American Society for Engineering Education
2019 Midwest Section Conference

Applied Learning and Industry Partnerships
Enhancing Engineering Education

September 15-17, 2019
Wichita State University

WELCOME

A MESSAGE FROM THE WSU DEAN OF THE COLLEGE OF ENGINEERING

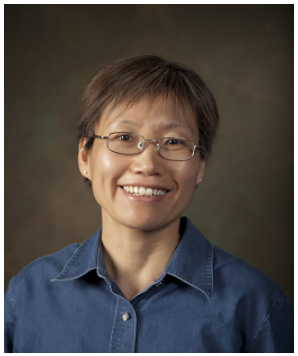
I am very pleased to welcome you to the 2019 ASEE Midwest Section Conference! This is a great opportunity for us to learn from each other in new pedagogies in teaching, engagement and student success. I am also looking forward to showing you Wichita State's rapidly developing Innovation Campus, where a new 142,000 square foot experiential engineering building and multiple industry partners are providing applied learning experiences for our students. I hope that you have a good and profitable time here and that you are able to take advantage of the sights and hospitality that Wichita offers.

Dennis R. Livesay, PhD, *Professor & Dean*

ASEE AMERICAN SOCIETY FOR ENGINEERING EDUCATION

WICHITA STATE UNIVERSITY COLLEGE OF ENGINEERING

CONFERENCE COMMITTEE



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Student Ambassador

WELCOME

KEYNOTE SPEAKERS

JEFF SMITH

Director of Aerospace and Defense Ideas Lab

Dassault Systèmes

JOHN O'LEARY

Vice President and General Manager

Airbus Americas Engineering

JOHN TOMBLIN

Vice President for Research and Technology Transfer & Executive Director

National Institute for Aviation Research (NIAR), *Wichita State University*

ERIC HEIN

Senior Director of Research and Technology

Spirit AeroSystems

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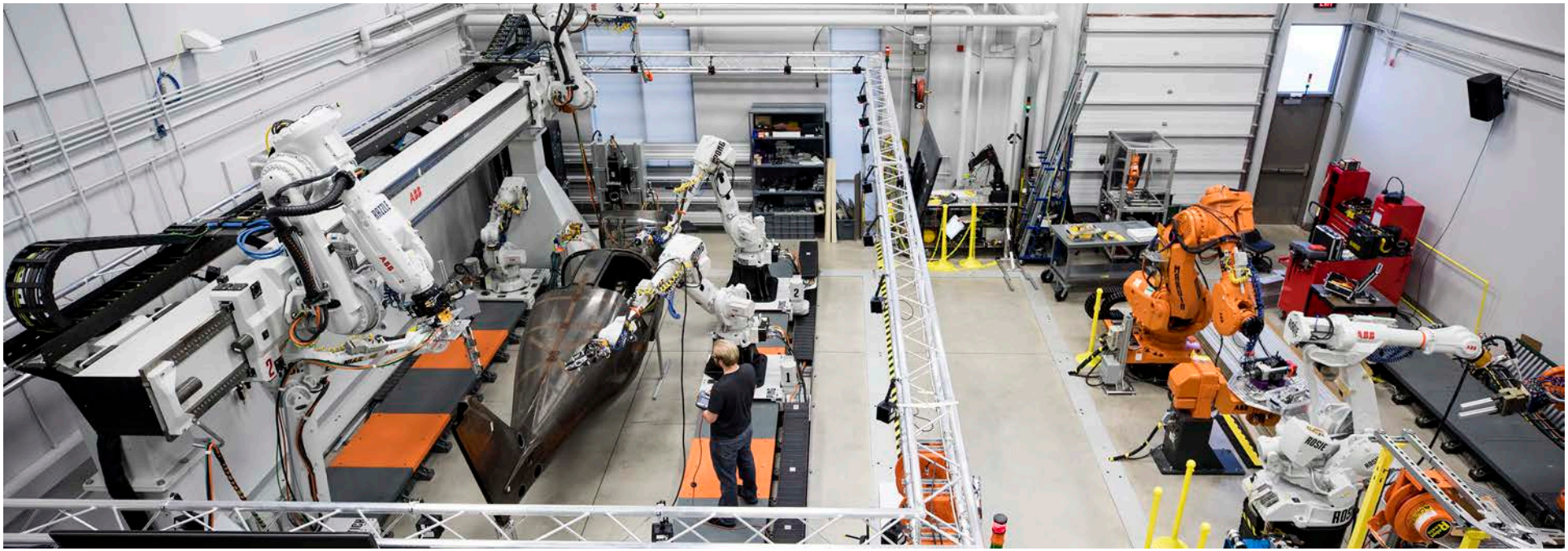


NIAR Robotics and Automation Laboratory

AGENDA

SUNDAY, SEPTEMBER 15, 2019

4:30pm - 7:30pm	**Registration, Reception & Networking** **Experiential Engineering Building (EEB) Lobby** *Reception sponsored by the National Institute for Aviation Research (NIAR)*
5:30pm	**Welcome Address** Steven Skinner, *Professor & Associate Dean for Undergraduate Studies, Finance & Administration, Wichita State University* Dennis Livesay, *Dean of the College of Engineering, Wichita State University* **EEB Lobby**
6:00pm, 6:15pm & 6:30pm	**Experiential Engineering Building Tours** Tours leave every fifteen minutes from the EEB lobby and include industry collaborative spaces, applied learning labs, and the GoCreate makerspace. **EEB Lobby**

MONDAY, SEPTEMBER 16, 2019

7:30am	**Registration & Breakfast** **Aster Lounge & Beggs Ballroom (Rhatigan Student Center 3rd floor)**		
8:15am - 9:15am	**Welcome & Opening Keynote Address** Jeff Smith, *Director of Aerospace and Defense Ideas Lab, Dassault Systèmes* **Beggs Ballroom East**		
9:30am - 10:30am	Problem-Based Learning **Lucas Room (RSC 265)**	Industry & Entrepreneurship **Pike Room (RSC 266)**	Ignite Presentations I **Herrman Room (RSC 262)**
10:45am - 11:45am	Statics & Dynamics Education **Lucas Room (RSC 265)**	Poster Presentations **Beggs Ballroom West**	Ignite Presentations II **Herrman Room (RSC 262)**
12:00pm - 1:15pm	**Lunch & Keynote Address** Eric Hein, *Senior Director of Research and Technology, Spirit AeroSystems* **Beggs Ballroom East**		
1:15pm - 2:00pm	**Plenary Session** Richard Muma, *Provost, Wichita State University* **Beggs Ballroom East**		
2:15pm - 3:15pm	Design **Lucas Room (RSC 265)**	ASEE Leadership Panel **Pike Room (RSC 266)**	Student Employer Panel: Engineering Your Future Career **Herrman Room (RSC 262)**

**schedule subject to change*

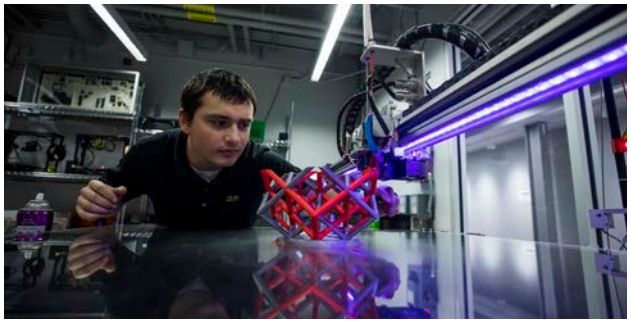
AGENDA

MONDAY, SEPTEMBER 16, 2019 CONT.

