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FYEE 2017

Embry-Riddle Aeronautical University
Daytona Beach, FL

Table of Contents

Welcome

In its 9th year, the First-Year Engineering Experience conference seeks to continue the dialogue that began at the University of Notre Dame in 2005. On behalf of the Engineering Fundamentals Department of Embry-Riddle Aeronautical University (ERAU), We welcome you to Daytona Beach and the FYEE conference. Held at the Shores Resort and Spa, the program committee hopes that you will enjoy an opportunity to discuss the myriad of issues pertaining to the first-year experience while overlooking the majesty of the Atlantic Ocean.

FYEE represents a unique opportunity to better understand the complexities associated with educating first-year engineering students. Through combinations of workshops and technical sessions, conference attendees are encouraged to share best practices and innovative ideas for changing the face of how first-year engineering education is taught.

The FYEE conference begins on Sunday afternoon with a welcome reception in the lobby of the Shores Resort. Monday morning will have a fascinating Keynote address from Dr. Kenneth Reid, Acting Department Head & Assistant Department Head, Undergraduate Programs, Department of Engineering Education, Virginia Tech. Ken will be talking about developing a taxonomy for “Introduction to Engineering” courses, as well as his experience formulating a Bachelor’s degree in Engineering Education while he was a faculty member at Ohio Northern University. Ken brings a unique perspective on the field that will undoubtedly push the dialogue in a positive direction.

Monday afternoon, we will travel to the Embry-Riddle Aeronautical University campus for an afternoon of workshops and works in progress. Consider checking out the sponsored workshops by National Instruments and Cengage. Their generous support has helped us keep the cost of the conference manageable.

Monday evening, we’ll gather back at the Shores resort for dinner and a keynote address sponsored by Autodesk. Tuesday will be filled with technical sessions and networking opportunities, concluding with a brief wrap-up and feedback session.

Finally, while we look forward to you participating in the conference, we would be remiss if we did not point out the host of other tourism opportunities you may want to plan for in your travels, including tours of Daytona International Speedway and Kennedy Space Center, a trip to Walt Disney World or Universal Studios, or just spending a few extra days with your toes in the sand.

With the continued focus on the connection between academic advising, K-12 preparation, and first year engineering experiences, we hope you see many old friends as well as lots of new faces at FYEE 2017.

FYEE 2017 General Chair
Matthew Verleger
Embry-Riddle Aeronautical University
Associate Professor
Department of Engineering Fundamentals

EMBRY-RIDDLE
Aeronautical University
DAYTONA BEACH, FLORIDA

College of Engineering
Office of the Dean
T: 386-226-6258

July 14, 2017

Dear Colleagues:

I am delighted to welcome you to Embry-Riddle Aeronautical University, Daytona Beach Campus. The College of Engineering is excited that our Department of Engineering Fundamentals will be hosting the 9th Annual First Year Engineering Experience Conference. We hope you will have a wonderful time in Daytona Beach and enjoy all it has to offer.

Embry-Riddle is 90 years old; established 23 years after the Wright Brothers' first flight and the birth of aviation. It is the oldest and the most prestigious aviation and aerospace university in the world. I hope you will take some time during the conference to tour our College of Aviation and our flight line to see first-hand our aviation legacy and our vast infrastructure for aviation education and research.

In the past decade, however, Embry-Riddle has also positioned itself as a technological university. At the core of this new identity is the College of Engineering at Daytona Beach, known for its top ranked undergraduate programs, innovative hands-on curriculum, focus on experiential learning, and research at undergraduate level opportunities. I invite you to walk through the Lehman Engineering and Technology Center to see the many practical projects our students are involved in as part of their education. I also hope you will find time to tour the new Engineering Building, the John Mica Engineering, and Aerospace Innovation Complex (MicaPlex). This iconic facility, the first building in Embry-Riddle's Research Park, serves as an ecosystem for faculty and students to pursue research as well as taking ideas from conception to a commercial product.

The Engineering Fundamentals Department leads our effort in ensuring student success through their research, evidenced-based approach to pedagogy, and putting in practice their research on how best to teach engineering. That translates into more hands-on activities and other forms of active learning that take students out of the lecture hall and into the lab. We are proud to host this event and to hear and learn about your best practices and share ours with you.

We are especially pleased to have Ken Reid, Acting Department Head & Assistant Department Head, Undergraduate Programs, as this year's Monday morning keynote speaker. Ken is a pioneer in promoting student success through first year engineering education. His talk, 'What Does "Introduction to Engineering" Mean?', will discuss his experience developing a taxonomy for "Introduction to Engineering" courses. Please join us at 8:15 AM on Monday in the Richard Petty ballroom of the Shores Resort and Spa to hear Ken's address.

I wish you a great and successful conference.

Sincerely,

Maj Mirmirani, Ph.D.
Interim Senior VP of Academic Affairs and Research
Dean, College of Engineering

600 S. Clyde Morris Blvd.
Daytona Beach, FL 32114-3900
800-862-2416

Conference at a Glance

Sunday, August 6, 2017	
1:00 p.m. – 7:00 p.m.	**Registration**, Shores Resort and Spa Lobby
5:00 p.m. – 7:00 p.m.	**Welcome Reception**, River Room, The Shores Resort and Spa
Monday, August 7, 2017	
7:30 a.m. – 11:00 a.m.	**Registration**, Shores Resort and Spa Lobby
7:00 a.m. – 8:00 a.m.	**Good Morning Continental Breakfast** Atlantic & Coastal Room, The Shores Resort and Spa
8:00 a.m. – 8:15 a.m.	**Conference Welcome/Announcements** Richard Petty Ballroom, The Shores Resort and Spa
8:15 a.m. – 9:30 a.m.	**Keynote Presentation** **Dr. Ken Reid**, Acting Department Head & Assistant Department Head, Undergraduate Programs, Keynote Topic: "What Does 'Introduction to Engineering' Mean?" Richard Petty Ballroom, The Shores Resort and Spa
9:45 a.m. – 11:00 a.m.	**Technical Sessions & Works-in-Progress**, Shores Resort and Spa
11:00 a.m. – 1:00 p.m.	**Lunch and Travel** to Embry-Riddle Aeronautical University campus. Vans start at 11:15. Box lunches are available in the lobby.
1:15 p.m. – 2:30 p.m.	**Workshops & Works-in-Progress**, Embry-Riddle Aeronautical University Campus
2:45 p.m. – 4:00 p.m.	**Workshops & Works-in-Progress**, Embry-Riddle Aeronautical University Campus
4:15 p.m. – 5:30 p.m.	**Workshops & Works-in-Progress**, Embry-Riddle Aeronautical University Campus
5:30 p.m. – 6:30 p.m.	**Return to Shores Resort and Spa** Vans will start at 5:30.
6:30 p.m. – 9:00 p.m.	**Dinner Reception and Keynote sponsored by Autodesk** Atlantic & Coastal Room, The Shores Resort and Spa
Tuesday, August 8	
7:30 a.m. – 11:00 a.m.	**Registration** in the Shores Resort and Spa Lobby
7:00 a.m. – 8:00 a.m.	**Good Morning Continental Breakfast** Atlantic & Coastal Room, The Shores Resort and Spa
8:30 a.m. – 9:45 a.m.	**Technical Sessions & Works-in-Progress**, Shores Resort and Spa
10:00 a.m. – 11:15 a.m.	**Technical Sessions & Works-in-Progress**, Shores Resort and Spa
11:30 a.m. – 12:30 p.m.	**Lunch**, Atlantic & Coastal Room, The Shores Resort and Spa
12:45 p.m. – 2:00 p.m.	**Technical Sessions & Works-in-Progress**, Shores Resort and Spa
2:30 p.m. – 2:30 p.m.	**Wrap-up & Send-Off Session** Richard Petty Ballroom, The Shores Resort and Spa

Transportation from Shores Resort to ERAU Campus

On Monday, participants will be transported by van to and from the Shores Resort to the Embry-Riddle Aeronautical University (ERAU) Campus (~15 min. drive each way). Two 25 passenger vans and two 9 passenger vans will be transporting individuals starting at 11:15 AM. Each of the 4 vans will take passengers to the ERAU campus and return to the hotel. The second round of transportation will begin at approximately 11:45 AM. To return to the Shores, vans will start at 5:30 PM and again at 6:00 PM in front of the Lehman building on the Embry-Riddle campus.

You are free to drive yourself to/from the Shores to campus. Temporary parking passes are available at the conference registration desk.

Conference Committee

Number	Name
101	Corsair Hall
150	North Chiller
155	Residence Hall (Under Construction)
175	Campus Safety
211	McKay Hall
221	Apollo Hall
241	Doolittle Hall
249	Bookstore
250	Mail Services
253	Undergraduate Research and Disability Services
259	Tine Davis Fitness Center
260	Student Financial Services
267	Center For Faith & Spirituality
269	Racquetball Court
273	Student Support Services and Honors Program
311	Advanced Flight Sim Center
312	Fleet Maintenance Hangar
320	Flight Operations
321	College of Business
331	Willie Miller Instructional Center
340	Aviation Maintenance Sciences
341	College of Aviation
398	AMS Hangar
398A	Test Cell
398B	Engine Test Cells
415	Canaveral Hall
419	College of Arts & Sciences
500	Wellness Center - HDS
501	ROTC Center
502	Wellness Center - Counseling
508	Print Shop
509	Veteran's Affairs
510	Eagle Alumni Center
511	Crotty Tennis Complex
513	Modular Building - Telescope
514	Track & Field Concession
516	Track & Field Bleachers
526	ROTC Obstacle Course
530	Multipurpose Artificial Turf Field
543	Artificial Turf Softball Field
553	Baseball / Softball Clubhouse
598	JPR Student Center & Admissions Visitor Center
601	ICI Center
602	Jim W Henderson Administration & Welcome Center
603	Sliwa Stadium
605	Soccer - Ticket Concession
607	Soccer Field Bleachers
610	Student Union (Under Construction)
618	Lehman College of Engineering
631	South Chiller
641	Admissions Operations

Conference Sponsors

Conference sponsors and affiliates play an important role in supporting the FYEE conference. This support subsidizes the cost of the meal functions and special events. We appreciate these supporters and the part they play in making the 2017 FYEE conference a successful event.

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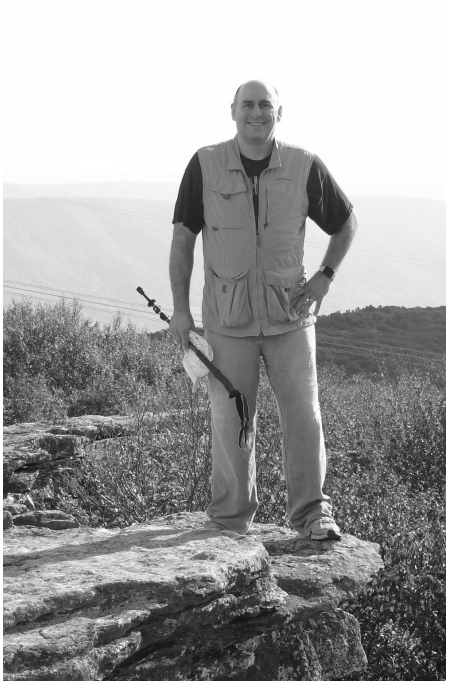
Monday Welcome and Keynote



Dr. Kenneth J. Reid,
Assistant Department Head for Undergraduate Programs
and Associate Professor,
Engineering Education,
Virginia Polytechnic Institute and State University

Keynote title: What Does "Introduction to Engineering" Mean?

Abstract: "You're good at math. Engineering is math and science. You should be an engineer." Engineering has been around for decades, and surely we can describe engineering as more than math and science, especially to aspiring engineers before they select a college major. Students who enter our engineering programs come from the world of K-12, where messages about engineering are mixed at best. High school students become first-year students, bringing misconceptions with them. Toward this end, many universities have established 'Introduction to Engineering' courses, meant to transition students into engineering. An examination of these courses showed great variability among programs – and in some cases, among sections in a program. Are our students introduced to engineering effectively?

We will take a brief tour of engineering in K-12 to understand where our students have been, and introduce a novel program with the potential to truly transform engineering within K-12. As our students transition into college, we will transition and examine the meaning of "Introduction to Engineering." A tool developed to quantify and categorize these courses will be introduced and we will discuss some potential uses of the First-Year Engineering Classification Scheme. Finally, we will attempt to answer our question "What Does 'Introduction to Engineering' Mean?"

Biography:
Kenneth Reid is the Assistant Department Head for Undergraduate Programs in Engineering Education at Virginia Tech. He has taught in the graduate and undergraduate program, but focuses his attention on administration and teaching in Virginia Tech's first-year program.

Ken was a member of the first cohort in Engineering Education at Purdue University and earned his Ph.D. in 2009 from Purdue. He previously earned his M.S. in Electrical Engineering from Rose Hulman Institute of Technology and B.S. in Computer and Electrical Engineering from Purdue.

He and his coauthors were awarded the William Elgin Wickenden award for 2014, recognizing the best paper in the Journal of Engineering Education and awarded Best Paper, ERM Division of ASEE in 2014. He was awarded an IEEE-USA Professional Achievement Award in 2013 for designing the nation's first B.S. degree in Engineering Education. He was named NETI Faculty Fellow for 2013-2014, and the Herbert F. Alter Chair of Engineering (Ohio Northern University) in 2010. The Tsunami Model Eliciting Activity, co-designed by Reid and implemented in an Indianapolis area middle school, was named the Middle School Curriculum of the Year for 2009 by the Engineering Education Service Center. He has received multiple teaching awards, including the Outstanding Teaching Award for the IL/IN section of ASEE. His research interests include success in first-year engineering, engineering in K-12, and international service and engineering. He is active in engineering within K-12, serving on the Technology Student Association (TSA) Board of Directors, and engineering international service learning, serving on the Board of Directors of Solid Rock International. He has written four textbooks (with another soon to be released), including texts recommended for the Project Lead the Way Digital Electronics course.

