Welcome to the 2016 ASEE Midwest Section Conference!

The Kansas State University (KSU) College of Engineering is delighted to host this year’s ASEE Midwest Section Conference in Manhattan, KS, Sept. 25-27, 2016. The conference organizers have worked with the KSU Global Campus team to develop a meeting based upon the theme, “Research-Powered STEM Education.” Consistent with that theme, we are honored to engage a group of plenary speakers that have demonstrated leadership in the field of STEM education research funding, project management, and publication.

The kickoff event for this year’s conference will take place on Sunday evening, Sept. 25, in the new KSU College of Engineering “Phase IV” complex, which became available for use by students and faculty in Spring 2016. The evening colloquium, which will start at 6:00 p.m. in the new Engineering Hall auditorium (DUE 1109), will thematically address the creation of modern lecture, laboratory, and community spaces for STEM education. Dr. Gary Clark, Senior Associate Dean of the KSU College of Engineering, will offer some remarks related to the vision and planning that led to the design of the Phase IV complex. Dr. Joel Andrews, Garmin Corporation, will then present some thoughts related to the need for such spaces when preparing STEM graduates for the professional workplace. An informal 7:00 p.m. dinner reception and a self-guided walking tour of the Phase IV complex will complete the evening.

The events on Monday and Tuesday (9/26-9/27) will be held at the Manhattan Conference Center that adjoins the Hilton Garden Inn, Manhattan, KS. Dr. Darren Dawson, Dean of the KSU College of Engineering, will open the morning plenary session and introduce Dr. Michael Loui, Purdue, who will address publishing STEM education research from his perspective as the editor of the *Journal of Engineering Education*. We are also excited to host Dr. Elliott Douglas (National Science Foundation, Program Director for Engineering Education) and Dr. Ece Yaparak (National Science Foundation, Program Director for the Division of Undergraduate Education), who have graciously agreed to moderate a Monday morning plenary workshop related to the creation of high-quality STEM education research proposals. During lunch on Monday, Dr. Matthew Ohland (Purdue, Co-Director of the National Effective Teaching Institute), will share experiences related to the creation and use of a national database of student educational records. Various technical sessions and workshops will be offered throughout the day on Monday, organized thematically for a variety of interests. The Monday evening banquet will complete the Monday agenda, offering an opportunity to present the ASEE Midwest Section Outstanding Teaching and Service Awards. After the meal, Dr. April Mason (KSU Provost and Senior Vice President), will address the attendees and introduce Dr. Elliott Douglas, who will share some ideas related to the need for revolutionary change in engineering education.

Finally, the Tuesday agenda will consist of a morning full of technical sessions related to STEM education, followed by a luncheon coupled with a Midwest Section business meeting, during which paper/poster awards will be presented. We trust that this short but high-powered conference will provide attendees with ideas to enhance their educational offerings and the confidence to pursue formal research grants that can fund those creative pursuits.

Sincerely,
The Conference Chairs

Dr. Steven Warren, Conference Chair, Associate Professor, Kansas State University, Department of Electrical & Computer Engineering 3108 Engineering Complex, 1701D Platt Street, Manhattan, KS 66506 Phone: (785)532-4644 Email: swarren@ksu.edu

Dr. Emily Dringenberg, Technical Program Chair, Teaching Assistant Professor, Kansas State University, General Engineering 1093Q Fiedler Hall, 1701C Platt Street Manhattan, KS 66506 Phone: (785)532-5171 Email: dringenberg@ksu.edu

2016 Midwest Section Award Winners

Outstanding Teaching Award
Dr. Carl W. Luchies, Associate Professor, Department of Mechanical Engineering, University of Kansas, Lawrence, KS 66045

Outstanding Service Award
Dr. Christi Lynn Patton Luks, Associate Teaching Professor of Chemical Engineering, Department of Chemical and Biochemical Engineering, Missouri University of Science and Technology, Rolla, MO 65409

Technical Program Committee

Prof. Chris Ahern, Kansas State University
Dr. Charles Bauskal, John Zink Company LLC
Dr. Ed Clausen, University of Arkansas
Dr. Tareq Daher, University of Nebraska - Lincoln
Dr. Emily Dringenberg, Kansas State University
Dr. Laura Ford, The University of Tulsa
Dr. Carl Frederickson, University of Central Arkansas
Dr. Mei He, Kansas State University
Dr. Keith Hohn, Kansas State University
Dr. Jhenhsien Hsu, Missouri University of Science & Technology
Dr. Gerald Kane, The University of Tulsa
Dr. Amardeep Kaur, Missouri University of Science & Technology
Dr. Christi Patton Luks, Missouri University of Science & Technology