3:30pm - 5:00pm	Lab & Classrooom Management **Lucas Room (RSC 265)**		Escape Room Workshop **Beggs Ballroom West**
6:00pm - 8:00pm	**Banquet, Keynote Address & Section Awards** John Tomblin, *Vice President for Research and Technology Transfer at Wichita State University and the Executive Director of NIAR* Clark Shaver, *Associate Professor of Engineering, Pittsburg State University* **Beggs Ballroom East**		
8:00pm - 9:00pm	**Midwest Section Executive Meeting** **Pike Room (RSC 266)**		

TUESDAY, SEPTEMBER 17, 2019

7:30am	**Registration & Breakfast** **Aster Lounge & Beggs Ballroom East**		
8:30am - 9:00am	**Closing Keynote Address** John O'Leary, *Vice President and General Manager, Airbus Americas Engineering* **Beggs Ballroom East**		
9:15am - 10:35am	Outreach & Diversity **Lucas Room (RSC 265)**	Research Experiences **Pike Room (RSC 266)**	
10:45am - 11:45am	Administration **Lucas Room (RSC 265)**		Best of Ignite Presentations **Herrman Room (RSC 262)**
12:00pm - 1:00pm	**Lunch & Conference Awards** Abu Asaduzzaman, *Associate Professor of Electrical Engineering and Computer Science, Wichita State University* **Beggs Ballroom East**		



**schedule subject to change*

TECHNICAL PAPER SCHEDULE

Concurrent Session I	Monday Sept. 16 9:30-10:30 RSC 265	Session I: Problem-Based Learning	9:30-9:50	Tank Depressurization Experiments for the Classroom or Laboratory	Meagan Olsen, Andrew Buck, Roy Penney and Ed Clausen (University of Arkansas)
			9:50-10:10	Implementation of Problem Based Learning into Materials Testing Lab	Jonathan Kuchem and Nicolas Libre (Missouri University of Science and Technology)
			10:10-10:30	Project-Based Approach to Intensify STEM Education Experience - A Case Study	Kishore Konda Chidella (University of Nevada Las Vegas), Srikanth Gampa and Abdulrahman Almohaimeed (Wichita State University)
	Monday Sept. 16 9:30-10:30 RSC 266	Session II: Industry & Entrepreneurship	9:30-9:50	Preparing Engineering Students for Industry	Charles Baukal, Mark Vacarri (John Zink Hamworthy Combustion), Thomas DeAgostino (University of Kansas), Carter Stokeld (Williams) and Courtney Baukal (Boeing)
			9:50-10:10	Design and Development of an Integrated Firewall-Seat for Formula SAE Car	Alana Gorski, Hannah Gross and Masoud Mojtahed (Purdue University Northwest)
			10:10-10:30	Incorporating Entrepreneurial Minded Learning into an Undergraduate Dynamics Course	Michael Hennessey (University of St. Thomas)
	Monday Sept. 16 9:30-10:30 RSC 262	Ignite Presentations I	9:30-10:30	What the Heck is "Innovation" Anyways? Refocusing the Accessibility of the Buzz Word within Higher Education	Christian Ammerman (Wichita State University)
				BIM in the Structural Engineering Education System	Jenna Harbert (Oklahoma State University)
				Engineering Education Needs to Better Utilize Interdisciplinary Opportunities	Rustin Clark (Wichita State University)
				Rethinking our Class Presentation Setting	Jairo Cervantes and Tareq Daher (University of Nebraska – Lincoln)
				Creativity and Education: Fostering Innovation through Ideation	Nicholas Hennigan, Sabrina Stangler and Tara Rahmani (Milwaukee School of Engineering - University Innovation Fellows)
Concurrent Session II	Monday Sept. 16 10:45-11:45 RSC 265	Session III: Statics & Dynamics Education	10:45-11:05	Prerequisite Testing as a Tool to Gauge Incoming Student Capability and Knowledge in an Engineering Statics Course	Roy Myose, Syed Raza, Elizabeth Rollins, Brandon Buerge and Nicholas Smith (Wichita State University)
			11:05-11:25	Restructuring a Modeling Dynamics Course with Absorb-Do-Connect Learning Units	Brett Whorley, Camilo Giraldo, Arjun Kamath, Molly McVey, Meagan Patterson and Carl Luchies (University of Kansas)
			11:25-11:45	Student Performance Characteristics in a Hybrid Engineering Statics Course	Roy Myose, Scott Miller and Elizabeth Rollins (Wichita State University)
	Monday Sept. 16 10:45-11:45 Beggs Ballroom West (RSC 3rd floor)	Poster Session	10:45-11:45	Effect of an Engineering Camp on Elementary Students Understanding of Engineering and Attitudes Toward Engineering	Drew Gossen and Juliana Utley (Oklahoma State University)
				Evaluating the Impact of an Expanded Sophomore Design Curriculum for Aerospace Engineering Students	Jillian Schmidt, Warner Meeks and Henry Pernicka (Missouri University of Science and Technology)
				Student-Built Electric Motor Project as a Culminating Project in Introductory Physics	Mark Pecaut and Michael McCoy (Rockhurst University)
				Bridging the Gap: Preparing Future Engineering Faculty for Post-Secondary Teaching Excellence	Tareq Daher (University of Nebraska - Lincoln)
				Effective Teaching of Introductory Programming Language Classes	Srikanth Gampa (Wichita State University)
				Master Control Unit for a Large Electric Lunar/Mars Rover	Anthony Ming and Kevin Lewelling (University of Arkansas - Fort Smith)
	Monday Sept. 16 10:45-11:45 RSC 262	Ignite Presentations II	10:45-11:45	Doing the Things That Scare You Just a Little Bit	Maggie Brown (Wichita State University)
				Strong-Seal Strength Research	Christian Thompson and Joshua Purdy (Wichita State University)
				Let's Go Full STEAM Ahead: Addressing Gender Parity	Sierra Bonn (Wichita State University)
				University of Nebraska-Lincoln's College of Engineering Graduate Student Teaching Fellows Program: A first-cohort fellow's perspective	Shahab Karimifard and Tareq Daher (University of Nebraska - Lincoln)
				Chronic	Madeline Shonka (Wichita State University)

