinghouse website. That website also contains a history of the division in terms of the people who participated in its leadership, received awards and recognitions, and made significant contributions to the conference. We also have a list of all the New Faculty Fellows we have supported over the years, and can trace their involvement in the conference since they receive their awards. We have a very good hit rate for continued involvement in FIE. Periodically, various authors have assessed the state of FIE in papers and panels presented at the conference. In this paper, we were review these many resources and provide more detailed documentation of our history and evolution. FIE 2014 in Madrid included a panel on the state of the Frontiers in Education conference; and last year Ed Jones and Jim Rowland reviewed their involvement in and impressions of FIE from the beginning. In 2002, a collection of 13 FIE authors assembled to address a variety of topics and predict the Future of Engineering Education. Larry Shuman organized and moderated the session. The published paper has had over 200 citations according to Google scholar. Ten of the authors are still active in ASEE and will be invited to participate in this panel. We will examine the predictions made by the various authors, and ask where we were right where we were wrong. What has come to pass? What is still in progress? And what concerns have faded from view? Universities and their faculties are undergoing significant disruptive change. Many years ago, Gearhold Johnson asked in a paper whether we are the last generation to enjoy a traditional academic life. He noted several disturbing trends that undermine academic culture and values. In a recent presentation at Purdue, Phil Wankat (https://www.youtube.com/watch?v=l1DMlDJEmFs) discussed the changing nature of academic careers. What's going on now in American universities that will shape the future of engineering education? Will current trends (larger classes, fewer faculty who teach) result in a crisis in Higher
Education? Or will we create innovative solutions (shared resources, greater use of technology, a new class of faculty, …) to maintain effective undergraduate education in engineering?

**S2D: Information Literacy**

- **A pilot "big data" education modular curriculum for engineering graduate education: Development and implementation**
  - 10:30am - 10:52am, Oct 21
  - Marriott 2

**Speaker:**

- **Alison Clear**
  - Associate Professor, Eastern Institute of Technology (EIT)

**4 Subsessions**

- Integrating Data Information Literacy Education into a Service-Learning Engineering Design Course
  - 10:52am - 11:15am, Oct 21

- **GRIP: A University's Program Develops Tracks to Bridges, A Professional Development Opportunity**
  - 11:15am - 11:37am, Oct 21

- **Using Design Journals to Uncover Information Literacy Habits of First-year Students**
  - 11:37am - 12:00pm, Oct 21

**S2E: Student Retention II**

- **The Role of Student Passions Inside the Engineering Curriculum**
  - 10:30am - 10:52am, Oct 21
  - Marriott 3

**Chair:**

- **Jinny Rhee**
  - Associate Dean of Engineering, San Jose State University

**4 Subsessions**

- **The Role of Student Passions Inside the Engineering Curriculum**
  - 10:30am - 10:52am, Oct 21
The I-C-D-M Methodology: Improving Undergraduate Engineering Student Motivation, Satisfaction, and Performance

10:52am - 11:15am, Oct 21

Grit and Two-Year Engineering Retention

11:15am - 11:37am, Oct 21

Impact of Course Policy Changes on Calculus II DFW Rates

11:37am - 12:00pm, Oct 21

S2F: Developing Intercultural Competence

10:30am - 12:00pm, Oct 21

Marriott 4

Chair:

Arnold N Pears
Head of Division, Computer Systems, Uppsala University

4 Subsessions

Exploring Global Skills Proficiency for Engineering Students Through a Short-Term Study Abroad Program

10:30am - 10:52am, Oct 21

Preparing Students for Intensive Global Fieldwork

10:52am - 11:15am, Oct 21

Cultivating global mindsets without leaving campus: Building interculturally competent engineer

11:15am - 11:37am, Oct 21

Curricular culture literacy and miscodes in its absence: making sense of conflicts in cross-institutional curricular collaborations

11:37am - 12:00pm, Oct 21

S2G: PK12 Teacher Development

10:30am - 12:00pm, Oct 21

Marriott 7

Chair:
Assessing the state of Engineering Instruction in Maine's K-12 Schools
10:30am - 10:52am, Oct 21

An Evaluation of a Research Experience for Teachers in Nanotechnology
10:52am - 11:15am, Oct 21

Challenges Encountered by Elementary Education Major Students When Learning Engineering
11:15am - 11:37am, Oct 21

Gamification in Education: A Methodology to Identify Student’s Profile
11:37am - 12:00pm, Oct 21

S2H: Using Analytics to Think About Teaching and Learning I
10:30am - 12:00pm, Oct 21
Marriott 8
Chair:
Kamal Kant Sharma
Chandigarh University

A Conceptual Framework for Analyzing Students’ Feedback
10:30am - 10:52am, Oct 21

A Word-Space Visualization Approach to Study College of Engineering Mission Statements
10:52am - 11:15am, Oct 21

Finding out Topics in Educational Materials Using their Components
11:15am - 11:37am, Oct 21

Toward understanding novices’ search process in programming problem solving
11:37am - 12:00pm, Oct 21

S2I: Use of Blended Learning Environments in General
10:30am - 12:00pm, Oct 21
S2J: Cyber Security

10:30am - 12:00pm, Oct 21
Marriott 10

Chair:

Jaime Raigoza
California State University Chico

4 Subsessions

- CyberCSP: Integrating Cybersecurity into the Computer Science Principles Course
  10:30am - 10:52am, Oct 21

- Cyber Security Training: A Survey of Serious Games in Cyber Security
  10:52am - 11:15am, Oct 21