Dr. Lorin Maletsky, The University of Kansas
Dr. Rachel Mosier, Oklahoma State University
Dr. Punit Prakash, Kansas State University
Prof. Carisa Ramming, Oklahoma State University
Dr. Hema Ramsurn, The University of Tulsa
Dr. Krishnaswamy Ravindra, Saint Louis University
Dr. Saeed Rokooeei, University of Nebraska - Omaha
Dr. Shelli Starrett, Kansas State University
Prof. Qudsia Tahmina, Grantham University
Dr. Hitesh Vora, Oklahoma State University
Prof. Kevin Wanklyn, Kansas State University
Prof. Steve Warren, Kansas State University
Dr. Sara Wilson, The University of Kansas
Prof. Dean Zollman, Kansas State University
Sunday, September 25, 2016
Kansas State University, College of Engineering, Phase IV Complex, Engineering Hall 1109 and atrium

5:00-9:00 p.m. Conference Registration - Engineering Hall atrium

6:00-7:00 p.m. Engineering Facility Colloquium Engineering Hall 1109
Dr. Gary Clark, Senior Associate Dean, College of Engineering, Kansas State University, “Welcome and Phase IV Overview”

7:00-9:00 p.m. Dinner Reception and Phase IV Walking Tours

Monday, September 26, 2016
Hilton Garden Inn & Manhattan Conference Center

7:30 a.m. – noon Conference Registration – Lobby

8:00 – 9:00 a.m. Welcome & Opening Plenary Session – Big Basin
Dr. Darren Dawson, Dean, College of Engineering, Kansas State University, “Welcome and Speaker Introduction”
Dr. Michael Loui, Purdue University, Editor, Journal of Engineering Education, “Publishing on Engineering Education in Journals: From Fundamental to Translational Research”

9:15 – 10:15 a.m. Concurrent Technical Session I – Alcove/Tuttle

10:15 – 11:00 a.m. Morning Break – Lobby

10:15 a.m. – 1:15 p.m. Student Poster Session – Lobby

11:00 a.m. – Noon Workshop on NSF Funding Opportunities – Big Basin
Dr. Ece Yaprak, Program Director, National Science Foundation, Division of Undergraduate Education and Dr. Elliot Douglas, Program Director, National Science Foundation, Division of Engineering Education and Centers, “Got an Education Project? How to Write Your Proposal for NSF and Where to Submit It”

12:15 – 1:15 p.m. Luncheon & Speaker – Big Basin
Dr. Matthew Ohland, Director of MIDFIELD, Purdue University, “Developing, Studying, and Sharing a Longitudinal Database of Student Educational Records”

1:30 – 5:00 p.m. Conference Registration – Lobby

1:30 – 2:30 p.m. Concurrent Technical Session II – Alcove/Tuttle

2:30 – 3:00 p.m. Afternoon Break – Lobby

Monday, continued

3:00 – 4:00 p.m. Concurrent Technical Session III – Alcove/Tuttle

4:15 – 5:15 p.m. Concurrent Technical Session IV – Alcove/Tuttle

6:00 – 8:00 p.m. Banquet, Section Awards, & Speaker – Big Basin
Dr. April Mason, Provost and Senior Vice President, Kansas State University, “Welcome and Speaker Introduction”
Dr. Elliot Douglas, National Science Foundation, “Starting a Revolution: Creating Change in Engineering Education”

8:00 – 9:00 p.m. Midwest Section Executive Meeting – McDowell Room

Tuesday, September 27, 2016
Hilton Garden Inn & Manhattan Conference Center

7:30 a.m. – noon Conference Registration – Lobby

7:30 – 8:30 a.m. Campus Representatives Meeting – McDowell Room

8:30 – 9:50 a.m. Concurrent Technical Session V – Alcove/Tuttle

9:50 – 10:15 a.m. Morning Break – Lobby

10:15 – 11:15 a.m. Concurrent Technical Session VI – Alcove/Tuttle

11:30 a.m. – 1:00 p.m. Luncheon, Conference Awards, & Business Meeting – Big Basin