TECHNICAL PAPER SCHEDULE

Concurrent Session III	Monday Sept. 16 2:15-3:15 RSC 265	Session IV: Design	2:15-2:35	Integrating 4D Printing Processes into STEM Education	Eylem Asmatulu, Yeshaswini Baddam, Md. Nizam Uddin and Thisath Nisitha Dasal Attampola Arachchi Attampola Arachchige Don (Wichita State University)
			2:35-2:55	Big Data Analytics for Big Outcomes in Healthcare	Hailey Michael and Shankar Krishnan (Wentworth Institute of Technology)
			2:55-3:15	The Retention of Graduates from Engineering Education Expansion in Kansas	Roy Myose, Scott Miller, Steven Skinner (Wichita State University) and James Myose (Kansas State University)
	Monday Sept. 16 2:15-3:15 RSC 266	ASEE Leadership Panel	2:15-3:15	Updates from the National Conference	Clark Shaver (Pittsburg State University), Raju Dandu (Kansas State University Polytechnic), Kenneth Van Treuren (Baylor University) and Amardeep Kaur (Missouri University of Science & Technology)
	Monday Sept. 16 2:15-3:15 RSC 262	Student Employer Panel	2:15-3:15	Engineering Your Future Career: Seasoned Engineers Share about Their Career Path, Big Wins, Mistakes and Things They Wish They Would Have Known when First Entering Their Careers	Laura Bernstorf (Airbus), Varun Vasankumar (CNH Industrial), Roy Moye III (Spirit Aerosystems), Lourdes Bareiro (NetApp), and Dan Biby (Professional Engineering Consultants)
Concurrent Session IV	Monday Sept. 16 3:30-4:30 RSC 265	Session V: Lab + Classroom Management	3:30-3:50	Saving Time In and Out of Class: Video Exam Solutions	Christi Luks (Missouri University of Science & Technology)
			3:50-4:10	Structured Redesign of a Circuits Laboratory	Amardeep Kaur and Theresa Swift (Missouri University of Science & Technology)
			4:10-4:30	Research Safety and Professional Development - A Graduate Course Focused on the Role of Safety in Laboratory Management	Tammy Lutz-Rechtin (University of Arkansas)
	Monday Sept. 16 3:30-5:00 Beggs Ballroom West	Escape Room Workshop	3:30-5:00	Do You Have the Skills (To Escape)? Overview of Personal and Team Development Strategies for use in Teaching	Chris Wyant (Wichita State University)
Concurrent Session V	Tuesday Sept. 17 9:15-10:35 RSC 265	Session VI: Outreach + Diversity	9:15-9:35	University Led Engineering Outreach to Adults: Public Engagement and Senior Adult Initiatives	Ashlee N. Ford Versypt, Joel J. Versypt and Heather Gappa-Fahlenkamp (Oklahoma State University)
			9:35-9:55	Women in Engineering- Focus on Self-Efficacy in Modeling and Design through Project Based Learning	Muhammad Khan and Mohamed Ibrahim (Arkansas Tech University)
			9:55-10:15	Influencing Elementary Students Perceptions about the Work of an Engineer	Juliana Utley, Drew Gossen and Toni Ivey (Oklahoma State University)
			10:15-10:35	Introduce High School Students to Engineering Disciplines: Activities and Assessment	Nicolas Libre and Stuart Baur (Missouri University of Science & Technology)
	Tuesday Sept. 17 9:15-10:15 RSC 266	Session VII: Research Experiences	9:15-9:35	Training Engineering Students on Synthesis and Characterization of Superhydrophobic Electrospun nanocomposite Fibers from Recycled Polystyrene	Eylem Asmatulu, Md. Nizam Uddin, Yeshaswini Baddam and Polo Osornio Cornejo (Wichita State University)
			9:35-9:55	Mitigations of Machine Damaged Fiber Reinforced Composites for Improved Mechanical Strengths and Educational Practices for Engineering Students	A Kunza, A.S.A Shairi, K.A Brauning and R Asmatulu (Wichita State University)
			9:55-10:15	Superhydrophobic Electrospun Nanocomposite Fibers for Training Engineering Students	Md. Nizam Uddin, Fenil Desai, Arvind Raj Murali, Andrew Swindle and Eylem Asmatulu (Wichita State University)
Concurrent Session VI	Tuesday Sept. 17 10:45-11:45 RSC 265	Session VIII: Administration	10:45-11:05	The Effect of Plus-Minus Grades on Graduation with Academic Distinction for Engineering Students at Wichita State University	Roy Myose, Elizabeth Rollins, Klaus Hoffmann, Kimberly Engber and Sarah Myose (Wichita State University)
			11:05-11:25	Top Administrators' Perceptions of the Quality in E-learning	Mohammed Al Awadh and Gamal Weheba (Wichita State University)
			11:25-11:45	Microfluidics-based Learning and Analysis for Plant Cells	Eylem Asmatulu, Sattar Ali, A. Bilal Ozturk and Amanuel Wondimu (Wichita State University)
	Tuesday Sept. 17 10:45-11:45 RSC 262	Best of Ignite Presentations	10:45-11:45	A showcase of the finalists for the Best Ignite Presentation Award. Come and vote for your favorite!	

SESSION ABSTRACTS

CONCURRENT SESSION I

PROBLEM-BASED LEARNING

Tank Depressurization Experiments for the Classroom or Laboratory

Meagan Olsen, Andrew Buck, Roy Penney and Ed Clausen (University of Arkansas)

A laboratory experiment/demonstration and modeling study was developed for engineering students that can serve as excellent training for tank venting calculations performed in practice. A simple incompressible flow experiment was conducted in depressurizing an 11 gal (0.042 m3) air tank from 65 to 7.5 psig (5.4 to 1.5 atm absolute) through multiple sharp-edged orifices and an automobile tire Schrader valve. A mathematical model was developed to predict the pressure of the air tank as a function of time using flow equations and numerical integration. The mathematical model predictions and results fit the experimental data well for depressurization through each of the orifices. The maximum average variance of the model from the data was 2.7-4.7%. The "best fit" orifice coefficient for the Schrader valve was 0.71.

Implementation of Problem Based Learning into Materials Testing Lab

Jonathan Kuchem and Nicolas Libre (Missouri University of Science and Technology)

Entrepreneurial Mindset Learning (EML) and Problem-based learning (PBL) are recent trends in higher education that develop the necessary skills and enhance learning in engineering education. A problem-based learning project was implemented into Materials Testing Lab to promote student interaction in class and increase problem solving, time management, and teamwork skills. A three week project was developed in order to expose students to open-ended real world problems through experimental activities in the lab. Students carried out experiments, calculated material properties, and applied them to a real-world mechanics problem. The project details are further described and show success in implementing problem-based learning into a lab format. Students have stated improved learning through the use of problem-based learning.

Project-Based Approach to Intensify STEM Education Experience – A Case Study

Kishore Konda Chidella (University of Nevada Las Vegas), Srikanth Gampa and Abdulrahman Almohaimeed (Wichita State University)

The evolution of engineering made an impact role in technology. Innovations with recent technologies brought a new lifestyle and wide variety of benefits. The engineering is an important drive to bring the technological innovations, which raised the growth and prosperity of United States (US). From eighteenth through early nineteenth century, engineering gradually adopted a scientific approach and they solved different problems. To obtain the scientific approach and to develop the prototypes/models hands-on experience is one of the best ways that should be accommodated in traditional lecture or labs related to the course. Theoretical knowledge alone is inadequate to reach high standard or not well acquainted with the modern designs. To meet or serve the workforce for industry standards, the old pedagogies have to be updated along with the updates in science, technology, engineering, and mathematics (STEM). Hands-on experience is extremely important for engineering education. Many basic engineering courses and advanced courses are included with labs that allows the students to practice, what they have learned from theory or from the traditional class lecture. In this work, we present the statistics of a typical course lab, Microprocessor based system design lab. This lab is the combination of Assembly language as first part and C language with DEMOEM hardware as second part. The course is intended for undergraduate and graduate level students. The statistics depends on different attributes such as the student feedbacks from classroom course, lab, materials, etc. The other attributes included are grades, team/group achievements, research motive, etc. In this course, most of the students enrolled are first generation, the diverse background of students and the learning curves of the students are always challenging. Considering that, new techniques are adapted/upgraded every year to better improve the feedback and standards of the course and also developing exercises in lab.

INDUSTRY & ENTREPRENEURSHIP

Preparing Engineering Students for Industry

Charles Baukal, Mark Vacarri (John Zink Hamworthy Combustion), Thomas DeAgostino (University of Kansas), Carter Stokeld (Williams) and Courtney Baukal (Boeing)

This paper discusses some of the important differences between academia and industry which professors can use to help prepare their students for full time employment in industry. The authors currently work or previously worked full time in industry. Some of them teach part time as adjuncts or full time as professors of practice at various universities. Some are also involved in hiring engineers. The purpose of this paper is to identify some important differences between academia and industry that many students are not aware of nor are prepared for when they enter the workforce. This paper should be of interest to engineering faculty, engineering students preparing to work in industry, and managers in industry who hire new engineering graduates. Engineering faculty can help make the transition from academia to industry smoother for their students by considering these differences and where appropriate alerting their students and modifying their teaching methods. Students can learn about and prepare for the differences between academia and industry. Engineering managers can also recognize these differences and prepare accordingly to make the transition as smooth as possible for new engineering hires.