Session and Presentation Timing

Sessions are 75 minutes long. All of the sessions within the same time slot will maintain the same starting time for papers as shown in the table below. This is to enable "session hopping," where papers of interest are in different sessions but are not presented at the same time.

If there is a "no-show" author in a session, the moderator will conduct an open forum on the session's theme between the presenters and the audience during this empty time slot. **Papers MUST be presented at their scheduled time. No papers will be rescheduled.**
Each technical paper session will consist of four or five (4-5) 15-minute segments. Each paper will be allotted 15 minutes for the presentation and questions. The moderator will use part of each of the 15-minute segments for introductions and instructions. Any additional time can be used for a group discussion. The design of the FYEE conference is to promote discussion and interaction. Thus, the sessions are not just people presenting material, but also a place for people to share their insights on an issue. The discussion should be based on the theme of each session. The presentations should present ideas that the group can then discuss. Come to the session prepared to provide your insight.

Paper times for sessions are shown in the table below. H designates the session starting hour: mm designates the session starting minutes. (For example, if the session starts at 3:30 p.m., then H=3 and mm=30.) The starting time of each paper is indicated by H:mm + X where X denotes the number of minutes to add to the session starting time. (For example, in a 90-minute session that begins at 10:30 a.m., the fourth paper, begins at H:mm + 45 so that H=10, mm=30 and X=45; the starting time is 11:15 a.m.)

Sessions	**1 hour 15 minutes**	**Ex. 1**	**Ex. 2**	**Ex. 3**	**Ex. 4**
1st Paper	H:mm	8:30 AM	9:45 AM	12:45 PM	1:15 PM
2nd Paper	(H:mm) + 15 min	8:45 AM	10:00 AM	1:00 PM	1:30 PM
3rd Paper	(H:mm) + 30 min	9:00 AM	10:15 AM	1:15 PM	1:45 PM
4th Paper	(H:mm) + 45 min	9:15 AM	10:30 AM	1:30 PM	2:00 PM
5th Paper/Discussion	(H:mm) + 60 min	9:30 AM	10:45 AM	1:45 PM	2:15 PM

1. The time allotted for both full and work-in-progress papers at FYEE is 15 minutes for your talk, including questions. You should rehearse your presentation to ensure that it will fit within these time limits.
2. For sessions with 4 or fewer papers, the final 15 minutes of each session are for group discussion.
3. Each of the session rooms will have an LCD projector, screen, and computer. It is recommended that presenters use the computer in the session room. If you are bringing your own computer, please have the appropriate cables to connect. The session moderator will help presenters load all their presentations on the session room computer. Please have a back-up copy of your presentation, just in case.
4. Please be at your session room 15 minutes prior to the scheduled starting time. This will allow time to meet the session chair and other speakers, discuss session procedures, and preload all of the electronic presentations onto the computer in the session room.

Time	
Sunday 1:00 PM - 5:00 PM	Registration in the Lobby of the Shores Resort and Spa
Sunday 5:00 PM - 7:00 PM	Welcome Reception and Networking Event Location: Shores Resort and Spa, River Room (Rooftop Level)

<table>
<tr><th>Time</th><th colspan="4"></th></tr>
<tr><td>Monday
7:00 AM -
11:00 AM</td><td colspan="4">Registration in the Lobby of the Shores Resort and Spa</td></tr>
<tr><td>Monday
7:00 AM -
8:00 AM</td><td colspan="4">Continental Breakfast
Location: Shores Resort and Spa, Atlantic & Coastal Rooms (Rooftop Level)</td></tr>
<tr><td>Monday
8:00 AM -
9:30 AM</td><td colspan="4">Conference Kick-off and Keynote
Kick-off Address: Matthew Verleger, Associate Professor, Engineering Fundamentals Department, Embry-Riddle Aeronautical University. FYEE 2017 General Chair.

Keynote: Kenneth Reid, Assistant Department Head, Undergraduate Programs,
Department of Engineering Education, Virginia Tech.
"What Does 'Introduction to Engineering' Mean?"
Location: Shores Resort and Spa, Richard Petty Ballroom (1st Floor)</td></tr>
<tr><td>Monday
9:30 AM -
9:45 AM</td><td colspan="4">Networking Break
Location: Shores Resort and Spa, Bill France A (1st Floor)</td></tr>
<tr><td rowspan="2">Monday
9:45 AM -
11:00 AM</td><td colspan="4">Works-in-Progress (WIP) Sessions Location: Shores Resort and Spa</td></tr>
<tr><td>Bill France A</td><td>Bill France B</td><td>Bill France C</td><td>Dolphin Room</td></tr>
<tr><td></td><td>Coffee, Networking, & "Pedagogical Reality" Room</td><td>WIP: Engineering Education Research - Focus on Engagement</td><td>WIP: Enrollment, Instruction and Pedagogy - Focus on Classroom Practices</td><td>WIP: Enrollment, Instruction and Pedagogy - Focus on Design-Based Projects</td></tr>
<tr><td>Monday
11:00 AM -
1:15 PM</td><td colspan="4">Lunch, Travel to ERAU Campus, & Explore ERAU Campus
Box Lunches available in Shores Resort & Spa Lobby
Buses for travel to campus begin at 11:15.</td></tr>
</table>

Time					
Monday 1:15 PM - 2:30 PM	**Workshops & Works-in-Progress (WIP)** Location: Embry-Riddle Aeronautical University Campus, Lehman Building				
	Lehman 126B	Lehman 269	Lehman 329	Lehman 367	Lehman 369
	SPONSORED WORKSHOP: National Instruments	WIP: Engineering Education Research - Focus on Problem Solving	Workshop: Adopting Evidence-based Instruction through Video-Annotated Peer Review	Workshop: Incorporating the Constraint-Source Model into the First-Year Design Experience	Workshop: R3: A Three-Pronged Model for Engineering Student Success
Monday 2:45 PM - 4:00 PM	**Workshops & Works-in-Progress (WIP)** Location: Embry-Riddle Aeronautical University Campus, Lehman Building				
	Lehman 126B	Lehman 269	Lehman 329	Lehman 367	Lehman 369
	SPONSORED WORKSHOP: National Instruments	WIP: Student Success & Development - Focus on Mentoring	SPONSORED WORKSHOP: Cengage	Workshop: Get Rid of Your Student's Fear and Intimidation of Learning a Programming Language	Workshop: CU Thinking PROCESS: Promoting Problem Solving Skills Development in Cornerstone Courses
Monday 4:15 PM - 5:30 PM	**Workshops & Works-in-Progress (WIP)** Location: Embry-Riddle Aeronautical University Campus, Lehman Building				
	Lehman 126B	Lehman 269	Lehman 329	Lehman 367	Lehman 369
	SPONSORED WORKSHOP: National Instruments	WIP: Student Success & Development - Focus on Self-Efficacy	Workshop: Implementing Cloud Collaboration using Fusion 360 into a First-Year Engineering Design Course	Workshop: Building Alignment Between Pre-college and First-Year Engineering Programs	Workshop: Small Wins - Big impact: Narratives from Behind the Scenes
Monday 5:30 PM - 6:30 PM	Return to Shores Resort and Spa Buses begin at 6:00				
Monday 6:30 PM - 9:00 PM	**Dinner and Sponsored Keynote** Speaker: Cory Brozina, Director, First-Year Engineering Program, Youngstown State University Sponsored by: Autodesk Location: Shores Resort and Spa, Atlantic & Coastal Rooms (Rooftop Level)				

WIP: Engineering Education Research - Focus on Engagement

Monday, 9:45 AM - 11:00 AM - Bill France B

Findings of the Pilot Offering of an Application Oriented Course (ENGR101)

Edwin Hou, Ashish Borgaonkar, Jaskirat Sodhi, Moshe Kam

Students' inability to easily apply concepts of mathematics to engineering problems and applications is detrimental to their success in pursuing an engineering degree. It has a direct impact on the retention and graduation numbers in engineering colleges. In addition, high failure rate in first year mathematics courses is also hurting students' chances to make satisfactory progress towards their degree and ultimately graduate within even six years. In order to address these serious issues, in Fall of 2016, New Jersey Institute of Technology offered ENGR 101 – an application oriented course based on Wright State University model to engineering students placed in pre-calculus courses. Although only one year worth of data has been collected thus far and there is much to be studied and analyzed on the effectiveness of the course, we can already see that this experiment has produced encouraging results and students taking this course performed better in their pre-calculus courses compared to students who did not take ENGR 101. This paper will present the results of our analysis, including performance in the math course while taking ENGR 101 simultaneously, and performance in the math course in the subsequent semester. With the lessons learned from last year, a few additions and changes will be made for Fall 2017.

Self Directed Projects to Increase Engagement and Satisfaction in Basic Programming Course

Jeffrey Potoff, Tonya Whitehead

Introductory programming courses can be very challenging, leading to students being disengaged and having difficulty relating the material to their specific area of study. We hypothesize that a student-centered project will lead to greater student motivation, satisfaction, and opportunity to excel. The newly designed final project uses the same programming and computation tools taught in the course and challenges students to analyze large sets of data. A pilot implementation occurred during Fall 2016 across three sections of the course, with different instructors involving, slightly different requirements and assignment structures. Based on instructor assessment and student feedback, revisions were made to the structure of the project and it was rolled out to both the sections in Winter 2017. To ensure consistency, both sections were team taught by the same two instructors. The new final project consists of multiple group and individual assignments. Assignments are staggered to not only ensure that groups are progressing successfully toward an effective final product, but also that all team members are making significant contributions. Due to the positive feedback received so far, for Fall 2017 we will be employing pre- and post- surveys to quantify if and how the project impacts students' motivation. One goal of this activity is to create a framework for group projects

to engage and motivate students that can be easily implemented in other courses or at other universities.

Motivation Profiles of Non-Major Computer Programmers in a Flipped Classroom Environment

Lauren Lingar, Rachel McCord, Isaac Jeldes

This work in progress paper focuses on investigating different motivational profiles of students in a computer programming course that uses flipped classroom pedagogy. The flipped classroom is an educational concept that is growing in popularity, where the traditional class-lecture and home-work are inverted to home-lecture and class-work. Engaging video lectures are viewed by the students before the class period, while the class time becomes a workshop dedicated to practical exercises and discussion. The flipped classroom methodology is being utilized to teach one of the computer programming courses of the Engineering Fundamentals Program at the University of Tennessee in Knoxville. This class targets approximately 700 students between fall and spring semesters, is one requisite for the majority of engineering majors, but is not required of students majoring in electrical engineering or computer science. Research in motivation and self-regulation has shown that students who are non-computer science majors that take programming courses tend to have lower motivational profiles than students who take the same course while majoring in computer science or a related field. The use of the flipped classroom model requires that students be more disciplined in completing out-of-class assignments (watching videos) in order to be prepared for the in-class activities prescribed for the course. Thus it is important that we investigate the impact that student motivation has on successful performance in our first-year flipped programming course as the difference in motivation may explain our previous study results.

This work focuses on the formation of motivational profiles of students participating in the flipped classroom environment. Based on the theory of intrinsic motivation, we used a portion of the Intrinsic Motivation Inventory, specifically the interest, values, and perceived choice scales, to ask students about their motivation in their programming course. Previous work reported initial responses to the IMI scales and compared these results to performance in the class. In this work, we will use cluster analysis to determine if different motivational profiles impact performance in the flipped classroom environment. Analysis of two semesters of data is on-going and will be reported in the full paper.

Work In Progress: An Organized Team Self Selection Process For First Year Engineering Design Projects

Robert Gettens, Harlan Spotts, Matthew Romoser, Jingru Zhang, Chang Hoon Lee

The purpose of this work in progress is to present a method of project development and team creation that is student driven. There are a variety of ways in which to develop course projects, usually being more instructor driven in the freshman year. However, if our objective is to help students become more independent, entrepreneurial focused thinkers, the earlier we let them have control the better. The same idea should apply to

the creation of teams within courses. We delivered two different team formation approaches across seven sections of a common first year engineering course. One approach involved an organized self selection process that will be highlighted int he paper. The other approach was a more traditional approach of instructor selection based on survey results. Anecdotal evidence is very positive for the new approach, however, data is not currently available comparing the methods for an statistical claims to be made. However, by the time of the first paper draft we may have data elevating the work to a full paper or workshop. It should also be noted that four sections had common instructors using the two different methods, allowing for the removal of instructor bias. Also one section involved a cross disciplinary approach with a section of first year business students, which will be highlighted in the paper.
Note to reviewers and Program Chair: If you think our approach would be worthy we could present this in a workshop format (have participants go through our process and discuss other team formation methodologies etc.).

WIP: Enrollment, Instruction and Pedagogy - Focus on Classroom Practices

Monday, 9:45 AM - 11:00 AM - Bill France C

Assessing usage, satisfaction, effectiveness, and learning outcomes for an engineering peer tutoring program

Brian Paljug, Lisa Lampe

Peer tutoring programs are an important service colleges and universities can utilize in pursuit of increased student success. Peer tutoring offers numerous benefits to students: individualized, active learning opportunities; the increased comfort and understanding that comes from working with a peer; and greater financial efficiency compared to hiring professional tutors or additional TAs. Additionally, peer tutoring is known to have positive academic and personal impact on tutors as well. Recognizing these potential benefits, the University of Virginia's School of Engineering and Applied Science (UVA Engineering) recently increased its commitment to its peer tutoring program. It is therefore important that the program be regularly evaluated on key measures of success: usage, satisfaction, effectiveness, and learning outcomes. We are interested in learning outcomes related to study skills and learning attitudes, specifically regarding deep versus surface learning. This paper details the pilot test of this assessment, initial results, and lessons learned from the experience. The goal is to provide resources for other institutions pursuing peer tutoring programs by providing sample methods and instruments for program evaluation, as well as critical thoughts on peer tutoring assessment.