1:00-1:30 p.m. Debriefing – McDowell Room

Meeting Room Layout
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<tr>
<th>Session</th>
<th>Date/Time</th>
<th>Room</th>
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<th>Presentation #</th>
<th>Time Slot</th>
<th>Title</th>
<th>Authors with Affiliations</th>
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<tr>
<td>I</td>
<td>Monday 9/26</td>
<td>Tutte</td>
<td>Learning &amp; Assessment</td>
<td>1</td>
<td>9:15-9:35 a.m.</td>
<td>Development of Learning Taxonomy for an Undergraduate Course in Architectural Engineering Program</td>
<td>Serrin G. Haller (Missouri University of Science &amp; Technology, USA); Stuart Bau (Missouri University of Science and Technology, USA)</td>
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<td>9:15-10:15 a.m.</td>
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<td>Effect of a Majors-only Section of a Non-Engineering Course on the Perception of Students</td>
<td>Laura Ford (The University of Tulsa, USA)</td>
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<td>2</td>
<td>9:35-9:55 a.m.</td>
<td>Online Courses for Facilitating Transforming Research into Engineering Programs from Community College</td>
<td>Christi Patton Luks (Missouri University of Science &amp; Technology, USA)</td>
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<td>3</td>
<td>Utilizing a Research-Based Assessment Method and Faculty Collaboration to Promote Undergraduate Research in STEM Education</td>
<td>Yunerski Yihua, Rajeev Nair and Muhammad Rahman (Wichita State University, USA)</td>
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<td>II</td>
<td>Monday 9/26</td>
<td>Tutte</td>
<td>Workshop</td>
<td>1</td>
<td>1:30-2:30 p.m.</td>
<td>The CAP Model: Using Engineering Design Principles to Design Engineering Courses (Part 1)</td>
<td>Ruth E. Wertz (Valparaiso University, USA); Emily Dringenberg (Kansas State University, USA)</td>
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<td></td>
<td>1:30-2:30 p.m.</td>
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<td></td>
<td>The CAP Model: Using Engineering Design Principles to Design Engineering Courses (Part 2)</td>
<td>Ruth E. Wertz (Valparaiso University, USA); Emily Dringenberg (Kansas State University, USA)</td>
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<td>2</td>
<td>3:30-4:00 p.m.</td>
<td>Transformation of an Introductory Computer Engineering Course to Hardware Design to Microprocessor Based Systems</td>
<td>Dwight Day and Charles Carlson (Kansas State University, USA)</td>
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<td>A Balancing Act: Teaching and Researching Agile Software Development</td>
<td>David Harvie (United States Military Academy, USA); Arun Agah (University of Kansas, USA)</td>
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<td>B</td>
<td>Monday 9/26</td>
<td>Tutte</td>
<td>Software Applications</td>
<td>1</td>
<td>3:00-4:00 p.m.</td>
<td>Teaching Introductory Robotics Programming</td>
<td>Tim Bowser (Kansas State University Salina, USA)</td>
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<td>3:00-4:00 p.m.</td>
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<td>Missouri Project Lead the Way Survey/Instructor Survey Based Assessments</td>
<td>Ronald Joe Stanley and Stuart Bau (Missouri University of Science and Technology, USA)</td>
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<td>IV</td>
<td>Monday 9/26</td>
<td>Tutte</td>
<td>K-12/PLTW</td>
<td>1</td>
<td>4:15-5:15 p.m.</td>
<td>The CAP Model: Using Engineering Design Principles to Design Engineering Courses (Part 2)</td>
<td>Ruth E. Wertz (Valparaiso University, USA); Emily Dringenberg (Kansas State University, USA)</td>
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<td>4:15-5:15 p.m.</td>
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<td>Active Learning and Cognitive Load: One Size Does not Fit All</td>
<td>Ashley Rhodes and Timothy Huzell (Kansas State University, USA)</td>
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<td>Using Weighted Examples in Equation Solvers Software to Enhance Students’ Contextual Problem Solving</td>
<td>Charles Baakil, Jr. (John Zink Company LLC &amp; Oral s University, USA)</td>
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<td>Engineering Problem-Solving: Student’s Approaches, Beliefs, and Identities</td>
<td>Elka Douglas (University of Florida, USA)</td>
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<td>1</td>
<td>7:30-9:30 a.m.</td>
<td>Cluster Computing: Applied to Calculus 1</td>
<td>Ian Nauta (Kansas State University, USA)</td>
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To increase retention, the College of Engineering at Kansas State University created an Academic Success Center focused on providing multiple services for all of its students. A new position, Academic Success Center (ASC) Advisor, was created within the center to work specifically to support at-risk engineering students. The ASC Advisor created an academic peer mentoring program called Building Excellent Engineers (BEE) to assist students in meeting the needs of engineering students who struggle academically. Through extensive advising and participation of the BEE program, there was evidenced an increase in student satisfaction in terms of college and university, attendance, and graduation rates. However, there is always room for improvement in terms of the success of these students. For that reason, research projects have focused on implementing new methods to provide continuous improvement both for the Engineering College and for the engineering students. The goal of the project is to focus on developing more comprehensive strategies for identifying at-risk students during their first year.