Design and Development of an Integrated Firewall-Seat for Formula SAE Car

Alana Gorski, Hannah Gross and Masoud Mojtahed (Purdue University Northwest)

The Society of Automotive Engineering (SAE) holds a competition named Formula SAE for engineering students to design and manufacture a car from inception to completion and compete in an event being held annually in Michigan. These cars are evaluated based on their design, innovation, and performance in the competition. The objective of this project is to completely revolutionize the design of the cockpit for the 2019-2020 Formula competition (FSAE). A complete design and material overhaul of both the seat and firewall will be completed. Allowing for a dramatic increase in driver safety, reduction of weight on the vehicle and allowance for other systems to be updated alongside this one. This project will allow the team to update the bulky aluminum seat and firewall design to a practical, lightweight composite firewall with custom foam inserts to serve as the seat. Prior research gave insight in needing to reduce weight with a material change and add more body contouring curvature to the seat. The design of the seat and firewall two-in-one will be made on SolidWorks, which will give the ability for it to be visualized in three-dimensions prior to manufacturing. Finite Element Analysis (FEA) of the firewall will be run on ANSYS to enable optimization of heat resistance and the strength to weight ratio. The manufacturing process will depend entirely on final material selection. Upon completion of research and analysis, this data will be used to manufacture the seat and firewall two-in-one which will be inserted in next year's car. The data collected during this project and all future redesigns will also serve as a data bank, giving upcoming teams a foundation for their firewall and seat design.

Incorporating Entrepreneurial Minded Learning into an Undergraduate Dynamics Course

Michael Hennessey (University of St. Thomas)

Inspired by the KEEN Foundation's mission, results are shared from incorporating entrepreneurial minded learning (EML) into an undergraduate Dynamics course within a mechanical engineering program. A "KEEN" team project was given to the students in which they were asked to pretend that they were members of a startup company that would design, build, test, market, and sell a product with some dynamics content to it. As part of the exercise, the 20 teams worked on idea generation, concept development & identification of required activities, in addition to writing a draft Business Plan. Product ideas varied across different economic sectors including power generation, sports technology, transportation, food & beverage technology, and health care. Grading of the resulting reports incorporated factors such as: (1) was there sufficient dynamics content, (2) could it work, (3) was is innovative, (4) were the students familiar with the technology, and (5) would J (January)-Term & spring semester and modest funding (if needed) significantly advance the idea? The top 3 teams made more progress during J-Term & spring semester, with each team fabricating a prototype device. Students were also asked to answer a short survey about the KEEN project and the results were generally positive, such as being more interested in dynamics due to participating in the KEEN project.

SESSION ABSTRACTS

CONCURRENT SESSION I

IGNITE PRESENTATIONS

What the Heck is "Innovation" Anyways? Refocusing the Accessibility of the Buzz Word within Higher Education

Christian Ammerman (Wichita State University)

Through an etymological, historical, and linguistical study of the word "innovation" and how it has been siloed, we can refocus the use of the word within higher education to be more inclusive of all majors, therefore breaking down the silos between students and administration on any college campus. By looking at the use of the word throughout history, we can see that the connotation of "innovation" has shifted away from "something new" or "creating change" to "profits within a company from a unique product." Through a close analysis of the word's definition, students from any major can reclaim the word as their own, and learn to engage with those around them in innovative ways, merging fields and creating friendships that may never have existed. I would like to present an Ignite showcasing this research, and how it can be applied with an institution of higher education and on my campus.
I want to educate those who work within higher education to look beyond the stigmatized buzz word denotation of "innovation" and to learn to use it with meaning and to equip them with the knowledge of how to successfully bridge the silos on their campus.

BIM in the Structural Engineering Educational System

Jenna Harbert (Oklahoma State University)

The utilization of Building Information Modeling (BIM) programs in the field of structural engineering for the purpose of design is rare and underused. The powerful qualities of BIM have become a necessity and standard practice in the world of architecture. However, for the structural engineer, the BIM model is not utilized for design, with an entirely new model being developed to be used for the structural design process. There now exists the capability of a connection between the BIM model and the model in an engineering design program. Instead of two separate models, one BIM model can be used by nearly every discipline in the building process, reducing the chance of human error as well as saving time and money. The interaction between BIM and structural design programs does require some knowledge of how the transition can be best utilized, and the steps required to make a smooth transfer of information between the programs. If this process was taught in higher education, it could begin the steps towards educating the structural engineering profession on ways to work smarter and more efficiently, creating larger assets to the structural engineering community.

Engineering Education Needs to Better Utilize Interdisciplinary Opportunities

Rustin Clark (Wichita State University)

Engineering education often makes it seem like each specialty is siloed off from all the others, as if aerospace engineers and chemical engineers each practice a totally separate, arcane, art that the other could never hope to understand. This is to say nothing of the difference between engineering as a larger umbrella compared to programs such as business, communications, or nursing, where the overlap seems to be nonexistent. But this overlap does exist, it's much, much larger than it seems, and engineering education is not doing nearly enough to identify and emphasize the interdisciplinary opportunities it could be utilizing. Why aren't electrical engineers taught about the anatomy and physiology of neurons, when there could be a treasure trove of insight for electronics architecture and function to be found? Students in fast-growing and cutting-edge engineering fields such as biomedical engineering can learn so much from business curricula, and one can only imagine the beauty that could come from a civil engineer with a properly developed talent for art. I am an engineering student. I am also a wedding DJ, a medical scribe, a pianist, a teacher, a manager, a runner, an aspiring entrepreneur, and a travel enthusiast. I firmly believe that variety is the spice of life, and that the variety in my life makes me a better engineer. I also believe that interdisciplinary connections are important in elevating engineering education and equipping future generations to design for a world with increasingly complex problems. To do this we need to encourage engineers to dabble in specialties not their own and make connections outside their immediate professional circles; there may just come a remarkable result that would never have come from inside their regular comfort zones.

Rethinking our Class Presentation Setting

Jairo Cervantes and Tareq Daher (University of Nebraska – Lincoln)

Decades of research states the importance of course evaluation. In my first course evaluation for the first course I ever taught, one student "[H]e got to know our names and it was great when he would address up by them - it showed he was interested in us as students." This comment ties into the research of addressing students by their names and relating their interest with the course content. In my junior course, students needed to present a topic of their interest. The presentations were conducted in pairs and developed over the course of a few weeks towards the end of the semester. During this period, the 10-min presentations allowed me to associate better students' name with their presented topic, and I also observed that my students get to know their peers better and their interests, resulting in an engaging classroom atmosphere that may have resulted in the evaluation's comment. Based on my experience and observation, I propose to distribute course presentations throughout the entire semester rather than assign them all together at the end of the semester. For instance, in a 3-credit course with 16 individuals/groups, the first 10 min of a weekly class can be allocated for a presentation, covering the 16-weeks semester, rather than using the final weeks of the semester for presentations. The proposed change could facilitate both student-student and student-teacher interaction early in the semester, improving the classroom environment and students' interest in the course topics. I plan to implement the proposed setting for presentations in future courses.