- Lessons Learned From Complex Hands-on Defence Exercises in a Cyber Range
  11:15am - 11:37am, Oct 21

- Demystifying Ad Fraud
11:37am - 12:00pm, Oct 21

Teaching Ranging and Localization using Bluetooth on Android Devices

1:30pm - 1:52pm, Oct 21

Learning Database Security with Hands-on Mobile Labs

1:52pm - 2:15pm, Oct 21

MiDroid: An open mobile platform for learning focused on microcontrollers' education

2:15pm - 2:37pm, Oct 21

ReqML-Catalog: The Road to a Requirements Catalog for Mobile Learning Applications

2:37pm - 3:00pm, Oct 21

12:00pm

Lunch

12:00pm - 1:30pm, Oct 21

Marriott 5 & 6

1:00pm

S3C: Mobile Learning Platforms, Apps & Education Technologies

1:30pm - 3:00pm, Oct 21

Marriott 1

Chair:

Martin Yeh
Assistant Professor, Penn State University

4 Subsessions

- Teaching Ranging and Localization using Bluetooth on Android Devices
  1:30pm - 1:52pm, Oct 21

- Learning Database Security with Hands-on Mobile Labs
  1:52pm - 2:15pm, Oct 21

- MiDroid: An open mobile platform for learning focused on microcontrollers' education
  2:15pm - 2:37pm, Oct 21

- ReqML-Catalog: The Road to a Requirements Catalog for Mobile Learning Applications
  2:37pm - 3:00pm, Oct 21

S3D: Everything Robotics

1:30pm - 3:00pm, Oct 21

Marriott 2

Chair:
4 Subsessions

- **Robotics Education Online**
  - Time: 1:30pm - 1:52pm, Oct 21

- **Teaching software maintenance with ludic techniques supported by Robotics**
  - Time: 1:52pm - 2:15pm, Oct 21

- **A Methodology of Contextualized Educational Robotics**
  - Time: 2:15pm - 2:37pm, Oct 21

- **Computational Vision Applied to The Monitoring of Mobile Robots in Educational Robotic Scenarios**
  - Time: 2:37pm - 3:00pm, Oct 21

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**S3G: STEM Outreach**

- Time: 1:30pm - 3:00pm, Oct 21
- Location: Marriott 7

**Speaker:**

- **Mangilal Agarwal**
  - Associate Director of Research Development, Indiana University–Purdue University Indianapolis

4 Subsessions

- **What Computing Instructors Did Last Summer: Experiences and Lessons Learned**
  - Time: 1:30pm - 1:52pm, Oct 21

- **What (de)motivates one to volunteer in K-12 STEM-C outreach activities?**
  - Time: 1:52pm - 2:15pm, Oct 21

- **Leveraging a Multi-Partner Approach to Develop Successful STEM Outreach Programs**
  - Time: 2:15pm - 2:37pm, Oct 21

- **Involving local administrations in STEM promotion: how to extend STEM initiatives to a whole region**
  - Time: 2:37pm - 3:00pm, Oct 21

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**S3H: Using Analytics to Think About Teaching and Learning II**

- Time: 1:30pm - 3:00pm, Oct 21
Marriott 8

Chair:

Megan Sapp-Nelson
Associate Professor of Library Science, Purdue University

4 Subsessions

- **Using Information Technology for Personalizing the Computer Science Teaching**
  - 1:30pm - 1:52pm, Oct 21

- **A Reference Architecture for Educational Data Mining**
  - 1:52pm - 2:15pm, Oct 21

- **Comparative study of xAPI validation tools**
  - 2:15pm - 2:37pm, Oct 21

- **Supporting Quality Teaching using Educational Data Mining based on OpenEdX Platform**
  - 2:37pm - 3:00pm, Oct 21

S3I: Problem/Project Based Learning (PBL)

Marriott 9

Chair:

Liping Liu
Associate Professor, Lawrence Technological University

4 Subsessions

- **Cross-Course Project-based Learning in Requirements Engineering: An Eight-year retrospective**
  - 1:30pm - 1:52pm, Oct 21

- **Applying the Agile Manifesto to a Project-Based Learning Experiment: A Statistical Analysis**
  - 1:52pm - 2:15pm, Oct 21

- **How do students experience the problem-solving studio?**
  - 2:15pm - 2:37pm, Oct 21
Effectiveness of problem-based learning in the academic performance of course 'Physics I'
⏰ 2:37pm - 3:00pm, Oct 21

S3J: Innovative Applications of Raspberry PI & Arduino
⏰ 1:30pm - 3:00pm, Oct 21
📍 Marriott 10

Chair:

Jaye Nias
Assistant Professor, Spelman College

4 Subsessions

- **Raspberry Pi Creativity: A Student-Driven Approach to Teaching Software Design Patterns**
  🕒 1:30pm - 1:52pm, Oct 21

- **Making Operating Systems more Appetizing with the Raspberry Pi**
  🕒 1:52pm - 2:15pm, Oct 21

- **Incorporating a Raspberry Pi into a Computer Information Systems Initial Course**
  🕒 2:15pm - 2:37pm, Oct 21

- **Assessing the Use of Open Source Microcontroller Board for Teaching Engine Sensing and Communication in Automotive Laboratory**
  🕒 2:37pm - 3:00pm, Oct 21

FIE 2018 Planning Committee Meeting
⏰ 1:30pm - 2:30pm, Oct 21
📍 Atlanta Room

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