The idea of using microprocessors as introductory computer engineering courses has become popular in recent years. The goal of this paper is to describe how microprocessors, specifically Arduino microcontrollers, are being used to improve student retention and advance the curriculum in an introductory computer engineering course, ECE 241, at Kansas State University. The course focuses on digital design, logic gates, flip-flops, microcontrollers, and the lab and the main lab is focused on writing VHDL, software, and hardware design. The main motivation for the transition was the desire to teach the students fundamental concepts of microcontroller software and hardware, and to expose the students to the very latest technology while giving them hands-on experience with both software and hardware by using the lab as a basis for both practical and theoretical implementations. It has been shown that early project-based experiences lead to higher student retention and engagement in STEM education. This paper details the work in progress of the transition and preliminary results.

The collection of course feedback most often happens at the end of a semester via the use of surveys. The information collected is useful for the next semester but doesn’t encourage continuous improvement throughout the semester. In a manufacturing environment data is collected constantly and used to implement continuous improvements to processes as needed. This paper outlines the process created to collect and utilize data throughout the semester to drive continuous improvement.

For decades, active learning approaches within science, technology, engineering, and math (STEM) courses at the undergraduate level have been shown to increase student engagement, improve knowledge retention, and increase student performance. However, these methods are not without their limitations. For example, when students have a high level of knowledge or expertise, more traditional learning methods may be more effective. Therefore, it is important to understand how these active learning methods can be tailored to fit the needs of different student populations.

Problem-solving is considered to be one of the central activities of engineering, and much of a student’s academic career consists of solving problems of various types. While much research has gone into studying how students solve design problems, there has been little work on the majority of problems students solve in their classes. These problems tend to be focused on a single concept and are either open-ended or guided. Using a think-aloud protocol, in this study we have investigated how students solve these typical classroom problems and the beliefs and identities they bring to the problem-solving process. We find that problem-solving approaches vary according to the epistemic beliefs of the students, that is to the extent to which they believe knowledge is gained by an authority versus justified by an individual. These students with more innovative epistemic views create ambiguities for themselves even when the problem is closed-ended, suggesting that ambiguity can be created by problem-solving and is not just a characteristic of the problem. We also find that students make a sharp distinction between academic and workplace problem-solving and there is little relationship between the two. Overall, our findings suggest that typical classroom problems may be preventing students adequately for the problems they will face in the workplace and that the role of problem-solving as currently practiced in engineering education may need to be reexamined.

The purpose of this research is to design an undergraduate course in teaching active learning strategies within Missouri State University’s Architectural Engineering Program. Based-on course improvement plan, course goals, student learning objectives and assessment tools need to be classified to better document improvements of instructional materials. This paper outlines development of a learning taxonomy for this purpose. Reviewing the study and proposed methodology presented herein by the help of literature review. Using a template for course blueprints enable to create targeted taxonomies. Selected course blueprints is an approach for another architectural engineering and online outlining learning architecture for [architectural material] and methods of building constructing course. Higher- and lower cognitive domains of learning objectives is specified by using necessary active tools classified in Möller’s taxonomy. Assessment methods are linked to learning objectives to meet course goals. Consequently, learning assessment for motivated course can be created by this methodology.

In this study, we attempt to identify the type of student who specifically benefits from such an approach, as well as what factors in their identity may be driving their preferences. By better understanding the nature of the students who benefit from an active learning approach, we can develop more effective strategies for increasing student engagement and retention.

The University of Arkansas has been known for its strong engineering and computer science programs. In recent years, the university has recognized the importance of active learning in the classroom and has implemented various initiatives to promote this approach. This paper presents an overview of the university's active learning initiatives and discusses the benefits and challenges that have been encountered.