An Introductory Course in Electrical Engineering: Lessons Learned and Continuing Challenges

Melinda Holtzman, Branimir Pejcinovic

Nine years ago we designed a three-quarter freshman sequence to address these goals: (i) give students early experience in design and teamwork, (ii) introduce programming and specifically MATLAB early in our program, (iii) stress communication skills, and (iv) attract and engage more students, in particular from under-represented groups, into electrical (and computer) engineering. While we have had some successes – popular and engaging team design projects, hands-on lab experience, an alumni mentor program – we still have problems with retention and student success. Specifically, the first quarter in the sequence has been a fun and inviting gateway course, but has not prepared students well for more rigorous coursework in the next two classes in the sequence.

A common belief is that students struggle in engineering courses due to lack of math skills. We find that students lack not just basic math skills, but also problem solving ability. This is particularly evidenced by problems students have in programming and debugging. We are currently working on math, logic and algorithmic assessments to detect and address these problems early on, and researching the correlation between these assessments and student outcome in the courses. So far, we have found little correlation between tests on specific math skills, from algebra to calculus, and success in the courses. However, we do see a correlation with overall math GPA. In addition, there is some promise in using a logic and algorithmic assessment. We are exploring the correlation between this logical-thinking test and student success, and also improvement in students' logic ability as evidenced by pre- and post-test comparisons.

In this paper, we will discuss the ongoing research and results to date, and we will also discuss possible strategies for improving students' problem-solving ability, including providing two tracks in the programming courses. We believe the issue of student problem-solving ability is not an easy one to assess or address, but is important for engineering education.

Adapting the S.I.M. (System, Interactions, and Model) physics problem solving strategy to Engineering Statics and an application to frictional forces on screws

Lu Li

Engineering Statics is a core lower-division Engineering class that many students struggle with. Current education research suggests using overarching themes to tie concepts together and to generate deeper understanding. Recent physics education research has found success using the S.I.M. (System, Interactions, and Model) problem solving strategy. Since first-semester physics (classical mechanics) is a prerequisite for Engineering Statics, adapting the S.I.M. strategy to Engineering Statics will leverage prior knowledge and improve student learning. This article suggests an adaptation, referred to as the problem-solving flowchart, which can be used to analyze almost all

core Engineering Statics topics, such as equilibrium of a particle, equilibrium of a rigid body, structural analysis, internal forces and friction.

One challenging topic in Engineering Statics is analyzing the impending motion of a square-threaded screw with friction between the thread and the mating groove. The broadly accepted analysis runs contrary to the spirit of the S.I.M. strategy. It also uses a free body diagram (FBD) that is counter-intuitive to students. This article applies the suggested problem-solving flowchart, and provides a variation on a published FBD. The result is a more intuitive analysis, which will improve student learning.

WIP: Enrollment, Instruction and Pedagogy - Focus on Design-Based Projects

Monday, 9:45 AM - 11:00 AM - Dolphin Room

WIP: Exploring Light Bulb Technologies to Teach Conservation of Energy, Numerical Integration, and Consumer Consciousness

Kaitlin Mallouk, William Riddell, Karl Dyer

In a freshman engineering course, one objective is to introduce multidisciplinary teams of engineering students to unifying engineering and science principles such as mass, momentum and energy balances; materials; thermodynamics, and electricity and magnetism using a consumer product or engineering process as a test bed. In several of the course sections, the test bed was a Net Zero Energy Building (NZEB). A NZEB is a building that, over the course of a year, produces as much energy as it consumes. One lab activity associated with this project was experimentally determining the most energy efficient of several types of light bulbs. Students measured the visible light output, power consumption, and surface temperature of four different bulb types (incandescent, halogen, compact fluorescent, and LED) and then determined the efficiency of the bulbs and considered the implications for a NZEB and their own home. In the lab, student teams measured illuminance as a function of angle for each bulb, converted that illuminance to a luminous flux using numerical integration, and then converted to radiant flux and power. Students then calculated the fraction of the power consumed by the bulb that was used to produce light. Students' results showed LED bulbs were the most efficient and incandescent bulbs were the least efficient. While this is, perhaps, an obvious finding, the addition of the bulb temperature measurement brought to life the First Law of Thermodynamics. In their reports students commented on the inverse relationship between efficiency and bulb temperature and related their results to NZEBs, indicating that LED bulbs would be preferable not only for their high energy efficiency, but for their low residual heat. This paper will describe the details of the laboratory set up and assignment, highlight the intellectual scaffolding that was provided to students, and present future assessment plans.

Instilling Entrepreneurial Mindset by Vertical Integration of Engineering Projects

Shankar Ramakrishnan, Deana Delp

The goal of this research project is to instill an entrepreneurial mindset by vertically integrating a single design project among two consecutive freshmen engineering design classes. The paper describes the context and background of two vertically integrated classes. Example work from students show the interpretation of the entrepreneurial mindset. A survey measures the effectiveness of the entrepreneurial mindset among students that are taking part in the project. Next, there are recommendations based on the information gathered during the implementation, including specific recommendations about the types of projects, constraints and methodologies. Other vertically integrated classes and curricula can use this case-study as a starting point for introducing entrepreneurial mindset. Lastly, there is a current discussion of case studies of vertical integration among student groups in non-consecutive semesters of a program, and student groups from completely different programs.

Understanding the Processes and Challenges Students' Experience Solving an Open-Ended Problem

Courtney Faber, Kevin Kit

There have been multiple calls to improve undergraduate engineering education in order to better prepare students to solve complex problems within rapidly changing, multi-disciplinary environments. One method to address these challenges is to provide students with the opportunity to experience design problems, open-ended problems, and ill-structured problems throughout their undergraduate studies. Open-ended and ill-structured problems, unlike well-structured problems and exercises, require students to collect information, evaluate sources, and provide a justification for their work. These problems give students the opportunity to develop skills and strategies that can be transferred to larger design experiences.

The goal of this work is to understand the process students use to complete an open-ended problem within a first-year physics for engineers course. Within the course, the students complete two design challenges; however, the majority of the problems related to the content in the course are well-defined and close-ended in nature. The open-ended problem we studied in this work requires students to identify and analyze a physical phenomenon using physics principles from the course. Students were asked to describe the phenomenon, write a problem statement, collect needed information and data, calculate a numeric answer, and justify their solution. Given that this problem was different in nature than other course problems, we sought to understand more about the processes and challenges the students faced in order to inform future versions and how to better scaffold the problem for the future.

The assignment we studied was assigned as extra-credit in the course, and students were not required to have their work included in the study to receive extra credit. In addition to writing and solving their own problem, students were asked to complete an open-ended

survey. The survey included items to understand how students identified a physical phenomenon to analyze, where and how they collected the required information, and what aspects of the assignment were the easiest and most challenging. Students' responses to the open-ended items will be analyzed using conventional qualitative content analysis in which codes will be developed from the data. We will also analyze the work students submit for the assignment, to assess quality of the assignment to gain more insight into the areas that were challenging for students. The outcomes of this analysis will be overlaid with the outcomes from analyzing the open-ended survey responses as a means of triangulation and expansion. Additionally, a constant comparative approach will be taken to understand areas of similarity and difference between students. The outcomes of the analysis will be used to inform future iterations of the assignment and provide scaffolding for the problem to better support students in the areas they found challenging.

Work-in-Progress - Emphasizing Human-Centered Design in the Freshman Year through an Interactive Engineering Design Process Experience

Kirsten Dodson

Let's start with the basic idea of the engineering discipline: problem-solving. At the base of all problems, there is a human with a need seeking a solution. While engineering problem-solving utilizes concepts from mathematics and physical sciences, sometimes the hardest part of a solution is including the human element. Around the world, engineering programs emphasize problem-solving using math, science, and engineering concepts, but many dismiss humanities or social science topics that are imperative to understanding the human element of design. While ABET accreditation requires that programs cover design and analysis under the considerations of global, economic, environmental, and societal contexts, many programs simply squeeze these topics into other courses rather than creating a curriculum focused on holistic problem-solving.

At Lipscomb University, the engineering faculty have found that upper-level students lack experience in client interactions, decision-making processes, holistic critical-thinking, and sustainable design. In the past, our engineering courses have generally focused on the analysis of a system rather than designing a solution to fit a human need. Though this is a natural inclination of engineering programs, the Raymond B. Jones College of Engineering plans to upset this norm through a freshman engineering course focused on human-centered design. To create this course, the college will partner with The Peugeot Center for Engineering Service in Developing Communities to better cultivate concepts and techniques critical to this human-centered design process. The Peugeot Center, an entity within the college, has a wealth of expertise in humanitarian engineering applications with nearly fifty completed projects over twelve years.

Throughout the course, students will be introduced to a five-step design process originally developed by Engineering for Change. The steps are: a plan stage for team formation and management; a learn stage for research; a design phase for brainstorming and prototyping; a realize stage for analyzing producibility; and a sustain stage for ensuring long-term success. One unique aspect of this design process is its iterative

nature. Simply stated, failure is viewed as a feedback loop for improvement. This design process is also inherently focused on the human at the center of the problem-solving experience.

The design process will be presented to the students through three interactive experiences. The first is a basic introduction where students are asked to design a new wallet for their lab partner. During the second, students are introduced to each step of the design process through the critique of a case study. Last, the students perform their own process through an immersive and interactive experience by working in groups, performing hands-on activities, active prototyping, and meeting with a client. For example, students may be given the scenario of a small community in Guatemala experiencing large numbers of stomach disease. Through the learn stage of the design process, the students may identify the need of a clean water system before designing and analyzing the system in the design and realize stages. Throughout each of these three experiences and in each step of the design process, the human element is the focal point of design.

SPONSORED WORKSHOP: National Instruments

Monday, 1:15 PM - 2:30 PM - Lehman 126B

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Join a representative from National Instruments in this hands-on workshop as they explore how to incorporate their hardware & software tools into your first-year engineering courses.

WIP: Engineering Education Research - Focus on Problem Solving

Monday, 1:15 PM - 2:30 PM - Lehman 269

Creating a First Year Engineering Course Utilizing the SCALE-Up Method

David Ewing

To meet the growing demands for professional engineers, retaining increasing numbers of engineering students has become a primary focus at the University of Texas at Arlington (UTA). To address this need, UTA conducted a study to identify core issues that highly affected student retention and success. The findings of this study identified that students were ill-equipped to deal with the rigors of the engineering curriculum. Specifically, students were found to be deficient in the areas of problem solving, professional writing, and computer programming. Therefore, UTA has recently created a new first year engineering course focused on improving these specific skill areas and available for students in Pre-Calculus and above. In order to adapt to the wide dispersion of learning styles, socio-economic backgrounds, and prior knowledge that students have at UTA, the course utilizes the Student-Centered Active Learning Environment with

Upside-down Pedagogies (SCALE-Up) method. This method was originally created at NC State University and is now used in many of the nation's top universities. The strengths of this method are focused on creating a highly active and collaborative environment that fosters interaction not only among student groups but also among students and their instructors. The method, relying specifically on peer instruction, problem-based learning, and active environments, has been shown to be effective. To foster these interactions, UTA built a brand new classroom that emphasizes active learning over more passive methods. This course also employs undergraduate students as in-class instructional assistants who not only assist during the active participation within class but also coordinate evening problem-solving sessions for additional instruction. This presentation will explore student performance within the class by comparing many different student groupings, breaking down students by admission status, gender, underrepresented minorities, and engineering departments. This presentation will also present early surveys showing that student perception of this approach to teaching and learning have aided in their problem solving, critical thinking skills, and their approach in other difficult STEM classes.

When Students Keep Timesheets during a First-Year Engineering Project: Assignment Evolution and Student Perceptions

Krista Kecskemety, Lauren Corrigan, Paul Clingan

Using timesheets to keep track of work is a common task for engineers. In a first-year engineering course, students were asked to track the time spent on their design and build robot project. Students had different category choices to select. Based on these timesheets the students were to use this data when reporting on their project. The results from the timesheet tracking were valuable for instructors to provide real-time feedback to the teams about workload. Students were then asked to provide feedback about the timesheet process. Students were generally positive in the survey results about the timesheets. The survey indicated that the timesheets met the components of the MUSIC Model of Motivation. Improvements to the process were made for a second year implementation, which included a more streamlined reporting process. Results of this work-in-progress will help inform areas for future investigations.

First-Year Program Enhancements at Liberty University

James Long, Carolyn Ziebart

Liberty University's School of Engineering and Computational Sciences was established in 2007 and currently offers undergraduate programs in Computer Engineering, Electrical Engineering, Industrial & Systems Engineering, Mechanical Engineering, and Computer Science (with four cognates), as well as a graduate program in Cyber Security. The First Year Engineering program has recently completed the third year of an ongoing initiative to transform it from a 'make or break' mindset to one more focused on preparing the incoming students for success in their engineering programs, which is the focus of this 'work-in-progress' report. A number of new active learning pedagogies have been implemented in the Introduction to Engineering course to provide a greater focus on critical thinking, metacognition, and acquisition of effective student learning

skills. Additionally, a number of student success initiatives have been instituted and additional initiatives are planned for the future. The results, while not yet up to the levels typically cited at the First Year Engineering Experience annual conference, have nonetheless been encouraging and are discussed in this report.

Flipping the Classroom for Engaging Critical Thinking and Active Learning

Nansong Wu, Xiaokun Yang

At Arkansas Tech University, the Microprocessor System Design course is offered to the electrical and computer engineering students at the end of their first-year study. Traditionally, the Microprocessor System Design course is taught in the way of two class meets of 80 minutes each per week. The laboratory and experiments are part of the class meet. I.E. The instructor normally gives a short lecture, and then continue the experiment in the lab. Base on the experience learned in previous semesters, we found the class meet time is not sufficient for students to complete longer lab assignment and comprehensive projects after the delivery of the lectures. It was not uncommon for students to complete their labs and project outside the class time. Causing disconnections between the experiments and the lectures. It is more difficult for students to get together and perform engineering teamwork on their projects. It was also discovered that many students need help with some course contents outside the classroom. But they have limited resources besides the office hours that they can use to seek help.