Creativity and Education: Fostering Innovation through Ideation

Nicholas Hennigan, Sabrina Stangler and Tara Rahmani (Milwaukee School of Engineering - University Innovation Fellows)

Existing engineering educational strategies neglect the full extent of the design process. Classes simply focus on learning the technology and required skills. By solidifying rote thinking patterns, it fails to demonstrate how the tools we learn as engineers are used to improve the world around us. This robotic mindset persists through different teaching styles and fosters a student culture that is resistant to change. STEM is technical in nature, yet driven by empathy and human-centered design. It exists to improve humanity, not just get the right answer at the back of a textbook. We must teach the WHOLE design process and find ways to stimulate creativity and communication in the classroom to remove these stagnant mindsets. It is a crying shame to see engineers emerge as leaders in technology with little knowledge of the impact they could be making. We shouldn't have to rely on industry experience to understand why the solutions we create matter. Students have the power to revolutionize their community now, so why aren't we providing them the skills to do so? As University Innovation Fellows, we are tackling this effort with two ongoing IRB certified research projects. First, we're introducing classes to the entire design process via Design Thinking. By collecting survey data, we hope to tailor these workshop sessions into classroom curricula. Second, we're quantitatively looking at how improv and theatre exercises affect a group's ability to brainstorm and be creative. By adding creative elements into the classroom, we hope to change the student mindset.

SESSION ABSTRACTS

CONCURRENT SESSION II

STATICS & DYNAMICS EDUCATION

Prerequisite Testing as a Tool to Gauge Incoming Student Capability and Knowledge in an Engineering Statics Course

Roy Myose, Syed Raza, Elizabeth Rollins, Brandon Buerge and Nicholas Smith (Wichita State University)

A prerequisite test given at the beginning of the semester was used to predict the class grade. This pre-test was shown to be moderately well correlated with the end of semester grade even though the pre-test is given before any substantive teaching of new material occurs. Thus, the pre-test appears to be a good instrument to use as the control parameter whenever changes to the course is attempted. However, there is one caveat to this pre-test instrument – the database needs to be at least 100 students with 300+ students being the more preferred size in order to make the averages in each grade "bin" to be statistically meaningful. Future work under consideration is studies on the effect of other variables such as class size or attendance while controlling for the capability and prerequisite knowledge level of the incoming students.

Restructuring a Modeling Dynamics Course with Absorb-Do-Connect Learning Units

Brett Whorley, Camilo Giraldo, Arjun Kamath, Molly McVey, Meagan Patterson and Carl Luchies (University of Kansas)

The authors experimented with the instructional pedagogy used in a mechanical engineering simulation course for undergraduate and graduate-level students. Students indicated higher levels of motivation, confidence, and engagement with course content under the Absorb-Do-Connect framework when compared to standard active learning environments.

Student Performance Characteristics in a Hybrid Engineering Statics Course

Roy Myose, Scott Miller and Elizabeth Rollins (Wichita State University)

Student performance characteristics in a hybrid Engineering Statics class were investigated. Although cumulative averages did not vary much over the course of the semester, the distribution of scores varied significant. As the course involved more complex material in the later half of the semester, poorly performing students withdrew from the course causing the average to remain fairly constant. Dividing the students into grade level categories, it was found that there was less variance in exam scores for each grade level as the semester progressed. The results help provide a benchmark that can be used in the future to compare against when interventions are made to affect student success in Engineering Statics at WSU.

POSTERS

Effect of an Engineering Camp on Elementary Students Understanding of Engineering and Attitudes toward Engineering

Drew Gossen and Juliana Utley (Oklahoma State University)

An increased demand for exposure to engineering has improved engineering education in the school setting, while opportunities to experience engineering in out-of-school contexts are important as well. This poster (a work in progress) will present preliminary findings on the effect of an engineering camp on understanding of engineering and attitudes toward engineering in elementary students.

Work in Progress: Evaluating the Impact of an Expanded Sophomore Design Curriculum for Aerospace Engineering Students

Jillian Schmidt, Warner Meeks and Henry Pernicka (Missouri University of Science and Technology)

The aerospace engineering curriculum at Missouri University of Science and Technology includes a series of discipline-specific design courses: a sophomore-level course covering aircraft design principles, and senior-level courses providing a choice of aircraft design or spacecraft design culminating experiences. An additional sophomore-level course in spacecraft design was developed with the goals of increasing student motivation and persistence, helping students make informed choices regarding their upper-level coursework, and aiding students in professional development by exposing them to spacecraft design techniques that are applicable to internships and research. This work in progress study investigates the effects of the new sophomore-level spacecraft design course on student preparedness, course selection, and retention in the degree program.

Student-Built Electric Motor Project as a Culminating Project in Introductory Physics

Mark Pecaut and Michael McCoy (Rockhurst University)

College Engineering students normally have difficulty understanding electricity and magnetism due the abstract nature of the subject. To facilitate understanding of magnetic forces, torque, Faraday's Law and to connect it with mechanics topics from the first semester of the course, we use an Electric Motor Project. The students, in pairs or individually, must build a functional electric motor from primitive materials such as wood, nails, magnet wire, though copper tape is allowed for the commutator. The motor must rotate at a minimum angular velocity, and must be able to lift a weight. Once the physical motor is constructed by the students and tested by the instructor, the students must individually write a paper describing the physics of the motor, and provide comparisons of the projected vs measured torque, power, etc... We present the project as a way to help students connect with the abstract ideas of electricity and magnetism.

Bridging the Gap: Preparing Future Engineering Faculty for Post-Secondary Teaching Excellence

Tareq Daher (University of Nebraska - Lincoln)

The vast majority of engineering PhD graduates seeking faculty jobs will have teaching assignments. However, as with many higher education STEM fields, many of our graduate students are presented with minimal teaching responsibilities and little to no formal training on excellence in teaching. At the University of Nebraska - Lincoln, College of Engineering, we developed the college of engineering Graduate Student Teaching Fellows program to help bridge the gap for our students desiring to become faculty. This program is a one-year competitive program that prepares graduate students who are currently (or will be) teaching at the postsecondary level. This is a unique opportunity that allows graduate students to engage with evidence-based teaching methods applicable to Science, Technology, Engineering, and Mathematics (STEM).

Graduate students will learn to become effective teachers through active participation in a peer-observation program, learning evidence-based course design and development, structured discussions with faculty mentors, and taking part in a course focused on teaching. Upon completion of the program, participants are awarded a non-degree certificate of completion and named a UNL College of Engineering Graduate Student Teaching Fellow. Students will simultaneously earn associate level certification through the CIRTL@Nebraska program (go.unl.edu/cirtl) to be named a CIRTL Associate. In this poster session, I will discuss the results of our pilot program and provide insights into the program development.

Effective Teaching of Introductory Programming Language Classes

Srikanth Gampa (Wichita State University)

An introductory programming course plays a significant role for the freshman engineering students. Many undergraduate students with computer science (CS) major assess their interest in the program based on their experience in the introductory programming course. Students coming from majors other than CS enroll with the expectation of implementing their domain-specific needs using the programming learned from this course. This work presents methodologies effectively used in an introductory programming course at Wichita State University to achieve student goals and enhance their learning experience. The methodologies offered various rewards. Many students told me that they enjoyed the way this course was taught, became better programmers, and would continue with the CS major. One student preferred to change the major to CS because s/he was fascinated with this course and felt that s/he could solve problems better through programming. The methodologies have also helped improve the score of Student Perceptions of Teaching Effectiveness evaluation.

SESSION ABSTRACTS

CONCURRENT SESSION II

POSTERS

Master Control Unit for a Large Electric Lunar/Mars Rover

Anthony Ming and Kevin Lewelling (University of Arkansas Fort Smith)

A large electric Lunar/Mars Rover is being constructed by UAFS students. The rover uses a novel steering design based on a zero turning lawn mower; allowing an astronaut to easily drive while wearing a bulky space suit. This rover is capable of traveling up to 20 miles at 10 mph on a single battery charge. The suspension system is based on a passive Rocker-Bogie design using a differential bar placed on the top of the battery/electronics box behind the rover seat. The rover using 6 in-wheel motors to provide consistent traction on difficult terrain. The 6 motors are controlled by a motor drive that was designed by four UAFS students. The drive is capable of controlling speed and torque using Space Vector Modulation (SVM). SVM allows the motor to be controlled without the use of sensors, thus reducing the number of wires found on the rover. The 6 motors will be part of a Controller Area Network (CAN) that will ensure each motor provides the correct speed and torque
The 6 motors are controlled by a Master Control Unit (MCU) which is connected to the zero turning steering system. Mechanical encoders are used in the zero turning system to signal direction and speed. When the encoder signals are received by the MCU, the onboard processor analyzes the encoder signal and puts the appropriate messages on the CAN for each motor. As the project progresses, a touch screen will be added to the MCU to add lighting, etc. This poster will summarize the current work being done on the MCU and steering system by UAFS students.