The collection of course feedback most often happens at the end of a semester via the use of surveys. The information collected is useful for the next semester but doesn’t encourage continuous improvement throughout the semester. In a manufacturing environment data is collected constantly and used to implement continuous improvements to processes as needed. This paper outlines the process created to collect and utilize data throughout the semester to drive continuous improvement.

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Poster Assignments For the 2016 ASEE Midwest Section Conference • Monday, September 26, 2016 • 8:30 a.m. - 1:55 p.m., Lobby

1. “Pulling out” as a procedural resource when solving partial differential equations
Babar Modir and Eleanor Sayre (Kansas State University, USA)
We investigate how students solve partial differential equations and partial derivatives in the context of quantum mechanics. We use the resources framework to investigate students’ discussion in a group problem-solving environment to investigate the five-gear elements of that problem solving. We analyze an example of students’ use of separations of variables to solve a partial differential equation for a free particle problem. We identify a mathematical action called “pulling out” as a procedural resource to help students separating the time part from the space part of the wave function in the course of solving the time-dependent Schrödinger equation. We discuss how students use “pulling out” as a procedural step in solving partial differential equations and sense-making.

2. A Pilot in Diagram Usage Within Proof Validation
Paul Flesher, John Huston, Lester Loschky and Andrew Bennett (Kansas State University, USA)
Under the eye-mood hypothesis, patterns of thought can be realized through the movement of the eyes. With increased focus on proof in curriculum and the surge in online education, understanding the processes of proof validation is a useful tool for educators. The use of diagrams is prominent throughout mathematics and science. An understanding of how experts and novices view and utilize diagrams is necessary and must be accounted for in teaching strategy.

3. Design and Development of a 5-DoF Wheelchair Mounted Robotic Arm
Carter Duiling (Wichita State University & Wichita State University, USA); Matthew Ahlstedt and Yimesker Yihun (Wichita State University, USA)
In the United States alone, approximately 5.9% of the population depends on a wheelchair for day-to-day tasks and mobility. However, many wheelchair users still need more help in their activities due to lack of strength in their upper body or limited arm mobility. A task like opening a door may be simple to same, but is an impossible or exhausting task to others. Wheelchair mounted robotic arms are supposed to assist people who lack this kind of mobility. However, NWRA is impossible for many to obtain due to the high cost of acquiring one. High levels of cognitive skills are also required to operate these robotic arms. To address these issues in preparation for an eye tracking study the fall.

4. Develop Lignin-Protein Based Adhesive
Sarocha Pradyawong (Kansas State University & Kansas State University, USA)
About 8 billion pounds of conventional petroleum-based adhesives, such as phenol-formaldehyde (PF)-based adhesives, are used in wood-based industries. PF provides high adhesion strength and water resistance. However, PF is harmful to humans and causes environmental pollution. There are strong demands for safe and environment friendly adhesives. Soy protein-based adhesives (SPA) have been commercially available for partial replacement of PF. SPA show good adhesion performance on wood and other materials. However, water resistance of SPA does not compete with PF and cannot replace PF-based adhesives for exterior applications. Lignin, the most abundant aromatic polymer, is largely available as industrial residues from paper and pulp-based production. Basic substrates, such as phenolic compounds, are building blocks for many polymers, which are currently obtained by synthetic chemistry from fossil-based feedstocks. Lignin is more hydrophilic and protein is more hydrophobic. Therefore, bio-based adhesives derived from principal components of lignin and plant proteins could improve water resistance as well as reduce the cost. The objective of this research is to develop a ligninprotein-based adhesive with improved water resistance properties. Lignin-protein adhesives were formulated at various concentrations and protein to lignin ratios. The highest wet strength was achieved at 10 to 2 soy protein to lignin ratio and pH of 4.5. In addition, the viscosity, contact angle, thermal properties of the lignin-protein adhesive were also evaluated.