To encourage active student participation in the class, develop critical thinking and reasoning, we propose a flipped classroom method to provide solutions to facilitating critical thinking and active learning in class. Rather than reading and complete activities outside of class and then coming to class to hear a content-intensive lecture, students in flipped classes can use short video lectures and other content-rich preparatory work and then, during the onsite class session, participate in discussions, exercises, and projects. The instructor will pre-record selected lectures and post them for the students to view as pre-class assignments. The recorded contents will be continuously available to the students for review until the end of the course. The class contact time will be used primarily on the interactivities between the instructor and the students, such as completing guided worksheets to assess the course contents. Students perform teamwork on solving programming problems that support the weekly lab assignment and building circuits to interface external devices with the microcontroller. The in-class activities will be carefully designed to measure student understanding of course topics. During the course, students will submit reports on two projects, and give a demonstration and presentation on their final project. Questionnaire-based assessment and outcome-based assessment will be taken in the class to collect implementation results. The experience and implementation results will be extremely valuable for future improvement of this course and other engineering courses.

WORKSHOP - Adopting Evidence-based Instruction through Video-Annotated Peer Review

Monday, 1:15 PM - 2:30 PM - Lehman 329

Adopting Evidence-based Instruction through Video-Annotated Peer Review

Lisa Davids, James Pembridge

This workshop seeks to encourage faculty to engage in peer teaching observations and to provide support on how to start a video-annotated peer-review system within their community. The workshop will also provide attendees with tools for the identification of evidence-based practices within the review, offer tips on how to provide peer-review comments that will result in a lasting impact on teaching, and address common limitations of the video-annotated peer review system. By introducing video-annotated peer review in the workshop format, participants can overcome some hesitation to participating in classroom observations.

WORKSHOP - Incorporating the Constraint-Source Model into the First-Year Design Experience

Monday, 1:15 PM - 2:30 PM - Lehman 367

Incorporating the Constraint-Source Model into the First-Year Design Experience

John Estell, James Hylton

The purpose of this workshop is to present the Constraint-Source Model (CSM) framework and preliminary evaluation data from an initial deployment of the CSM to the first-year engineering community for review, discussion, and refinement. The CSM is conceptually based on four characteristics traditionally associated with the entrepreneurial engineering mindset: technical fundamentals, customer needs, business acumen, and societal values. Our hypotheses are that, by categorizing constraints such that the source of a constraint is also included, an engineering student can (1) examine each constraint from the point of view of a stakeholder from that source area, thereby allowing for a greater perspective on how such constraints can affect the design, and (2) gain an appreciation for the general education courses that provide that perspective. Resources developed to date in support of this framework will be provided. Attendees will have opportunities to apply the CSM towards different design scenarios, to participate in evaluation of student submissions, and join in a facilitated discussion afterwards.

WORKSHOP - R3: A Three-Pronged Model for Engineering Student Success

Monday, 1:15 PM - 2:30 PM - Lehman 369

R3: A Three-Pronged Model for Engineering Student Success

Harry Ingle, Kristine Craven, Beth Powell, Elizabeth Hutchins, Linda Randolph, Carol McGee

The College of Engineering Student Success Center at Tennessee Technological University has developed and implemented a three-pronged model for student success, R3: Recruitment, Retention, and Recognition. Since its inception, the Center has seen positive impacts on student success, including an 81% persistence rate from first to second year for first-year freshmen in the Center's advising program [1]; success stories from graduates of the Center's Ambassador program, such as an alumni who won the 2017 STEP Ahead Emerging Leader Award; and a robust outreach program that has impacted over 5,000 secondary students and community members.

The R3 model reflects educational research and evidence-based practices. Research and practice suggest that a combination of efforts and supports are necessary to ensure student success for a broad number and variety of students [2], especially considering that every student will have a unique background and all students will "start from diverse places," thus needing different supports and finding engagement and motivation in different sources [3]. Furthermore, the supports within the R3 model use evidence-based practices, student success and retention research, and engineering education research [4]-[6].

Workshop facilitators will offer an interactive, hands-on session utilizing strategic planning and active learning techniques, such as small and large group discussion and hands-on demonstrations. The workshop is suited for attendees in different roles, including educators, student success professionals, and enrollment management professionals. The goal is to offer attendees strategies for recruitment, retention, and recognition in their own universities, recognizing that the strategies we have developed will need to be adapted for each campus's own "culture and goals" [7]. Facilitators will achieve this goal through discussion and activities related to recruitment, retention, and recognition strategies currently used by the Success Center and the General and Basic Engineering Department. Moreover, the facilitators will discuss "lessons learned" from formative assessment and program evaluation. When attendees leave, they should have the necessary tools to identify supports, networks, stakeholders, and resources to help develop recruitment, retention, and recognition strategies to fit their needs and goals.

1. Office of Institutional Research at Tennessee Technological University.
2. Jolly, E. J., Campbell, P. B., & Perlman, L. Engagement, Capacity and Continuity: A Trilogy for Student Success. GE Foundation, 2004. Retrieved from http://www.campbell-kibler.com/trilogy.pdf
3. Committee on Underrepresented Groups and the Expansion of the Science and Engineering Workforce Pipeline. Expanding Underrepresented Minority

Participation: America's Science and Technology Talent at the Crossroads. Washington D.C.: The National Academies Press, 2011. Retrieved from http://www.nap.edu
4. Earl, W. R. "Intrusive Advising of Freshmen in Academic Difficulty." NACADA Journal, 1988.
5. Kuh, G. D., Kinzie, J., Buckley, J. A., Bridges, B. K., & Hayek, J. C. What Matters to Student Success: A Review of the Literature. National Postsecondary Education Cooperative, 2006.
6. American Society of Engineering Educators. Going the Distance. ASEE, 2012. Retrieved from https://www.asee.org/retention-project
7. Brownell, J. E., & Swaner, L. E.. "High-Impact Practices: Applying the Learning Outcomes Literature to the Development of Successful Campus Programs." Peer Review, 2009, 26-30.

SPONSORED WORKSHOP: National Instruments

Monday, 2:45 PM - 4:00 PM - Lehman 126B

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WIP: Student Success & Development - Focus on Mentoring

Monday, 2:45 PM - 4:00 PM - Lehman 269

Engineering Co-op Interns as Partners in First-Year Student Engagement, Mentoring, and Course Development

Geoff Rideout, Thelma Coley

Memorial University welcomes approximately 250 students into its "Engineering One" (Eng One) first year, directly from high school. Eng One is common to all departments. Upon completing 11 courses within three semesters, students with sufficient academic standing are promoted to second year ("Term 3"). Academic Terms 3 through 8 alternate with 4-month mandatory co-op work placements. Approximately 70-80% of Eng One students meet the promotion requirements for Term 3; however, a certain percentage will not enter their department of first choice and voluntarily leave the program. Once in Term 3, students move through the remainder of the program as a block-promotion cohort, with significantly reduced attrition and increased peer-to-peer support and learning.

Co-op students ("Engineering Student Engagement Partners", or "ESEP's") were hired at the beginning of the 2016-17 academic year to help maximize first-year student success, engagement and motivation; and to increase Eng One students' sense of belonging to an engineering community. The ESEP program was also initiated to involve junior students

in curriculum development for the four Eng One courses specific to the Faculty of Engineering.

Each of the four ESEPs was given the lead role in supporting an individual course (Statics, Introduction to Programming, Design and Graphics, and Circuits / Thinking Like an Engineer). ESEP's support students by attending lectures, providing tutoring, facilitating sessions on time management and study skills, redirecting students to appropriate support services, and hosting "online rooms" to provide after-hours support for lecture clarification and help with assignments. ESEP's support the instructional team by developing and focus-grouping course materials in collaboration with the instructor, administering extra problem sets through the on-line rooms, and informing instructors of specific student difficulties with assignments and lecture concepts. Compared to professors and even graduate Teaching Assistants, ESEP peer mentors have less of an "expert blind spot". Finally, the ESEP's support the undergraduate program administration through research into best practices in first-year engineering education, curricular advancements in other schools, and novel instructional methods.

Preliminary results show increasing uptake of services (as evidenced by a three-fold increase in online room visits from the first to the second semester), and increasing support from the instructors via in-class announcements and reminders of ESEP services. Examples of instructor-ESEP collaboration for course material generation include spatial visualization aids for orthrographic projection (Design), a solar powered heat pump feasibility case study (Thinking Like an Engineer), and practice problem sets (Programming). There is evidence that some students are more comfortable approaching the ESEP's compared to the instructor, given the ESEP's peer status. ESEP's have successfully relayed information about student struggles to the primary instructor, leading to changes in subsequent lectures in the Programming course.

Instructors' perceptions of the current and potential advantages of ESEP's will be surveyed in future, and correlations between student use of supports and academic success will be quantified as part of a continuous improvement process. The role of the ESEP's may be expanded to outreach in the form of conducting tours for K-12 groups or incoming freshman.

Work in Progress - Helping First Year Students Start on Track in the Mathematics Sequence

Ashish Borgaonkar, Jaskirat Sodhi, Moshe Kam, Ryan Baldwin

Most incoming freshman take the Mathematics Placement Test before joining New Jersey Institute of Technology (NJIT). Outcome of this test determines the level of mathematics (calculus I or a remedial pre-calculus course) they begin with in their first semester. For students in Newark College of Engineering (NCE) at NJIT, by design, the mathematics placement drives the remainder of their courses as well. This means that poor performance on the Mathematics Placement Test easily adds 1-2 semesters to students' overall graduation time. This also has a strong impact on the retention and graduation rates within NCE. Clearly, if more students perform better on the Placement

Test, the better the retention and graduation rates will be. This work-in-progress paper takes a look at various reasons due to which students do not do well on the Placement Test. For each of these reasons identified, NJIT has implemented various initiatives to help students start on track in their first semester. Some of these initiatives include- 1) developing sample placement tests for students to practice under the same environment as the original test, 2) making a placement calculator for students to input the scores from the practice placement tests to determine their likely mathematics placement, 3) establishing a strong outreach to educate students about the impact of their mathematics placement on their engineering curriculum and motivating them to do better on the Placement Test, and 4) Engineering Mathematics Summer Boot Camp. Authors would like to present data about these projects and initiatives and would like to get input and feedback on how these can be polished to perform better going forward.

Peer Mentoring in the First-Year Engineering Experience

Emily Sandvall, Deanna Calder, Megan Harper, Zachary Jackson, Billy Baker

Creating intentional connections between students in the first year of college is essential to help develop a sense of connection and belonging to the university. In engineering, creating peer mentorship allows new students to see beyond the incoming year and enables them to builds bonds which can sustain them through the peaks and valleys of the academic experience. The School of Engineering and Computer Science (ECS) at Baylor University utilizes an intentional peer-mentoring model with pre-engineering majors that students can engage with both in and outside the classroom.

Since 2003, Baylor University has offered new student experience courses designed to assist in the transition process for incoming students. As the university has moved to offering these as “credit-bearing” courses, ECS has developed an intentional curriculum for pre-engineering students offered in tandem with the introduction to engineering course. EGR 1095, the new student experience course required of all pre-engineering students, is led by both a faculty member and Peer Leaders, upper division engineering students. These student leaders are recruited, hired, and trained to serve as mentors and teaching assistants. In addition to their role in the classroom, these Peer Leaders also serve as leaders during Welcome Week, programming designed to acclimate new students to their new campus community. These Peer Leaders are intentionally assigned to connect with the students in their EGR 1095 classes during the Welcome Week experience, which provides for a smooth transition to the classroom upon the start of the academic year.

In Fall 2015, ECS opened the doors of the Learning Resource Center (LRC), a space designed to support academic and student success of students within the school. The vision for opening this space was born out of discussions with faculty and staff who desired to increase student success and graduation rates. The LRC offers students collaborative study space, access to a computer lab connected to the ECS network, free major-specific tutoring, and academic programming. In addition, a mentoring program, The Power of Two Mentoring Program (TPOT), for pre-engineering students was developed to support incoming students who desire a more intentional, one-on-one

mentoring experience. New students apply for this program and are paired with an upper-division student mentor. Mentors utilize a curriculum to guide conversation based on the needs of the transitioning student and the academic calendar. Topics include, but are not limited to, goal setting, time management, navigating resources, professional development, and student involvement. The TPOT program is more focused on tailoring a relationship to the needs of each individual student.

These two peer-mentoring models provide a diverse approach in supporting engineering students in the first year. Connecting new students to upper-division students in these intentional ways has increased community, balanced new student expectations, and eased the transition for students at the start of their academic experience in engineering.

Third year assessment of a student-based mentorship program for first-year environmental engineering students

Joanne Uleau

We have recently completed the third year of a mentorship program for first-year students (~50) in the environmental engineering (EVEN) program (~200 students), in which senior or junior level environmental engineering students volunteer their time to mentor the incoming students. The objective of the program is to support first year and transfer EVEN students as they gain their footing in the EVEN Program and in life at CU Boulder. The approach is to assign each junior/senior mentor five to six mentees. They will first meet with the first year EVEN students in our EVEN 1000 lecture, then meet/ communicate with them two to three times throughout the semester. This is still (despite input from last year's FYEE conference) a volunteer effort. EVEN first year students are not required to participate. Mentors are volunteering their time, but get a couple of free meals as a token of our appreciation.

The mentor's objectives are to provide student-student mentoring, while increasing interactions between upper-class and newer EVEN students; to aid in the academic, emotional and social adjustment of first-year students; to grow a culture of giving and volunteerism at CU Boulder; to encourage the development of student relationships with other engineering students and staff and to provide consistent, reliable sources of support, information and inspiration. The mentors are trained in a 2-hour session in which their roles and responsibilities, including ethics, are stressed.