IGNITE PRESENTATIONS

Doing the Things That Scare You Just a Little Bit

Maggie Brown (Wichita State University)

As engineers, we like to push boundaries. It's what we do. We have the technology we have today because we didn't accept the limits that were put in front of us. But are we trying to push past similar barriers in ourselves? Personally, I have found myself doing things that I love and growing as a person when I push myself outside of my comfort zone and do the things that scare me just a little bit. When I remain in my comfort zone, I become stagnant and don't seem as happy. I have seen the same trend in many people close to me.
Many people in this world are unsatisfied with what they are doing with their life and it is because they have stopped pushing themselves outside of their comfort zone. I would encourage people to start doing the things that make them a little bit uncomfortable and see where it takes them.

Strong-Seal Strength Research

Christian Thompson and Joshua Purdy (Wichita State University)

Engineering Technology students can improve their education by working on degree relevant research projects to expand their knowledge and technical skills. During our research project we had to learn about unfamiliar testing practices and material testing machines. Our group worked with a NIAR and Mayer Specialty Services to test compression capabilities of strong seal concrete. Although Wichita State has prepared us with the practical knowledge needed to succeed there is still a gap between college and the real world of engineering. Understanding this knowledge gap and how to overcome it quickly is perhaps the best thing we can learn as students. The areas we felt we grew individually and as a team include communication, organization, research abilities, and industry specific knowledge. Working with private industries forces students to communicate outside their comfort zone and forces them to grow as individuals and engineers. Coordinating project timelines that delegate specific tasks to team members in an environment that everyone is accountable for missed deadlines benefits students' organizational skills along with time management skills. Starting a research project in an area you had no previous knowledge forces students to learn large amounts of information fast without formal lecture environment college provides. After completing research and testing we felt we had a passable knowledge of nondestructive pipe replacement technology. Although this is a small area of potential career fields, we learned many valuable tools that we can use in any career field.

Let's Go Full STEAM Ahead: Addressing Gender Parity

Sierra Bonn (Wichita State University)

Women make up around one fifth of the workers employed in science, technology, and engineering jobs, according to the Bureau of Labor Statistics, and for women of color, that percentage is even smaller. In order to grow the trend of women in STEAM fields, girls must be encouraged at a young age that they are capable of accomplishing incredible engineering feats and scientific discoveries.
I needed a role model when I was younger. I didn't know that I could be a clever, strong, feminine, artsy engineer until I started seeing clever, strong, feminine, artsy engineers. I want to highlight role models for young women to demonstrate how to be uniquely themselves in whatever field they want to be in – whether it is in engineering, researching, or teaching.
Through the implementation of Women in STEAM Week, currently recognized in the State of Kansas as the third week in October, educators are equipped with curriculum to highlight influential women in STEAM fields. Educators are also encouraged, along with their students, to nominate a local inspirational women to become recognized as a Woman In STEAM.

University of Nebraska-Lincoln's College of Engineering Graduate Student Teaching Fellows Program: A First-Cohort Fellow's Perspective

Shahab Karimifard and Tareq Daher (University of Nebraska - Lincoln)

Traditional or conventional teaching methods that lack active learning components can hinder students learning. A shift towards modern and interactive student-centered methods is being implemented by a new generation of instructors. However, this transition from passive lecture-based instruction to active learning is facing a challenge that we call "the missing step". This missing step in the transition phase refers to training and preparing future faculty to adopt research-based instructional strategies. My fellow aspiring professors and I were mostly educated via old-school methods. Without proper training on STEM teaching, we were likely to approach our future teaching, by modeling what we saw. If granted the opportunity to teach engineering in a faculty role, we would have come into it lacking teaching theory and instructional strategies rooted in engineering education. If a new instructor is not familiar with subjects such as "backward design", "evidence-based instructional strategies" and "active learning", or is not acquainted with importance of classroom assessment techniques, rubrics, and motivation strategies, I believe the result will be an unfillable gap between the instructor and the students who are from a very different generation: Generation Z. I was in the first cohort of Ph.D. students who completed the College of Engineering's graduate teaching fellowship program at the University of Nebraska-Lincoln. This one-year, well-structured, peer-observation program gave me invaluable knowledge about teaching following the research. Starting such a program in every school for interested graduate students can make a significant difference. My session discusses my perspectives on the program and its impact.

Chronic

Madeline Shonka (Wichita State University)

I equate chronic illness to puberty and discuss how chronic illness has impacted my life. I have used that life experience and turned it into a company that uses STEM to help young adults understand their diagnosis. Another focus is building a support system for those affected and connecting their commonalities. Many do not realize how many people around them are impacted by hidden disabilities. Creating an open conversation can help those afflicted grow in confidence. This positively impacts their learning experience. Overall, creating a more positive environment for everyone.

SESSION ABSTRACTS

CONCURRENT SESSION III

DESIGN

Integrating 4D Printing Processes into STEM Education

Eylem Asmatulu, Yeshaswini Baddam, Md. Nizam Uddin and Thisath Nisitha Dasal Attampola Arachchi Attampola Arachchige Don (Wichita State University)

The combination of three-dimensional (3D) printing and smart materials into printable material has led to the development of new outstanding technology, referred to as four-dimensional (4D) printing. In the last decade, 3D printing technology has made significant progress with respect to materials, printers, and processes. However, considerably more research could be done to handle various challenges. The additive manufacturing (AM) industry is discovering new applications, new materials, and new 3D printers. Meanwhile, smart materials can alter printable properties or shapes when external stimuli is applied. 3D printing of these materials also changes their shape or properties over time. Here the fourth dimension, which is time, can be combined with conventional 3D printing. 4D printing is the procedure through which a 3D printed object changes itself into another structure as the result of the impact of environmental stimuli such as temperature, light, or other environmental influences. 4D printing will open new possibilities that are useful in larger-scale applications, will work in extreme conditions, and create a transformable structure. This paper will introduce the background and development of the 4D printing technology, 4D printing process, materials, potential applications, and integration into science, technology, engineering and Math (STEM) education.

Big Data Analytics for Big Outcomes in Healthcare

Hailey Michael and Shankar Krishnan (Wentworth Institute of Technology)

The National Cancer Institute estimated that there were over 1.7 million new cancer patients in the United States in 2018 and about a third of these patients will not survive. According to the World Health Organization, cancer is the second leading cause of death globally. Traditional cancer treatments are expensive, and the high prices combined with the low survival rates could turn patients away from going through appropriate cancer screenings and detection procedures. A significant issue within the healthcare system is the lack of personalization among treatments. Patients are looked at from a disease cluster consideration, rather than as an individual patient requiring personalized care. Large volumes of complex data, forming the big data, can be reviewed and analyzed to arrive at a personalized plan for patient case management. The objective of this project is to review examples of current applications of big data in healthcare, highlight the corresponding benefits, and make suggestions for future improvements. Big data analytics refers to the comparison and utilization of high volume, variety, velocity and veracity of relevant data to select a treatment approach for a given patient. Applying the analytics on relevant big data and zooming in on a specific patient's case to determine appropriate regimen and personalized patient care will help to reach the outcomes with better chances at survival, especially for patients with cancer or cardiovascular diseases. Results based on big data analytics for cancer treatment are presented and discussed. The benefits of big data analytics include improving diagnoses, reducing readmission rates, providing more effective treatments and substantially reducing associated costs and corresponding time. Incorporating user-friendliness in big data analytics is difficult since massive volumes of data must be organized into appropriate simulations to achieve better results. In conclusion, based on the potential power and preliminary results, it is predicted that big data analytics will play a crucial role in healthcare management of complicated cases and care delivery, leading to big and effective outcomes.