5. How to Design an Effective Case Study
Abigail Wilson (Kansas State University & Division of Biology, USA); Ashley Rhodes and Timothy Rozell (Kansas State University, USA)
Active learning has been extolled for its ability to enhance student engagement and understanding of complex information as it promotes learning through student activity. Case studies are a form of active learning that can increase learning gains for students; however, our recent results indicate that students with higher prior knowledge may benefit even more from case studies. Case studies are believed to be an effective active learning tool because they use an activity to engage students in learning and understanding complex concepts. Furthermore, case studies can use a compelling narrative story that involves authentic problems or contemporary issues to capture student interest. However, despite the potential benefits case studies may provide, very little is known about what actually makes a case study effective or what features need to be included to maximize learning for undergraduates. While some general guidelines have been described, nothing specific exists for the creation of an effective case study for use within intermediate and advanced STEM courses. Using those general guidelines as a foundation, we designed and implemented a case study within intermediate and advanced physics courses at a large Midwestern university with the explicit purpose of improving students’ understanding and critical thinking skills in relation to a complex concept, the progression of type II diabetes. Through our research, we have discovered that designing an effective case study involves a critical examination of the topic to be presented or discussed, within the case study, a design-based research approach for methodological improvement and refinement of the case study, and the use of clear and concise interactive graphics requiring students to visually connect different concepts within a problem to the structures and processes involved in labeling, diagramming, and adding details to basic line diagrams. Preliminary data we have collected regarding case study design and development utilizing this approach have revealed that a concise and focused case study with targeted learning objectives and interactive graphics is more effective than a traditional approach consisting of a didactic lecture and corresponding handouts, which aligns with previous research in this area. However, we found this only to be true for certain types of learners. Thus, while there is some indication that a well-designed case study can be an effective active learning tool for use within intermediate and advanced STEM courses, our results contrast earlier findings that found this form of active learning to be beneficial for all students. Specifically, we have found that case studies might only be beneficial for students with higher prior knowledge, students with lower prior knowledge might benefit more from a traditional approach. Given these inconsistencies, more research is needed to improve case study design and development and ultimately case study effectiveness for a broader range of students enrolled within intermediate and advanced STEM courses.

Shuyu Yang and Zhiyan Han (University of Michigan-Flint, USA)
The project is to build a robot that is able to play keyboard according to music sheet. By using Lego Mindstorms NXT, the robot will be able to follow the rhythms of the music sheet and find the location of each keys.
### Abstract

The engineering technology unmanned systems option (ET-US) of State polytechnic campus is one of the first bachelor programs for unmanned aircraft systems design and integration. As a pioneering interdisciplinary program, it was felt that the curricular design had to be substantially driven by the needs of this exponentially growing industry. The program has relied on the expertise of an established unmanned aircraft systems (UAS) operations program in the college; the expertise from a growing research program associated with the UAS laboratory and the engineering technology department, and government and private sector literature relating to this industry. In the trying to stay current, relevant, and industry focused, an attempt was made to see how a group consisting of mostly UAS industry professionals felt about the curriculum and where it was going through an electronic survey. A discussion of the implications of the survey forms the basis of this paper.

Community development courses developing countries provide an excellent opportunity to provide engineering students with an relevant, hands-on design-build opportunity that will develop their planning, team building, leadership skills and enhance the design skills while helping the community in need. But, there are additional requirements and costs that must be addressed.

Lecture-based tutorials are a recent development in active learning. This paper describes how to change from a lecture to a lecture-based tutoring course. An example demonstrates how to implement this new teaching style. To assess the effectiveness of lecture-based tutoring, a distance education class was changed to this new format. Statistical analyses show that students have performed significantly better in the lecture-based tutoring course than in the lecture class. Thus, lecture-based tutoring improves student learning.

The method of developing interactive instructional videos is explored in this study. Online education is becoming more popular as more institutions are expanding various programs by incorporating online courses in curriculum. One of the most crucial steps in creating an online course is to develop interactive instructional videos. In the present work, we focus on identifying the important aspects of developing such videos and provide a detailed procedure for video recording. Out developed interactive instructional videos are presented as an example to investigate the limitations that may be encountered during developing online videos. Lastly, critical challenges in developing online instructional videos were identified for future study.