In the first year of the program we divided up the first-year students by an academic measure: their interest in one of the seven EVEN tracks/options. The mentors were then assigned based on their EVEN track/option. In the second and third year of the program we divided up the first-year students by their residence hall assignment (including an off-campus category). The mentors were then assigned based on their first year residence hall. The mentors are introduced to the first year students in class. In the second year, we had a break-out session in which contact information is exchanged on a volunteer basis. The mentors then try to set up meetings outside of class. In the first year the introduction took place in the 7th week of the semester and in the second year in the 3rd week. We have only ~30% participation in the second year. The third year we introduced the

mentors on the first day of class, they were again paired up according to their residence hall. They were assigned a homework task do complete with their mentor within the first 2 weeks of class. The mentors had a strong turnout for the homework assignment meeting and then 7 out of 8 groups met with their mentees twice or more throughout that semester mainly as a group setting. The mentors also came back to the classroom setting during registration period to review the registration system/process with the students. We will talk about the mentor and mentee survey results

SPONSORED WORKSHOP: Cengage

Monday, 2:45 PM - 4:00 PM - Lehman 329

SPONSORED WORKSHOP: Cengage

Join representatives from Cengage as they demonstrate their digital platform and discuss how it can be used in your first-year engineering courses.

WORKSHOP - Get Rid of Your Student's Fear and Intimidation of Learning a Programming Language

Monday, 2:45 PM - 4:00 PM - Lehman 367

Get Rid of Your Student's Fear and Intimidation of learning a Programming Language

Christina Frederick, Matthew Pierce, Andrew Griggs, Lulu Sun, Li Ding

Are your students afraid of taking programming language courses? Are they intimidated by the syntax, keywords, punctuations that you cover in the class? Have you thought about making a change? Have you thought about your first or second language learning experience and if you can apply it to facilitate programming language study? Do you want to learn how to effectively design a programming language course in a blended learning environment?

In this workshop, we want to share our experience with you. We will show you how to apply second language acquisition to facilitate a blended learning of programming language based on our NSF funded project findings, our own second language experience, and blended learning design experience. Using this approach will place greater emphasis on problem solving techniques utilized in all courses. Participants will be engaged in proven strategies and techniques through active discussion, collaboration, and sharing of experiences. Discussion topics will range from programming language study and teaching experience, student perception and feedback, online course design and techniques. Collaboration will be conducted by allowing participants to work on different levels of programming problems and experiencing our project design. We will show the website, PowerPoint, videos, quizzes, surveys, and programming problems developed for this project.

Each workshop participant will receive a project flyer and a flash drive, which includes our project materials. This workshop is being offered as a NSF project of Research

Initiation Grants in Engineering Education under the division of Division of Engineering Education and Centers.

WORKSHOP - CU Thinking PROCESS: Promoting Problem Solving Skills Development in Cornerstone Courses

Monday, 2:45 PM - 4:00 PM - Lehman 369

CU Thinking PROCESS: Promoting problem solving skills development in cornerstone courses

Sarah Grigg, Elizabeth Stephan

The CU Thinking PROCESS was developed by a joint initiative between the Engineering and Science Education and General Engineering programs at Clemson University and is an innovative approach to learning and assessment that was developed based on a task analysis of problem solving attempts of students in a first-year engineering fundamentals course. There are several coordinating parts that work together to promote skills development of the cognitive and metacognitive tasks reflected successful problem solving solutions. The learning aids provide students with scaffolding to support the organization of their problem solving solution, promoting cognitive and metacognitive learning by assisting to reduce the student's mental workload through various tasks that have been shown to have correlations to accurate solutions. The rubric aids to provide standardization and consistency of evaluation while providing direct feedback that can be used to monitor progression of skill acquisition over time. The PROCESS structure was integrated into the cornerstone problem solving course in an active-learning SCALE-UP environment, and student's self-reported perceptions of the learning gains show that it is particularly effective for C students in our program. This workshop (and paper) will attempt to explain the acronym, lecture materials, scaffolding template, scoring rubric used by our program, as well as discuss future directions.

The workshop will consist of 5 parts
1) Explanation of the Problem Solving PROCESS and acronym.
2) Micro-lecture on using the PROCESS instructor materials.
3) Working session evaluating sample solutions with the CU Thinking PROCESS Rubric
4) Group evaluation of PROCESS assessment and ideas for further refinement
5) Discussion of a multi-institution study to validate the rubric for use in various other courses such as (but not limited to) the following
a. cornerstone engineering courses
b. other courses in engineering (Statics, Biomechanics)
c. cornerstone science courses (Physics, Chemistry)
d. cornerstone math courses (Pre-Calculus, Algebra, Geometry)
e. General Education (non-STEM majors)
f. Secondary Education (Math, Science, Pre-engineering)

SPONSORED WORKSHOP: National Instruments

Monday, 4:15 PM - 5:30 PM - Lehman 126B

SPONSORED WORKSHOP: National Instruments

Join a representative from National Instruments in this hands-on workshop as they explore how to incorporate their hardware & software tools into your first-year engineering courses.

WIP: Student Success & Development - Focus on Self-Efficacy

Monday, 4:15 PM - 5:30 PM - Lehman 269

Bulls-Engineering Youth Experience: promoting relationships, identity development, and empowerment for first year students through outreach

Jonathan Gaines, Victoria Bergman

Bulls-Engineering Youth Experience Promoting Relationships, Identity Development, and Empowerment (Bulls-EYE PRIDE) is a 3-year engineering design based intervention program recently recommended for funded through the National Science Foundation's Broadening Participation in Engineering program. Project personnel train and hire engineering undergraduate students as mentors for local middle school youth. After training, mentors facilitate a 5-week summer intervention program for rising 7th and 8th graders, drawing from a community around USF that is primarily Black and Hispanic. Part one of the curriculum, Bulls-EYE Robotics, was created and piloted during the 2014-2015 academic year to target rising 7th graders with an emphasis on mechatronics and interpersonal relationships. Part two of the curriculum, Bulls-EYE Environment, was created and piloted during the 2015-2016 academic year to target rising 8th graders through environmental engineering, earth science, and community involvement. All activities are structured through the program’s novel Plan, History, Act, Shift, Evaluate, Success (PHASES) design process. The program will reach 120 middle school youth and 60 mentors while adding a research component to measure participant engineering identity development over time. This paper presents the essential components of the Bulls-EYE PRIDE program while sharing reflections from some of the Bulls-EYE Mentors about their experiences facilitating the pilot programs.

Understanding General Engineering Students - Identification as Engineers

Racheida Lewis, Tamara Knott

This paper is a work in progress analysis of major choices by first year engineering students in the General Engineering (GE) program at Virginia Tech. Students whose major is GE are enrolled in Foundations of Engineering I and II (fall and spring respectively), two courses that are part of Virginia Tech\'□□s First Year Experiences.

These courses are designed to equip students with problem solving skills, inquiry skills, and integration of learning skills necessary for navigating college level curricula [1]. The series surveys are administered to GE students at three times over the course of their first year: in August at the beginning of the fall semester; in December at the end of the fall semester; and in April at the end of the spring semester. All three surveys collect data about which majors GE students are interested in pursuing at the three points of administration. Survey results used in this study include responses from students who were in the GE program during the 2015-16 academic year and completed all three surveys with a 67% total response rate. Students are required to take these surveys and submit their confirmation of survey completion as a homework assignment in the first-year courses; however, their participation in research is voluntary.

Most adults have multiple things they identify with whether it'd be their race, gender, occupation, or even relationship statuses to a spouse, offspring, or other family members. Having social identities provides a person with social validation and a framework for which they navigate the world. These identities are usually beneficial but can also be challenging if one has difficulty incorporating one or more of their identities in their life [2]. Domain identification theory is the extent to which one define themselves through a role or performance in a domain, such as engineering [4]. The First Year surveys administered to students includes relevant constructs using validated measures [3]; 12 survey items are related to utility and may infer students' identification as engineers, and 9 items are related to belonging to the GE community.

At the conclusion of the academic year, most first year engineering students would have completed three surveys that inquires about the usefulness of engineering as a field, and their experience and sense of belonging to the GE program at Virginia Tech. Using domain identification as the theoretical underpinnings for this paper, we seek to gain a better understanding of the relationships between belonging to the GE community at Virginia Tech and identifying as an engineer.

Works Cited

1. First Year Experiences at Virginia Tech. (n.d.). Retrieved February 02, 2017, from https://www.fye.vt.edu/
2. Settles, I. H. (2004). When multiple identities interfere: the role of identity centrality. Personality and Social Psychology Bulletin, 30(4), 487-500. http://doi.org/10.1177/0146167203261885
3. Jones, B. D., Paretti, M. C., Hein, S. F., & Knott, T. W. (2010). An Analysis of Motivation Constructs with First-Year Engineering Students: Relationships Among Expectancies, Values, Achievement, and Career Plans. Journal of Engineering Education, 99(4), 319-336. http://doi.org/10.1002/j.2168-9830.2010.tb01066.x
4. Jones, B. D., Ruff, C., & Osborne, J. W. (2015). Fostering Students' Identification With Mathematics and Science. In Interest in mathematics and science learning (pp. 331-□352). Washington, DC: American Educational Research Association.

Presence of Stereotype Vulnerability in Freshman STEM students at a Historically Black College

Whitney Gaskins

The first year of college encompasses one of the most challenging transitions a student may face during their college career and/or lifetime. For minority students in Science, Technology, Engineering, and Math (STEM), the transitioning experience may yield many stressors that lead to diminished college experiences. In the first year, STEM students not only explore their sense of belonging within their fields of study but how they fit within their environment. The psychological effects of fitting into an environment unlike their usual, may expose and establish diminished sense of worth and self-efficacy (Aronson & Salinas, 2006). One of which, Stereotype Threat Vulnerability (STV), exposure to being perceived and/or treated as a stereotype, which self-fulfills as the stereotype, may diminish student's academic abilities (Robertson & Chaney, 2015). This quantitative study examined the presence of STV at a Historically Black University of approximately 179 freshman STEM students. Demographics of the students in the study consisted of approximately 80% female and 20% male. Reported racial/ethnic background of participants were approximately 80% African American, 13% Asian American, 4% White, 4% Other, and 1% Hispanic/Latino. The findings indicated will be discussed.

Student Descriptions of Self-Regulated Learning: A Qualitative Investigation of Students' Reflections on Their First Semester in Engineering

Kayla Arnsdorff, Steffen Peuker, Rachel McCord

This work in progress paper summarizes initial work conducted to understand how students discuss their self-regulated learning skills through an end of semester reflective assignment. Many students enter the engineering disciplines unprepared to be successful in the rigors of engineering academia. Engineering student retention continues to be a significant area of research, partially due to lack of academic preparation or skill when entering a higher education institution. One theoretical framework that describes the needed skills to successfully progress through higher education is self-regulated learning. Self-regulated learning (SRL) is the process that a learner goes through to enact and sustain cognitive functioning, behaviors, and metacognitive functioning to reach a set goal or goals. SRL is a complex process that includes the learner's beliefs about their own learning, motivations, pre-existing knowledge, and cognitive and metacognitive skills. It is a commonly held belief in education that the most effective students are the students who have a high level of awareness about their own knowledge level and take control of their own learning processes; these students are referred to as self-regulated learners. Though there are many different perspectives that provide different views of SRL, in general SRL theorists view students as metacognitively, motivationally, and behaviorally active participants in their own learning process.

As part of a first year seminar course for engineering students at [school], students are asked to complete weekly reflective assignments relating the week's topic to their own practice as a student. At the end of the semester, students are asked to complete a summarizing reflective assignment where they look at their growth as a learner over the

academic term. Specifically, students are asked to define what a highly skilled engineering student would look like, to define their current status as an engineering student, and to discuss ways in which to close the gap between the two definitions. Using the framework of self-regulated learning, our research team has begun coding the end of semester reflective assignments to understand how students discuss their self-regulation. In this work in progress paper, we will discuss initial results of the qualitative coding. Specifically, we will focus on defining themes in how students talk about their motivation during and after one semester as an engineering student. Themes for motivation include the fear of missing out on opportunities, tangible and indefinite rewards, and the expectation of family members. This work seeks to help both researchers and practitioners understand levels of self-regulated learning ability in first year students in order to provide more effective classroom interventions for the development of SRL.

WORKSHOP - Implementing Cloud Collaboration using Fusion 360 into a First-Year Engineering Design Course

Monday, 4:15 PM - 5:30 PM - Lehman 329

Workshop: Implementing Cloud Collaboration using Fusion 360 into a First-Year Engineering Design Course

Cory Brozina, Akshay Sharma

Industry and the world at large is becoming an ever-connected state where there is greater importance on atypical collaboration. The type of collaboration needed is radical in nature. Radical collaboration for a first-year engineering education curriculum needs to focus on effective learning strategies. This type of collaboration includes timely intervention by instructors, ease of learning for students, and access to professional level tool sets. All of which can create a platform for more engaging and effective peer-to-peer collaboration among students from different branches of engineering, design, and business. Cloud collaboration is a way for distributed, virtual teams to work efficiently on a common project. This workshop will teach faculty the benefits of cloud collaboration using an Autodesk Inc. product, Fusion 360, and the collaborative systems embedded within the platform. The workshop will entail four elements: (1) Pre-Workshop Signup/Team Formation, (2) A Case Study, (3) Interactive Design Session, and (4) Question and Answer segment. The goal of the workshop is for faculty to feel excited and empowered to implement new technology into their engineering design projects and have students who are novice in 3D modeling increase their skills dramatically. Faculty will leave with a handbook guiding them through the process of utilizing Fusion 360 in their design-based courses with examples and assessment tools to use.