The Retention of Graduates from Engineering Education Expansion in Kansas

Roy Myose, Scott Miller, Steven Skinner (Wichita State University) and James Myose (Kansas State University)

The retention of graduates from Engineering education expansion in the state of Kansas was considered. The investment by the state has resulted in a significant increase in the number of Engineering graduates by K-State, KU, and WSU. KU reached its expansion goal early in 2016, K-State has graduated a significant number of Engineering graduates in raw number terms, and WSU provided the highest percentage of its Engineering graduates staying and working in Kansas when compared with K-State and KU. In addition to retention-related analysis, some state of Kansas labor demand estimates were made for individual Engineering majors that are in high demand. Besides computer-related occupations, Aerospace, Civil, and Electrical Engineering appear to be high-demand fields for the state of Kansas.

CONCURRENT SESSION IV

LAB & CLASSROOM MANAGEMENT

Saving Time In and Out of Class: Video Exam Solutions

Christi Luks (Missouri University of Science & Technology)

Demands on faculty time seem to be increasing year after year. Technology has proven to be both friend and foe in meeting our goals. This paper presents one instructor's attempt to reduce time spent in class and in one-on-one sessions with students using video solutions to exams. Posting solutions to individual problems as well as written solutions has tremendously reduced the number of questions about grading and has been well-received by students as a review tool for final exams.

Structured Redesign of a Circuits Laboratory

Amardeep Kaur and Theresa Swift (Missouri University of Science & Technology)

In the work presented here, a structured approach is taken to redesign and update The Circuit Analysis Laboratory course at our institution. The course has not been updated or revised for a number of years resulting in out-of-date equipment information in the manuals, lack of cohesion in the lecture and the lab courses, significant time spent by teaching assistants (TAs) in helping students, and frustrated students. This report discusses the nature of the course redesigned, motivations that led to the redesign, feedback received from TAs and students prior to the redesign, and tools used to bridge the gaps between lab tasks performed and learning outcomes met.

Research Safety and Professional Development-A Graduate Course Focused on the Role of Safety in Laboratory Management

Tammy Lutz-Rechtin (University of Arkansas)

In this work, a twice-a-week full semester course "Research Safety and Compliance for STEM Professionals" is presented that encompassed the essentials of safety combined with addressing safety research management soft skills. After participation, students can create a culture of safety and have the confidence to recognize, challenge, and be proactive about potentially unsafe situations. This course will continue to evolve and may be taught in a two-part series if other departments are interested in participating. Inclusion of an expanded safety leadership component would be greatly beneficial to the students if time allows. Currently, the chemical engineering department at the University of Arkansas already provides a basic of safety instruction as part of the orientation of new graduate students under my direction.

Escape Room Workshop

Chris Wyant (Wichita State University)

Like a challenge? Come to this session to see if you have the team skills to complete the puzzle to escape. You will learn about how to develop students' personal and teamwork skills using the most recent research insights and methods while having a good time playing an escape room style puzzle. Once you escape, you will take home to your classes your lessons learned and methods you practiced in the session for immediate adoption in your courses. Bring your A game, the challenge awaits!

SESSION ABSTRACTS

CONCURRENT SESSION V

OUTREACH & DIVERSITY

University-Led Engineering Outreach to Adults: Public Engagement and Senior Adult Initiatives

Ashlee N. Ford Versypt, Joel J. Versypt and Heather Cappa-Fahlenkamp (Oklahoma State University)

University-led engineering outreach is an important activity for extension efforts and for faculty interested in broader impacts of their teaching and research endeavors. In many universities, much of the science, technology, engineering, and mathematics outreach activities are focused on K-12 students and/or educators. In this paper, we highlight engineering outreach geared primarily towards adults through public engagement and senior adult initiatives. First, we will describe benefits of engineering outreach to adults. Then, we will detail some examples from our university.

Women in Engineering – Focus on Self-Efficacy in Modeling and Design through Project-Based Learning

Muhammad Khan and Mohamed Ibrahim (Arkansas Tech University)

Ability to model and design engineering systems is central attribute of engineering education. With the rapid technological advances in diverse fields, the practice of engineering profession is taking place in a team environment. The diversity of engineering teams is important not only to promote creativity but also to achieve the goals of efficiency, usability, saleability, and innovation. In recent years, there has been focus on inducting more women in science, technology, engineering, and mathematics (STEM) related field to promote diversity in engineering profession. Within the undergraduate engineering curriculum, the students pursue project-based learning (PBL) especially in courses involving modeling and design of engineering systems. The students learn to work in diverse teams, generate concepts, model and design systems, deploy designed prototypes, and communicate project outcomes. To measure the effectiveness of PBL methodology in undergraduate engineering education, it is important to determine the personal perception of self-efficacy of students. The concept of self-efficacy involves the perceptions of students on their self-belief and optimism to accomplish tasks and produce expected results with the skills acquired during the engineering curriculum. It is a major element to determine their chances of success in future as engineering professionals. To measure the effectiveness of PBL methodology in engineering modeling and design courses, an important research question is: Does the use of PBL methodology affect self-efficacy and course scores of male and female students differently? In this paper, we address this question by highlighting the results from a longitudinal study conducted on students in engineering modeling and design (junior-level) courses at Arkansas Tech University. We have statistically analyzed the collected data to compare the effect of PBL strategy on male and female engineering students' self-efficacy and course scores. The results indicate that PBL approach was equally effective in improving self-efficacy and course scores of male and female engineering students. Significant improvement was observed in self-efficacy and course scores of both male and female students when the project based learning strategy was employed.

Influencing Elementary Students Perceptions about the Work of an Engineer

Juliana Utley, Drew Gossen and Toni Ivey (Oklahoma State University)

Most of pre-college engineering curricula is designed to increase students' understanding of engineering and change their perceptions about the work of engineers. The purpose of this study was to explore students' potential changes in perceptions of the work of engineers after participating in Engineering is Elementary (EiE™) curriculum and instruction. While findings revealed a significant increase in students' conceptions of engineering with large effect sizes for general knowledge of what is engineering and what is technology, the influence on students' conceptions about the work of an engineer, as measured using the modified Draw an Engineer Test (Thomas, Colston, Ley, DeVore-Wedding, Hawley, Utley, and Ivey, 2016), and how engineers use mathematics was a small effect. These results suggest that the use of a single EiE™ curriculum unit with elementary aged students can significantly enhance students overall understanding of the work of engineers; however, does not have as much impact on their perceptions of how engineers apply mathematics in their work and the depth of their knowledge about the work of engineers is not as strong.

Introduce High School Students to Engineering Disciplines: Activities and Assessment

Nicolas Libre and Stuart Baur (Missouri University of Science & Technology)

Our presentation documents and describes the educational summer camp program developed for high school students. The overarching broader impact goal of the Intro summer camp is to introduce the students to various engineering disinclines and help them to make a better decision on choosing career or disciplines they want to pursue. Several activities are designed to achieve the goals. This presentation focus on the hands on activities offered in the Architectural Engineering and Civil Engineering programs. Activity details are described in this paper and the results are discussed. Students showed success in implementing the engineering principles into basic engineering problems through a problem-based learning activity. Students enjoyed the activities and showed improved learning after the hands on program. Overall the Intro summer camp was very positive for both the participants and their mentors.