### Technical Paper and Poster Assignments

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<td>7:30-7:50 a.m.</td>
<td><strong>8. Online Contemporary Physics Course for Non-physics Majors</strong></td>
<td>Rajia Ebini (K-State &amp; K-State, USA); Ulis Ustin (Artvin Coörh University, Turkey); Dean Zollman (Kansas State University, USA)</td>
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<td>8:00-8:20 a.m.</td>
<td><strong>10. Smart Home Controls</strong></td>
<td>Caroline Kabus and Chris Ahern (Kansas State University, USA)</td>
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<td>8:20-8:40 a.m.</td>
<td><strong>1. Lean Six Sigma - Active Learning via Mondopad</strong></td>
<td>Jose Ascensio (University of Kansas, USA)</td>
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<td>8:40-8:55 a.m.</td>
<td><strong>6. Community Development Course in Belize - Ten Years of Improvement</strong></td>
<td>Todd Easton (Kansas State University, USA)</td>
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<td>8:55-9:15 a.m.</td>
<td><strong>2. Retaining engineering students is a critical issue in engineering education, especially in the first year of college when the attitude in engineering has been stubbornly high. The purpose of this study is to examine the epistemological beliefs of freshmen in introductory engineering courses using a unique approach: O-methodology. All participants were freshmen from an introductory Engineering Orientation course at a Midwestern land-grant university. Personal epistemological views of engineering were examined through a focused-sorting procedure, during which individuals judged each statement in relation to other items on the topic, drawing on their own experiences in learning and understanding engineering in the introductory course. Two distinct epistemological views emerged. The first epistemological view was characterized by reflectiveness, persistence, and reliance on context experts. The second epistemological view was characterized by active construction of meaning and viewing engineering knowledge as dynamic and fluid.</strong></td>
<td>Thomas Soerens (Messiah College, USA); Amy Farmer and Findlay Edwards (University of Arkansas - Fayetteville, USA)</td>
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<td>9:15-9:30 a.m.</td>
<td><strong>5. A Survey of UAS Industry Professionals to Guide Program Improvement</strong></td>
<td>Kevin Lewelling and Tyler White (University of Arkansas Fort Smith, USA)</td>
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<td>9:30-9:50 a.m.</td>
<td><strong>11. Mathematization project investigations students' use of mathematical tools across the undergraduate physics curriculum. As a part of this project, we investigate how upper division Mechanics and Electromagnetism students use mathematical tools in their homework problems. We code student's written solutions using the modified version of the ACER framework (Activation, Construction, Execution, Reflection) to find the evidences for use of mathematical tools. We use Social Network Analysis to compare network patterns across students and problem statements. Also we use the two axis framework to generalize network patterns across problem statements. In this post, we present preliminary findings of this ongoing project to find characteristics patterns for problem statements in Mechanics.</strong></td>
<td>Jose Ascensio (University of Kansas, USA)</td>
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<td>9:50-10:10 a.m.</td>
<td><strong>12. The Mars Rover Project</strong></td>
<td>Kevin Lewelling and Tyler White (University of Arkansas Fort Smith, USA)</td>
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<td>10:10-10:30 a.m.</td>
<td><strong>7. Lean Six Sigma - Active Learning via Mondopad</strong></td>
<td>Joseph Ascensio (University of Kansas, USA)</td>
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<td>10:30-10:50 a.m.</td>
<td><strong>3. Helix project started over a year ago and has involved four engineers and two technicians. Helix uses a “tether borg” power supply system, rarely seen outside of Mars rovers, to provide stability and allow climbing over difficult obstacles. The rover uses six-wheel motors powered by a 44 cell, 48 watt battery. Power is delivered to a Raspberry Pi microcomputer and Ardunio microcontrollers for the drive controls, and is driven by two handles near the seat in a fashion similar to what is seen on a zero-turning lawn mower. The zero-turning inner action will make it easier for astronauts to control and maneuver the rover.</strong></td>
<td>Rachel Cantrell, Aaron Goodnight, Jacob Marney, and Raju Dandu</td>
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<td>10:50-11:10 a.m.</td>
<td><strong>14. Cat Cannon Semi-Automatic T-Shirt Cannon</strong></td>
<td>Wesley Cantrell, Aaron Goodnight, Jacob Marney, and Raju Dandu</td>
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</tbody>
</table>

The electrical circuits laboratory provides the foundation for design and analysis of all electronic circuits. Students must become proficient with the standard circuits and electronic laboratory measurement procedures and techniques in order to be successful in their subsequent courses. Studies have shown that students who worked individually on lab assignments achieved a higher level of proficiency with the laboratory instrumentation than students who worked in teams of two or more. An enhancement to a low cost self-contained portable laboratory system has been developed which provides an user-friendly interface allowing students to easily analyze circuits both within and outside the laboratory.
Gary Clark
Gary Clark is the senior associate dean in the College of Engineering and a professor of biological and agricultural engineering. He has been at Kansas State University since 1994 and is a registered professional engineer.