WORKSHOP - Building Alignment Between Pre-college and First-Year Engineering Programs

Monday, 4:15 PM - 5:30 PM - Lehman 367

Building Alignment Between Pre-college and First-Year Engineering Programs

Noah Salzman, Matthew Ohland

Developments in pre-college engineering such as the incorporation of engineering in the Next Generation Science Standards and the rapid growth of formal and informal pre-college engineering programs and activities has resulted in increasing numbers of students arriving in first-year engineering programs with significant prior engineering experience. To assist first-year engineering faculty and staff with improving the alignment of their programs with their students' pre-college engineering experiences, in the first part of this workshop we present a framework we developed to understand how pre-college engineering programs and activities influence students' transitions into first-year engineering programs. Supported by both qualitative and quantitative data, we will describe ways that pre-college engineering activities can both support and hinder this transition. For the second part of this workshop, we will work with the participants to identify and share ways that they recognize elements of this framework in their own first-year engineering programs, brainstorm and share strategies for promoting successful transitions from pre-college to first-year engineering, and ways to differentiate instruction to address the wide range of pre-college engineering experiences represented in the first-year engineering classroom. This workshop presents a means for participants to begin a larger conversation related to understanding the impact of pre-college engineering participation on the first-year engineering experience, and ways that first-year engineering programs can adapt to address the changing conceptions of and experience with engineering of incoming students.

WORKSHOP - Small Wins - Big impact: Narratives from Behind the Scenes

Monday, 4:15 PM - 5:30 PM - Lehman 369

Small wins - Big impact: Narratives from behind the scenes

Kelsey Rodgers, James Pembridge, Heidi Steinhauer, Leroy Long, Matthew Verleger

Engineering departments are continuously focusing on institutional transformation efforts that lead to lasting impacts that improve the quality of education and the success of undergraduate students. First-year engineering programs are often times a focus of these efforts as they are at the forefront of issues concerning the transition from high school to college, retention of all students especially those populations that are traditionally under-represented in engineering, and developing the foundational engineering knowledge and skills. Through these efforts, many engineering programs

have implemented small incremental changes that have resulted in positive lasting effects. Due to the importance of context of these successes, this workshop will utilize a methodology based in narrative in order to develop a deep understanding of problems common to first-year engineering programs and what is the minimum viable solution that other institutions can adopt.

The workshop will be begin with the identification of 2-3 problems critical to the success of first-year engineering programs. Participating institutions will then tell in-depth stories of their experiences with the problem and their approaches to the solution. Using these narratives, the facilitators will begin to identify common themes and key features to those solutions. At the conclusion of the workshop, facilitators will generate info-graphics that will be distributed to the participants of both the workshop and the FYEE attendees.

Time				
Tuesday 7:00 AM - 11:00 AM	Registration in the Lobby of the Shores Resort and Spa			
Monday 7:00 AM - 8:00 AM	Continental Breakfast Location: Shores Resort and Spa, Atlantic & Coastal Rooms (Rooftop Level)			
Tuesday 8:30 AM - 9:45 AM	**Technical Sessions** Location: Shores Resort and Spa			
	Bill France A	Bill France B	Bill France C	Dolphin Room
	Coffee, Networking, & "Pedagogical Reality" Room	Student Success & Development - Focus on Academic Support	Enrollment, Instruction and Pedagogy - Focus on Classroom Practices	Issues in the First Year - Focus on Classroom Activities
Tuesday 10:00 AM - 11:15 AM	**Technical Sessions** Location: Shores Resort and Spa			
	Bill France A	Bill France B	Bill France C	Dolphin Room
	Coffee, Networking, & "Pedagogical Reality" Room	Student Success & Development - Focus on Mathematics	Enrollment, Instruction and Pedagogy - Focus on Design-Based Projects	Issues in the First Year - Focus on Self-Efficacy
Tuesday 11:30 AM - 12:30 PM	Lunch Box Lunches available in Shores Resort & Spa Lobby			
Tuesday 12:45 PM - 2:00 PM	**Technical Sessions** Location: Shores Resort and Spa			
	Bill France A	Bill France B	Bill France C	
	Coffee, Networking, & "Pedagogical Reality" Room	Student Success & Development - Focus on Mentoring	Engineering Education Research - Focus on Engineering Design	
Tuesday 2:00 PM - 2:30 PM	Wrap-Up & Feedback Session Location: Shores Resort and Spa, Richard Petty Ballroom (1st Floor)			

Student Success & Development - Focus on Academic Support

Tuesday, 8:30 AM - 9:45 AM - Bill France B

Utilizing an Institution's QEP and Applying Career Development and Learning Principles into an Engineering FYE Course

Kristine Craven, Elizabeth Hutchins

The first-year experience course is a program designed to help new students build the academic, social, and professional connections needed for a successful college experience at XYZ University. A key to a successful college experience is retention from Fall semester freshman year to Fall semester sophomore year. By providing a course such as this to entering freshman students, XYZ University is attempting to impact this retention rate. Unfortunately looking at these rates over the time period since the inception of the course, no pattern is observed and it is not clear if the course is reaching its intended potential. However, this one-credit hour course introduces students to many aspects of higher education and the engineering profession. Course sessions are geared toward enhancing students' university experience and aiding in the transition from high school to university. This paper will review the why behind the different activities and discuss how they relate to student development and the course objectives and outcomes. The course under consideration in this paper is targeted at a variety of students in the College of Engineering that also includes Computer Science and Engineering Technology majors. The content focuses on psycho-social variables that are within the power of the individual student to control or change. Related to academic connections, course sessions provide insights into communication with professors, email etiquette, organization through time management, understanding the syllabus, exposure to study environments, and personal management skills. Campus engagement activities are also encouraged including attendance at college seminars and university programs and participation in relevant engineering professional societies in order to build both the social and professional connections. Phase 1 in career development is to understand one's self. Activities in the course provide opportunities for personal exploration and the use of career planning tools. XYZ University is tasked with developing a Quality Enhancement Plan that is used across the university to enhance the student learning and overall collegiate experience. Currently, the QEP is exploring ways to use Guided Inquiry to achieve this purpose. For many years, several of the faculty have been using an activity called the Three Minute Engineer where students are required to give a three to five minute talk about an engineering topic. This exercise serves to connect the students to their discipline of study, to explore the human factor associated with engineering, and to have an informal introduction to public speaking. Our paper will help to better explain the reasons behind our chosen curriculum and provide examples others can easily adapt.

Supporting Academically-Struggling Students in an Engineering First Year Program: Course Evolution

Hailey Queen

The First Year Engineering program at North Carolina State University has many goals, one of the most important being supporting students through their personal and academic transition from high school to a college-level engineering program. This goal of supporting students during this significant transition period aims to positively impact student outcomes including retention in the College of Engineering and at the University.

Prior to 2009 students who earned less than a 2.0 GPA (Academic Warning) in their first semester were required to meet with their academic advisor within the first four weeks of the spring semester, but were not offered any other specific support. In an effort to enhance support for student transitions and retention for the at-risk population of academically struggling first-year students, the College of Engineering in conjunction with University offices such as Enrollment Management and Retention Services, developed a second-semester course for first-year students who are on Academic Warning. This course was piloted in the spring of 2009.

This academic support course, E 122: Engineering Academic Success, began as a graded, semester long, one-credit-hour course that met once a week and included assignments related to journaling, self-awareness, individual conferences, and skills-building exercises. Learning outcomes included students being able to identify strategies to improve their academic standing; describing areas of improvement needed for their particular academic/transitional challenges; identifying success strategies to utilize in all academic courses, and being able to identify campus resources that may aid in their personal and academic success. The course was exclusively facilitated by Engineering Academic Affairs staff, Enrollment Management staff, and Academic Support Programs for Student Athletes (ASPSA) staff. The course was required for some students and optional for others.

Over the past eight years the course has evolved with observational, anecdotal, and quantitative evidence as instructors have annually evaluated what has been effective for student enrollment and participation, and for academic and retention-based outcomes. Some changes over the years have had positive outcomes, others have had negative outcomes, and still others have seen no changes. The current form of the course is considered to include the best practices to date, which have evolved over the eight-year life of the course. The current version of E 122 can be described as a graded, eight-week, one-credit-hour course that meets twice a week, and includes assignments related to skills-reflection and skills-building exercises. The course is facilitated by College of Engineering Academic Affairs staff and is supported by guest lecturers from on-campus content experts in the areas of stress management, counseling resources, academic and tutoring resources, etc. The course is required for two populations of students; those on Academic Warning after their first semester and those who failed to successfully complete the required introductory engineering course taught in the fall semester.

Hardening Freshman Engineering Student Soft Skills

Andrea Burrows, Mike Borowczak

This paper, based on pre/post test scores of engineering student responses to ABET soft skill knowledge, explores the possibilities for freshman engineering students to engage meaningfully in six of the 11 outcomes for engineering graduates. With a focus on multi-disciplinary teamwork, professional ethical responsibility, effective communication, engineering solution impacts, life-long learning, and contemporary issues, the researchers surveyed >50 engineering students at a large western university to establish a baseline of their ABET soft skill understanding. Even after attention to soft skills, as explored in the literature review, findings show that even senior engineering students do not know about ABET accreditation, soft skills related to communication, or ways to apply those soft skills through conflict resolution. Currently as stand-alone course sessions embedded within engineering classes, exposure to ABET's soft skills as well as conflict resolution techniques, can dramatically improve student understanding and collaborative interactions. The researchers propose utilizing these techniques and creating a freshman class or embedding the work in another course early in the engineering students' program as explicit instruction is needed. For this study, techniques used in a stand-alone course session are explored. Implications for improved engineering student success are large and easily transferred to other programs as well as offering female engineering students a means to leverage socio-cultural capital.

Using LMS Data to Provide Early Alerts to Struggling Students

Donald Hayes, Wonjoon Hong, Matthew Bernacki, Nick Voorhees

The academic demands of college curricula often expose poor time management and study skills of freshmen students. Interventional advising can help get struggling students on track. Mid-term grades traditionally provide the first opportunity to identify those students; unfortunately, by the time mid-term grades are posted and interventional advising can occur, it is difficult for struggling students to significantly change their final grades. This project maximizes the utility of a Learning Management System (LMS) to improve the efficacy of early warnings by providing timely alerts to struggling students before they accrue poor performances.

An LMS can serve as a comprehensive platform for delivering rich multimedia content to learners, managing discussions, organizing collaborative and problem-based learning activities, and conducting assessments. In many engineering courses, the LMS is a barren space that provides only a syllabus, a few handouts, and - maybe - an online gradebook. We used the LMS to provide students with a rich digital environment for learning by creating and hosting all course materials within the LMS. A data management and visualization tool called Splunk was used to model usage of LMS resources and provide a timely picture of students' learning progress. In an initial correlational study, students' usage of course resources were found to correlate to performance in the first year engineering course (rLMSevents = .44, rfolders_accessed = .42, rLectureNoteDownloads = .39).

The traditional model of having mid-semester grades prompt meetings with an advisor is inherently flawed. First, it comes after mid-semester (i.e., week 9), which limits the time remaining for students who receive support to get themselves on track. Second, it relies on early poor performance, which once achieved diminish the potential to recover from early failure. Early, behavior-based prediction modeling and intervention avoids both these weaknesses.

A second study utilized educational data mining methods to produce a prediction algorithm based on digital course material usage. A logistic regression model was estimated using LMS behavioral data from the first five weeks of the course to predict student performance: whether a student obtained a C or better, or a D or worse. The cross-validated prediction model accurately classified 79% of students as C or Better vs. D or worse learners (Kappa = .57) based upon LMS access patterns. The model identified learners likely to perform poorly well before mid-semester grades. It accurately identified 54 of the 79 of students who ultimately failed to obtain a C or Better during the training and testing phase of prediction model development. This degree of specificity (68.39%) provided sufficient accuracy that the prediction algorithm was programmed back into Splunk to provide real time predictions of students' success projections. An initial intervention study is ongoing to 1) identify students likely to struggle in the course, and 2) alert these students and provide them additional learning resources. The full paper will include a detailed account of prediction model features and additional results on the number of students identified, the percent of whom responded to alerts and learning supports, and the effects of the intervention.

Enrollment, Instruction and Pedagogy - Focus on Classroom Practices

Tuesday, 8:30 AM - 9:45 AM - Bill France C

Effectiveness of a Theme-Based Introduction to Engineering Course

Heath Schluterman, Leslie Massey, Candace Rainwater, Brandon Crisel, Aysa Galbraith

The goal of this paper is to examine the effectiveness of changing to a theme-based, project-centric version of the Introduction to Engineering Course sequence by examining students' responses to end-of –semester evaluations, course evaluations, and retention within the college of engineering. The Freshman Engineering Program (FEP) at the University of Arkansas was established in 2007 with the primary objective of increasing the retention of new freshman in the College of Engineering (CoE) to their sophomore year. A key component of the FEP is the Introduction to Engineering course sequence which serves as the first year experience course for new students in the CoE. After seeing a decline in student participation in class, the Introduction to Engineering course sequence was redesigned to devote more time to theme-based, extended hands-on projects while redistributing the other topics. The four project themes Biosystems, Electronics, Robotics, and Structures- have been offered. Projects were developed to reinforce the engineering skills taught in the course, develop teamwork skills, incorporate engineering design, and guide teams to completion within the framework of the course.

As a part of the end-of-semester evaluations, students are asked to rate certain aspects of the projects and course using a 5-point Likert scale. The responses were heavily in "strongly agree" and "agree" categories, with the mean total scores for all questions regarding student's improvement were fairly high and ranged from 3.86 to 3.97. The course evaluations show an increase in the mean of course ratings from 3.3 (before the implementation of projects) to 4.1 (after the implementation of projects). Retention rates has been improved since the start of the FEP, which can be attributed to the constant improvement of the format and the material offered through the program, including the restructuring of Introduction to Engineering course sequence.