RESEARCH EXPERIENCES

Training Engineering Students on Synthesis and Characterization of Superhydrophobic Electrospun Nanocomposite Fibers from Recycled Polystyrene Foams

Eylem Asmatulu, Md. Nizam Uddin, Yeshaswini Baddam and Polo Osornio Cornejo (Wichita State University)

The scarcity of pure drinking water is one of today's major humanitarian challenges around the globe. The world population growth, urbanization, depleting water resources, deteriorating water quality, and global climate change have intensified this crisis, especially in countries with arid and semi-arid regions. Also, the production of different plastic wastes is increasing day by day and, therefore, a growing concern to the serious environmental challenges. These wastes are rarely dissolved by microorganisms, and hence, the recycling of value-added materials is essential. In this work, recycled expanded polystyrene (REPS) foam with various proportions of titanium dioxide (TiO2) nano- and aluminum (Al) microparticles was spun into superhydrophobic nanocomposite fibers using the facile electrospinning technique and proposed for harvesting fog from the atmosphere. The fiber morphology and thermal properties as well as surface hydrophobicity of the nanocomposite fibers were investigated. Test results show that the as-prepared nanocomposite fibers exhibit superhydrophobic characteristics with a water contact angle of 152.03°. These electrospun superhydrophobic nanocomposite fibers from REPS have various industrial applications, including water collection, water filtration, tissue engineering, and composites. During the present study, undergraduate and graduate students worked together to learn every steps of the project.

Mitigations of Machine Damaged Fiber Reinforced Composites for Improved Mechanical Strengths and Educational Practices for Engineering Students

A Kunza, A.S.A Shairi, K.A Brauning and R Asmatulu (Wichita State University)

Fiber reinforced composites have been used in a number of different industrial applications, such as aircraft, wind turbined, automotive, defense and many other manufacturing industries because of their high strength to weight ratio, low coefficient of thermal expansion, fatigue and corrosion resistance, ease of manufacturing larger parts, design flexibility and high and low temperature applications. During the manufacturing and machining (e.g., curing, cutting, trimming, drilling, and fastening) processes of composites, some surface damages and free edges are formed around the composites. These defects on the fiber reinforced composites are considered to be major flaws and can reduce overall mechanical properties of those composites. In this study, pre-preg carbon fiber laminate composites were produced in a vacuum oven at different fiber orientations and then test coupons were extracted from the prepared composite panels. Two different edge treatment adhesives (cyano-acrolate and epoxy resin) were applied on the machined sides of the composite surfaces and the tensile test results were compared with the bare samples without any treatment. The test results indicated that edge treatments could improve the mechanical properties of the composites about 11%. This may be useful for the future design of composite products for different industrial applications. Through the studies, undergraduate and graduate students were involved in these studies and gained a lot of hands-on experiences.

SESSION ABSTRACTS

CONCURRENT SESSION V

RESEARCH EXPERIENCES

Superhydrophobic Electrospun Nanocomposite Fibers for Training Engineering Students

Md. Nizam Uddin, Fenil Desai, Arvind Raj Murali, Andrew Swindle and Eylem Asmatulu (Wichita State University)

To address the global water scarcity issue, efficient water collecting surface with fast capturing, and easy drainage is essential. This paper presents a facile method for the fabrication of permanent electrospun superhydrophobic polyacrylonitrile (PAN) and Poly (methyl methacrylate) (PMMA) nanocomposite fibers. The superhydrophobic nanocomposite fibers are fabricated with various proportion of titanium dioxide (TiO2) nano, and Al microparticles using the facile electrospinning technique followed by stabilization and carbonization to remove all non-carbonaceous material from the fibers. The fibers morphology, surface hydrophobicity, crystal structure of the nanocomposite fibers were investigated by scanning electron microscopy (SEM), X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR) and water contact angle. The test results showed that the inclusion of nanoparticles in the carbonized nanocomposite fibers ameliorate the surface roughness as well as surface hydrophobicity. Besides, the degree of crystallization is also improved. A water contact angle of 154.8° was achieved by addition of 10% inclusion of the combination of micro and nanoparticles. Thus, the electrospun carbonized superhydrophobic nanocomposite fibers have various industrial applications; including water collection, water filtration, tissue engineering, composites, and so forth.

CONCURRENT SESSION VI

ADMINISTRATION

The Effect of Plus-Minus Grades on Graduation With Academic Distinction for Engineering Students at Wichita State University

Roy Myose, Elizabeth Rollins, Klaus Hoffmann, Kimberly Engber and Sarah Myose (Wichita State University)

The effect of a plus-minus grade system on graduation with academic distinction at a medium-size public university was considered. Commencement program brochures were used to determine the number of summa cum laude, magna cum laude, and cum laude graduates over a five-year period when whole-letter grades were used and for a similar period under the plus-minus grade system. For the university as a whole, the number of summa cum laudes decreased with plus-minus grades while the number of graduates in the other distinction categories increased. However, in engineering, there was a decrease in summa and magna cum laudes without a corresponding increase in cum laudes. Actual and simulated grade distributions from individual classes were also considered to see how they relate to graduation with distinction.

Top Administrators' Perceptions of the Quality in E-learning

Mohammed Al Awadh and Gamal Weheba (Wichita State University)

E-learning has grown quickly and resulted in broad implementations. It has become an essential component of higher education as a non-traditional instructional method. Quality has always been and continues to be the primary issue in education. This study was aimed at identifying the perceptions of quality in e-learning from the standpoint of university administrators. These perceptions are likely to affect the way e-learning programs are designed and delivered. In achieving this objective, the study included 100 top-ranked universities in the U.S. Statements from administrators from these universities were analyzed for content. The analysis reviled that administrators' perceptions are dominated by features and performance constructs. Factor analysis suggests that constructs reflecting engagement and trust are used to distinguish between different programs.

Microfluidics-based Learning and Analysis for Plant Cell Studies

Eylem Asmatulu, Sattar Ali, A. Bilal Ozturk and Amanuel Wondimu (Wichita State University)

Microfluidics is a new field of technology and science, which brings all the disciplines together, such as physics, chemistry, biochemistry, engineering, nanotechnology, and biotechnology. It manipulates the fluids between microliters (10-6) and picoliters (10-12) in the channels through dimensions from tens to hundreds of micrometers. The attributes of a microfluidic system, such as extensive surface-to-volume proportions, laminar stream, surface tension and capillary effects at the micrometer scale are significant and make the gadgets proficient for the processes as well as investigating complex biological examples. Microfluidic devices are emerging as innovative systems, which can significantly alter sustenance, agriculture, and biosystems enterprises. The standards of electrokinetics, electro-hydrodynamics, and thermo-capillarity of microfluidic systems help take care of significant logical issues that are difficult by regular systems and innovations. The discrete advantages of microfluidic technology over the conventional fluidic systems are low-cost fabrication, development of analytical performance, low power and chemical requirement, and better control and biocompatibility. The benefits offered by miniaturization are quick response, short reaction times, low sample and reagent volumes, reduction of the size of equipment, possibility of portable devices, and parallel tasks for numerous examinations. This paper highlights the manufacturing processes, characteristics of microfluidics, their applications in plant cells, as well as educational use of these devices and technologies in engineering fields.

CONFERENCE INFORMATION

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The Outstanding Service Awardee: *Ashlee Ford Versypt, Assistant Professor in the School of Chemical Engineering at Oklahoma State University.*

The Outstanding Teaching Awardee: *Patrick O'Malley, Associate Professor of Engineering at Benedictine College.*

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