Clark's technical expertise is in the design and management of irrigation systems and in the administration/oversight of engineering degree programs and program assessment. He's had a faculty position in teaching, research and extension. He has taught courses and workshops on the design and management of irrigation systems with a focus on both sprinkler irrigation and microirrigation systems, and on energy use in agricultural systems.

Joel Andrews
Joel Andrews, Olathe, Kansas, is a 1997 and 1999 graduate of Kansas State University with his bachelor’s and master’s degrees, respectively, in electrical engineering. He also holds a doctorate in electrical engineering from the Georgia Institute of Technology. 2009. He is a team leader for Garmin International aviation radar products, acting as both project and technical lead. He has designed much of the mm-wave circuitry on multiple designs from blank sheet through production. Andrews is the author of more than a dozen technical papers in the field of electrical engineering and recently received his first patent. He is the main Garmin recruiter for electrical engineers at K-State, and takes pride in hiring and mentoring new graduates and interns alike. He has served on the department of electrical and computer engineering advisory board at K-State for the past four years.

Darren Dawson
As the dean of the largest engineering program in the state of Kansas, Darren Dawson is leading efforts to increase both doctoral and undergraduate student enrollments at Kansas State University. These goals play a part in the K-State visionary plan of becoming a Top 50 Research University by 2025, as well as the state’s initiative to increase the number of engineering graduates by 50 percent in 10 years to meet Kansas’ demand for engineers.

Michael C. Loui
Michael C. Loui is the Dale and Suzi Gallagher Professor of Engineering Education at Purdue University. He was previously Professor of Electrical and Computer Engineering and University Distinguished Teacher-Scholar at the University of Illinois at Urbana-Champaign. He serves as Editor of the Journal of Engineering Education and as a member of the editorial boards of College Teaching and Accountability in Research. He is a Carnegie Scholar and an IEEE Fellow.

Matthew Ohland
Dr. Ohland is a Professor of Engineering Education at Purdue University. He is a Co-Director of the National Effective Teaching Institute, and a Fellow of the ASEE and IEEE. He has received multiple best paper awards from the Journal of Engineering Education and the IEEE Transactions on Education. He led the teams that developed the Multiple-Institution Database for Investigating Engineering Longitudinal Development (MIDFIELD) and the Comprehensive Assessment of Team-Member Effectiveness (CATME).

Ece Yaprak
Dr. Ece Yaprak is a Professor of Engineering Technology in the College of Engineering at Wayne State University. She received her PhD in computer engineering from Wayne State University in 1989. She has held research fellowships at NASA research centers (John Glenn Laboratory at Case Western, Jet Propulsion Laboratory at Cal Tech, Ames Research Center at Stanford, and the Johnson Space Center at Texas A&M Universities) and the U.S. Navy (at its SPAWAR Research Center in San Diego). She has also served as a Fulbright scholar at the Nokia Wireless Communications Research Center at the University of Oulu in Finland in 2009. She is a senior member of the IEEE. Dr. Yaprak serves as an ABET IEEE/ETAC Commissioner since 2012. Currently, she serves as Program Director of Division of Undergraduate Education (DUE) at the National Science Foundation (NSF). She manages a large and diverse portfolio of awards on STEM education and workforce development.

Elliot P. Douglas
Elliot P. Douglas is Program Director for Engineering Education at NSF. He oversees the Research in the Formation of Engineers, Research Initiation in Engineering Formation, and REvolutionizing engineering and computer science Departments programs, as well as participating in a number of NSF-wide activities. He is also Associate Professor of Environmental Engineering Sciences at the University of Florida, where he conducts research on problem-solving, critical thinking, and cultures of inclusion in engineering.

April Mason serves as the Provost and Senior Vice President of Kansas State University. As the university's Chief Academic Officer, Provost Mason provides oversight and leadership to the academic dimensions of the university and ensures the university's academic standards. She serves as the second-ranking administrator, responsible for undergraduate and graduate academic programs on three campuses. The deans of the nine academic colleges, the Libraries, Graduate School, Global Campus, and the CEOs of both K-State Salina and K-State Olathe report to Mason. University offices also reporting to Mason include Undergraduate Studies, Diversity, International Programs, the Staley School of Leadership Studies, the Center for Engagement and Community Development, the Office of Sustainability, and Information Technology Services.