Redesigning an Introductory Engineering Course to Address Student Perceptions About Engineering as a Profession and Field of Study

David Feinauer

In the first course of an introductory engineering sequence, students from multiple engineering disciplines and diverse college-preparatory experiences are introduced to professional and technical concepts from various engineering disciplines. The course presented a great breadth of topics through a series of tutorials, laboratory experiments, and lectures. When reflecting and commenting on the course, students expressed frustration with a "lack of accomplishment" and "jumping around"—indicators of low self-efficacy beliefs. Further analysis determined that although many quality standalone exercises existed, a guiding narrative for the course was lacking. Over multiple years, the course was redesigned using a pedagogical approach that incorporated research-based instructional practices with a goal of helping the students grow in their understanding of engineering as a general field of study. The motivating principles behind the redesign involved integrally connecting the presentation and practice of both technical and professional engineering skills, introducing exercises perceived as real-world and relevant, and refocusing the course on skills and principles common to engineers of all disciplines. This paper details a restructured curricular model that was designed to be more easily attuned to contextual and audience-specific needs, address students' perspectives on the relevancy of an engineering education, and improve the consistency of the student experience. Central elements of the evolutionary course redesign and a summary of the knowledge-base that informed them are presented. Measurement of student attitudes for four cohorts are discussed and compared to a cohort from before the redesign. The measurements reflect improved student confidence in selection of major, and improved understanding of the impact that engineers have in larger societal contexts among the cohorts.

Improving Disciplinary Literacy in an Electronics course

Ohbong Kwon, Juanita But, Sunghoon Jang

Electronics (EMT1255) is a required course for students studying for the Associate Degree in Applied Science (AAS) in Electromechanical Engineering Technology (EMT) at New York City College of Technology. EMT1255 introduces semiconductor devices and their applications in electronic-circuits. Students are expected to understand the structures and principles of semi-conductor devices and the configuration and principles

of basic electronic circuits. They are also expected to master circuit analysis, to design electronic circuits. In the lab setting, they acquire troubleshooting knowledge and hands-on technical skills. EMT1255 is one of the second-level engineering courses in a sequence of circuitry courses that combines both lecture and laboratory components in the curriculum. In this reading intensive course, apart from the lab manual, students need to read a textbook of over 700 pages. Therefore, reading and understanding the textbook is the main concern, especially for students who cannot grasp the complex concepts and problem solving techniques. Given the breath and depth of material covered in the course, instructors also struggle with teaching specialized concepts, formula, and technical terminologies because of various levels of their readability and the lack of strategies to engage students in active reading and learning.
In this paper, we will examine the challenges students face in reading to learn in EMT 1255 and discuss strategies we apply to overcome these challenges. First, we will review the correlation between students' reading proficiency and their performance in the course. We will analyze and compare the results of reading assessments administered in three sections (N=66) of EMT1255 every semester from Fall 2015 to Fall 2016, which reveal students' level of ability to comprehend, analyze, apply, and evaluate information in their textbooks. This will allow us to identify the impact of students' reading skills on their ability to learn in EMT1255. Secondly, we will look at how students' reading habits affect their performance in the course. In this study, we will also present the findings in our student survey based on the ABET assessment outcomes of the course
We will also describe the Reading Effectively Across the Disciplines (READ) program, a college-wide initiative established in 2013 to train faculty to implement instructional strategies and develop assignments to facilitate reading to learn across the disciplines. In this program, participating EMT faculty work with reading faculty to enable students to become independent readers and improve their disciplinary literacy.

Learning Experience in Mechanical Engineering First-Year Students

Hamid Rad

The retention of engineering students continues to be a major challenge affecting engineering
schools across the nation and unsuccessful experiences in freshmen engineering and science course are some of the driving factors contributing to this problem.

This paper presents details of a freshmen course reform offered in the mechanical engineering (ME) program at XXX University. It is a two semester-credit course with a primary purpose of giving the students an opportunity to explore what the mechanical engineering discipline topics are that they are going to learn in their four-year studies.

This course has been offered for the past ten years with various teaching approaches. It is mostly a project-based course combined with lecture across the mechanical engineering topics. These topics cover fundamentals of force/stress analysis, motion, material properties, fluids, etc. In the first few offerings, ME faculty members were invited as guest speakers to present their area of research to the students for the purpose introducing themselves. Mechanical engineers from local industry were invited as guest speakers to

talk to the students about “a day in their engineering life”. These approaches have had various outcomes. With the amount of material to cover in a two-credit course, there has always been a challenge to cover class material, while trying to make the course appealing to the students.

In the new approach, in addition to covering the engineering fundamentals and problem solving, the students are engaged in two group projects enhancing their creativity and hands-on skills. One is a term project, similar to the ones assigned in previous years. The additional project, proposed for the first time at freshman level was on reverse engineering.

The paper provides details of how the course was organized, topics presented in the course, and the types of projects assigned to the students. Results on the student learning experience throughout the course conclude the paper.

Issues in the First Year - Focus on Classroom Activities

Tuesday, 8:30 AM - 9:45 AM - Dolphin Room

A competency-based flipped classroom for a first year hands-on engineering design course

Shankar Ramakrishnan

This paper presents the implementation and results from combining a specific flipped classroom technique with a competency-based learning approach. Results from the analysis of student performance on selected course objectives indicate improved student motivation to attempt the course objectives. Significant difference was also observed in the percentage of students that were able to successfully complete the selected course objectives. Strengths of this teaching method include greater overall student satisfaction with in-class assistance and competency-based assessment. Results also suggest an impact on mid-level and low achieving students leading to a higher overall class performance. Criticisms suggest simplification or emphasis on the workings of the system from time to time. The effect of this course delivery on different assessment formats is discussed, with recommendations on the type of assessments that are best suited for this method. Based on the analysis of the data collected, modifications for future offerings of the course are discussed. Overall, results suggest that a combination of competency-based assessment and flipped classroom approach is more effective in a first-year hands-on engineering design course than each of these individual styles of course delivery.

Improving introductory programming courses by using accurate metal models for the key abstractions.

Robert Ward

Computer programming has become increasingly important to most science and engineering disciplines. Unfortunately, introductory programming courses historically

have a high failure rate. In addition, it is vital that computer programming be accessible to a broader range of students. It is important to provide a more diverse group of students the foundation necessary to succeed in programming.

The goal of this paper is to investigate solutions to improve the pass rate of introductory programming courses. These solutions should provide students with the foundation in the key concepts of programming that allow them to succeed in subsequent courses, should provide multiple practice opportunities to reinforce and automate skills, and should reduce cognitive load. This paper discusses each key abstraction and its mental model and how the abstraction is connected to the operation of a physical computer. Examples of the exercises used to reinforce these models are discussed.

If we don't provide a learner with an accurate mental model, they will create their own mental model, which is often inaccurate. As they learn more about the topic, their mental model will fail, and they are forced to create a new model to accommodate the new information. Students confronted with the need to rebuild the world view of how programs work often decide, "I just can't do this" and drop out. If, instead, students had an accurate mental model from the outset, they could more easily assimilate new information and ideas and extending the existing model. Because the new information would still fit with their existing mental model there is less frustration, requiring less mental effort on the part of the learner and fewer barriers to continuing to study programming.

To provide the introductory programming students with a sound foundation, we focus on providing accurate mental models for the basic abstractions of programming: variables, conditionals, loops, and function calls. Early in the introductory class, we introduce the concept of the fetch-decode-execute cycle to connect at a high level the operation of the CPU and program counter to the code. Each model is a given a direct connection to the deterministic nature and actual operation of a computer and to the machine code generated by source code. We couple this focus with multiple skill-building exercises on the abstractions.

For each key abstraction a simplified, but accurate, mental model is provided to the learner which must be simple enough for an introductory student to understand, while being accurate enough to allow the student to assimilate new information into the model as they expand their understanding of programming. To help students understand the mental model, skill-building exercises are done in class to reinforce the concepts and to provide skill automation that reduce the overall cognitive load required to program. Reducing cognitive load is vital to being an effective programmer as complexity increases and by automating performance of certain operations through repeated practice, the student can limit expending cognitive resources on those operations and can focus on learning new concepts or extending old concepts in new ways.

Fostering and Establishing an Engineering Entrepreneurial Mindset through Freshman Engineering Discovery Courses Integrated with an Entrepreneurially Minded Learning (EML) Pedagogic Approach

Hyunjae Park

It is recognized worldwide that first-year engineering education is critical for new entry-level engineering students to obtain a clear vision and direction for their future. The

engineering discovery course developed at Marquette University – Opus College of Engineering offers freshman engineering students the opportunity to discover and explore their potential through various course contents/topics and activities integrated with entrepreneurially minded learning (EML). As a result, the students are able to develop their value as future engineers by gathering and assimilating information to discover opportunities or insights for further action. This is the first step that new engineering students take in fostering and establishing an engineering entrepreneurial mindset.

The main objective of the two-semester long Freshman Engineering Discovery courses developed and currently running at Marquette University – Opus College of Engineering is to provide new engineering students a vision as successful world-class engineering students in the future, equipped with both proper engineering skillset and mindset. In order to meet the objective, this course adapted an entrepreneurially minded learning (EML) pedagogy, complementarily stacked alongside other pedagogical approaches such as the problem-based and project-based learning.

After introducing the entrepreneurially minded learning (EML) as one of the pedagogical approaches along with the engineering entrepreneurial mindset defined by the 3C's of Curiosity, Connections and Creating Value, this paper describes how the Freshman Engineering Discovery courses have been integrated with the EML and also shows its primary outcomes obtained by implementing the EML in the courses, supported by some students' course performance results obtained from various evaluation forms and rubrics (such as reports, presentations and posters) as direct and indirect measures of how the students are able to foster and build their engineering entrepreneurial mindset during their freshman year.

The Implementation of Experiment Centric Pedagogy in 13 HBCU ECE Programs

Kenneth Connor, Dianna Newman, Kathy Gullie, Mohamed Chouikha, Petru Andrei, John Attia, Otsebele Nare, Yacob Astatke, Lisa Hobson, Robert Bowman, Kaveh Heidary, Abdelnasser Eldek, Sacharia Albin, Saleh Zein-Sabatto, John Kelly, Payam Matin

A consortium of 13 Historically Black Colleges and Universities (HBCUs) has been collaborating for more than three years implementing experiment centric pedagogy (ECP) in over forty courses that involve circuits and electronics. ECP is enabled in this project through the use of mobile, inexpensive personal electronic instrumentation; in nearly all cases the hardware used has been Digilent's Analog Discovery (AD). Most of these courses have been in the circuits and electronics sequence in electrical and computer engineering programs. A subset of the faculty involved in this effort has also used the same approach to support hands-on learning in introductory engineering courses, both focused on general engineering and specifically on introduction to ECE. This program was initiated and funding obtained because the group recognized that integrating hands-on learning is one of the key approaches that has been proven to be effective in improving retention by making the learning experience engaging and motivating for students. The introduction of AD board based ECP has been shown to be

successful in a variety of instructional settings. This project has benefitted from and inspired similar work by faculty at other universities who have been officially and unofficially affiliated with the 13 HBCUs. In this paper we will report on the impact of ECP on the first year engineering student experience at institutions both inside and outside the HBCU project.

Student Success & Development - Focus on Mathematics
Tuesday, 10:00 AM - 11:15 AM - Bill France B

High School ACT Math Scores: Why and How Do We Use Them?
Sungwon Kim

This paper summarizes the continued study of trying to correlate ACT Math scores of students enrolled in a university freshman level "Introduction to Engineering" course and their level of success. Voluntary survey data collected initially during Fall semester 2015 was compared with results of the same survey conducted during Fall semester 2016. The survey, which consisted of questions asking students their anticipated grade in the course, their anticipated GPA in the semester, the current math course that they were registered for, the math course that they were planning to register for in the following semester, and their high school ACT Math score. Preliminary results for the survey conducted during Fall semester 2015 suggested that students making good progress towards their engineering degree had ACT Math scores of 28 and above. Results from the follow up survey conducted during Fall semester 2016 largely reinforces the results from the previous year.

In addition to ACT Math score results being used for university admissions and math course placement cutoffs, the possibility of using ACT Math score to identify a group of "marginally prepared" students for engineering study is explored. The question of how we can provide academic and advising support to the group of students who are identified to be "marginally prepared" is raised and discussed. Effective strategies of using ACT Math scores to identify this group of "marginally prepared" students so that their probability of success in the freshman and sophomore year calculus and calculus based physics courses are suggested.

Modification and Assessment of a First-Year Engineering Course to Improve Students' Calculus Readiness
Noah Salzman, Gary Hunt

In this paper, we describe the modification and evaluation of a first-year engineering program at a western public university. Primarily motivated by the desire to improve students' readiness for and performance in subsequent calculus classes, we adopted a modified version of the Wright State integrated mathematics curriculum at our institution. The curriculum we describe and evaluate in this paper integrates the engineering mathematics focus of the Wright State curriculum with engineering design activities intended to create a course that is both engaging for students and effective at

preparing the students for future mathematics and engineering coursework. Based on a positive experience with a pilot of the course modeled on the Wright State curriculum model, we transitioned to using this curriculum for all sections of our first-year engineering course to include a stronger emphasis on mathematics content and preparation and exposure to Matlab programming. Given the motivation for our modification and the focus of the new course is on improving students' performance and retention in calculus, we evaluated the effectiveness of the new course by longitudinally tracking students' success and persistence in subsequent engineering mathematics courses. The results of these analyses show that students' participating in the new course are not performing significantly better than their peers from earlier years, and international students seem to be fairing worse under the new curriculum. Potential reasons include misalignment of the lecture and laboratory activities associated with the course and changes in the student population, especially international students, that are not captured in the model.

Math Problem Solving Sessions for Freshman Engineering Success

Robert Rabb, Kevin Bower, Ally Martin, Emily Book

To assist the transition of students from high school to the challenges of college level engineering courses, The Citadel developed a math review program to retain more engineering students. Students who initially selected one of the engineering majors were tempted to change majors early due to difficulties encountered in non-engineering courses such as math. Recent years had higher enrollments than what was expected in engineering. The challenge was to provide appropriate levels of support and curriculum engagement to help students be successful and retain them in the engineering programs. For the past two years, the School of Engineering conducted a variation of Math Review sessions at the pre-calculus level during the first few weeks of the fall term. Engineering faculty conducted one-hour math review sessions in the evenings. The sessions were designed to be active learning sessions where instructors worked example problems followed by students working problems on the board and discussing the solutions. With some documented success in grade improvement and retention rates in the math review conducted by engineering faculty, the Math Department created a math review program modeled after the School of Engineering's. Prior to the current school year, freshman math courses met four times weekly. The new Math Review scheduled a math work session each week for one hour in freshman math courses. Math instructors were free to use the extra hour meeting time to work problems or they include shorter problem solving sessions throughout the week. The objectives of this paper are to explain this initiative, to assess the first year program results quantitatively and qualitatively through grades, retention data and surveys, and to discuss the future potential of the program.

Using a Math Tutorial Program to Decrease the Number of Failed Grades the First Semester helping the College achieve a 91% First Year Retention Rate

Mary Goodwin

More than ever before universities are feeling the pressure to improve their first year retention rates and their graduation rates. Learning communities, increased advising, first

year seminars, summer programs, along with improvements in curriculum and teaching have all helped to improve universities retention rates.

Many students struggle with the transition to college emotionally, academically and socially. Some students struggle with time management and how to study effectively. Still struggle with not having the level of preparedness and knowledge in the subject area. Many come to school overconfident and are surprised at the level of difficulty and the pace of college courses.

The stress students encounter trying to handle these gaps in their preparedness affect their ability to be academically successful. Engineering students at this university who receive less than a 2.00 grade point average (GPA) their first semester have only about 30% chance of returning a year later. Many do not even return for the spring semester. The College piloted a new initiative to use the basic prep for calculus offered by ALEKS (Assessment and Learning in Knowledge Spaces) a web-based, artificially intelligent program for their incoming first year students. The purpose was not for math placement as many schools are using it for, but instead it was used to help students see how prepared they were in mathematics and to help those students who found that they were weak in various math subjects. Those students who spent time in the ALEKS tutorial program over the summer did significantly better than those students who did not, in their fall semester classes. The results from the year it was piloted saw dramatic decreases in D, W and F grades and a 50% reduction in the number of students receiving less than a 2.00 GPA their first semester compared to the prior year. An addition, for the first time in the history of the College, 91% of the 2015 cohort of engineering first year students were retained to their second year.

Enrollment, Instruction and Pedagogy - Focus on Design-Based Projects

Tuesday, 10:00 AM - 11:15 AM - Bill France C

Examples of Free Choice Open-Ended Design Projects in a First-Year Engineering Course

Jack Bringardner, Gunter Georgi, Victoria Bill

This complete evidence-based practice paper investigates the implementation of a pilot section with free-choice in selecting an open-ended design project for the NYU Tandon School of Engineering first-year Introduction to Engineering and Design course. This pilot section has been offered for both Fall 2016 and Spring 2017 semesters. The faculty for this 3 credit hour first-year course are developing an advanced project for students who want a challenge beyond the current options. There are three different project choices that focus on either Lego Mindstorms, LabVIEW, or AutoCAD for all course sections. The same topics are addressed in each project: programming fundamentals, technical drawings, the engineering design process, teamwork, and project management. This new project focuses on the same learning objectives, but it also allows students to take ownership of their design project by generating their own idea.

The project combines entrepreneurial thinking and maker technology to allow students to address large-scale multidisciplinary engineering problems. In addition to the introduction to engineering course, a 1 credit hour first-year course, called the Innovation and Technology Forum, that focuses on the Lean Launchpad methodology and design thinking is a co-requisite for students in the pilot section. The same group of at most 15 students were enrolled in the same sections for both the 3 credit and 1 credit hour course. For this pilot section, the project requirements are a combination of the two courses. The 1 credit hour course focuses on ideation for the project while the three credit hour introduction to engineering course provides the support and resources for creating physical, technological prototypes. Care must be taken to provide the necessary additional support and resources for these prototypes with clear expectations of grades and deliverables. With that support, interested students can succeed in integrating a free-choice aspect to their first-year design project.

The EWB Challenge - Preparing engineers to work globally through international development design projects

Alistair Cook, Mona Hemmati, Thomas Siller

Since 2014 Colorado State University College of Engineering has been involved with the first United States based pilot of the Engineers Without Borders Australia global design challenge (EWB Challenge). The EWB Challenge is a series of design challenges in different technical areas, created in cooperation with a local community and non-government organization in a different development setting and location each year. Challenges in previous years have been based in Vietnam, Nepal, Timor Leste, Cameroon, and India in partnership with NGO's such as the Nepal Water for Health and Habit for Humanity. The EWB Challenge utilized in the design class this year at Colorado State University was based in the Mayukwayukwa refugee settlement in Zambia, partnered with the United Nations Refugee Agency. The EWB Challenge has been developed to be flexible for multi-disciplinary, intra-disciplinary or single discipline engineering design courses in the first and second year of undergraduate engineering degrees. The EWB Challenge program has been embedded into the curriculum of over fifty universities in Australia, New Zealand, the United Kingdom and the Republic of Ireland.

This paper reports on the change in one hundred and eighteen first year civil and environmental engineering student's global preparedness attributable to their taking a one semester, first-year civil engineering design class in which the EWB Challenge is taught at Colorado State University. The change has been measured utilizing the validated Engineering Global Preparedness Index (EGPI) as a pre-test and posttest (with retrospective pretest to account for response shift bias). The EGPI instrument measures the students self-identified changes regarding engineering ethics, efficacy, global-centrism and community connectedness. Students responses have been compared through segmentation, to understand how gender, age, previous international travel, or involvement with student organizations such as the universities Engineers Without Borders USA student chapter affect student's self-efficacy responses

Designing a Scalable Statics Project for a First-Year Mechanical Engineering Course

Dani Fadda

A two credit-hour, first-year course is offered in the Mechanical Engineering Department which is a pre-requisite for core mechanical engineering courses including mechanical design, statics, kinematics, dynamics, thermodynamics, fluid mechanics, and heat transfer. The purpose of this course is to give students a general understanding of the broad range of technical areas and applications specific to the mechanical engineering profession. In this course, weekly lectures are given by mechanical engineering faculty or industry experts followed by a lab where students work on projects related to the lectures that require analysis, computer simulations, fabricating and testing. To address the broad range of technical areas, the students work on four design-related projects throughout the semester: computer-aided design, mechanism design, design of structures, and thermal analysis.

In this paper, we will present one portion of the class related to a statics project, designed to give students a preliminary understanding on the design of structures. Students work in teams of two to design a truss which can bear the highest possible load within given space and materials constraints. The students conduct research and brainstorm different truss designs. Once they select a design, they generate a set of equations to model the truss, solve these equations using MATLAB, and determine the load in each of the truss' members. Finally, they fabricate their prototypes and subject them to destructive testing to determine the highest load the truss can bear.

We will discuss how the project was originally designed and how it was improved to be suitable for a small or medium sized class (e.g., 50 students) and also for a larger class (e.g., 250 students). The improvements were successfully tested during the fall of 2016 on a class of 48 students. It is now scaled to a class of 221 students during the spring of 2017. A discussion of the resources (materials) and personnel including faculty and graduate teaching assistants required to administer this activity is also presented. Finally, we will discuss how improvements to this project can be made based on faculty observations and assessments, as well as a survey administered to the students.

A Project Based Approach To Introduction To Engineering

Rouzbeh Tehrani, Mohammad Kiani, Evangelia Bellas , John Helferty, Won Suh

A new model has been designed and implemented for the Introduction to Engineering course at Temple University. In the past, the course was run as a large lecture style and various topics were covered, such as time management, career options, on-campus tutoring and resource centers to name a few. Based on student feedback and low retention rates, it was obvious that a new model was needed. The focus was to be much more hands-on and use a project-oriented approach. In addition, multiple instructors were employed from four departments, and it was decided that each instructor would teach topics very specific to the departments. The large lecture mode was removed in favor of splitting the freshman class of approximately 320 students in two sections of 160 each.

Then, within each section, students are divided into four groups of approximately 40 students per group. Students do rotations among instructors from the various departments. The entire course is centered on the design projects specific to that departments/instructors' field of expertise. The course begins with a week of introduction to the course, requirements and grading, rotations, and scientific methods. Each rotation takes two weeks to complete. During these rotations, students are taught to use 3D printers, Arduino microcontrollers, MS Excel, LED circuits, laser cutters, microscopy, SOLIDWORKS, UAVs, K'NEX, and water quality measuring devices. The last part of this course is completion of a 4-week interdisciplinary design project. Students are allowed to select any of these projects regardless of their discipline. The interdisciplinary projects offered are bioengineering and electrical engineering, civil and environmental engineering, civil and mechanical engineering, and mechanical and electrical engineering. We are currently monitoring retention rate, student success in match extensive courses, and students' education experience.

First-year Redesign: LabVIEW, myRIO, EML, and More

John Miller, Carolyn Skurla

Over the past year, faculty at Baylor implemented a new curriculum in a pilot course for first-year engineering students. The curriculum had four main objectives: encourage students to persist in engineering, foster self-motivation and curiosity, develop a fundamental set of knowledge and skills, and see the "big picture" of engineering design. Important characteristics of the new curriculum were the use of a variety of hardware and software tools (including LabVIEW, myRIO, SolidWorks, and a Makerbot 3-D printer), an increased number of hands-on labs and projects, a focus on connecting concepts to other courses (math, science, etc. and later engineering courses), and a multi-part project that involved reverse engineering, 3-D modeling, material and sustainability considerations, redesign for a target customer group, prototyping, and presentation. Part of the motivation for this new curriculum was to promote "entrepreneurially minded learning" (EML), which is to foster a mindset of curiosity, making connections, and creating value. Another motivation was to provide students with the tools they need for acquiring internships after their freshman year. This paper will explain the details of the curriculum, feedback from students, some quantitative data, and lessons learned by the faculty.

Issues in the First Year - Focus on Self-Efficacy

Tuesday, 10:00 AM - 11:30 AM - Dolphin Room

Development of Engineering Professional Identity and Formation of a Community of Practice in a New Engineering Program

Lee Rynearson, Anastasia Rynearson

In 2016 Campbell University added a School of Engineering, offering a general engineering degree with concentrations in chemical and mechanical engineering. This paper describes efforts to intentionally support the development of engineering identity

in students during their first year through the formation of a community of practice. Faculty managed and supported a variety of in-class and extracurricular activities to encourage the development of engineering identity. As part of the first-year experience, methods employed to foster community and identity development included four main avenues along with three cross-cutting themes. The four main avenues for development were the first-year engineering (FYE) design course sequence, an FYE seminar, mandatory extracurricular programming in professional development and service, and mandatory machine shop and makerspace training. The three cross-cutting themes were the core values of the School of Engineering, the need for diversity in engineering, and the availability of different career choices in engineering. Data was collected throughout the 2016-2017 academic year to understand the first year experience of the charter cohort at Campbell University. Data sources including student event participation record, facilities use records, and a modified professional identity scale were used to characterize and assess the methods. Results indicate that these efforts effectively promoted the creation of an engineering community and supported identity development for the initial cohort of students. This work may provide a template for other programs wishing to increase or systematize their efforts in identity development and community of formation.

You Might (or Might Not) Know More Than You Thought: Student Self-Perception vs. Performance in First Year Engineering Graphics and Programming

Natalie Van Tyne

Students' perceptions of their abilities in fundamental engineering skills such as graphics and computer programming may be influenced by their familiarity with these skills, as well as their assessment of how well they were able to perform them upon exposure and practice. While some students may believe in or doubt their ability to master these skills, others possess a sufficient level of confidence and persistence to overcome any doubt about their current or future ability. The similarity between belief in one's ability to acquire a particular skill (self-efficacy), and the belief that one can be successful (self-confidence) may also lead some students to conclude that they can't become "good" at something if they can't be successful at it on the first or second attempt. This is likely to be due to their limited amount of exposure to and experience with a particular engineering skill, such as graphics or computer programming.

The results of a beginning of semester survey of students' current abilities in engineering graphics and computer programming were compared to their homework assignment and test grades in engineering graphics and computer programming. The graphics unit consisted of four weeks of manual drafting followed by four weeks of computer-aided drawing (CAD) with Autodesk Inventor. The programming unit, lasting six weeks, consisted of review and expansion of MatLab skills and tools.

The first year engineering design course in which this study took place is taught at a large multipurpose university in the eastern United States, in sections of 30 students each. In the survey, students offered feedback enabling us to code their current ability in graphics and programming, respectively, as Beginner, Average or Expert, depending on their previous experience in these skill areas and attitudes toward them. The distribution

for current graphics ability was approximately 30% Beginner, 40% Average and 30% Expert. For programming, the distribution was approximately 35% Beginner, 45% Average and 20% Expert.
When each student's survey results were compared to their combined homework and test percentage grades in graphics and in programming, we found that students with prior experience usually earned higher grades on graphics homework and tests than those with no experience. However, prior experience with MatLab did not guarantee success in our programming unit, and prior experience with Java, C++ or Python, without MatLab, yielded mixed results at best.

An Analysis of First Year Engineering Students - Course Perceptions in Two Introductory Engineering Courses

Lilianny Virguez, Kenneth Reid

As a national initiative to support engineering students' retention, engineering programs have seen a wave of revisions in their first-year programs in the last years. These program modifications are intended to enhance student success in engineering, including both students' achievement and students' motivation to persist in an engineering degree. This paper will look at students' perceptions as it compares Traditional versus Revised versions of an introductory engineering course taught in a general first year engineering program. The purpose of this paper is to examine students' course perceptions from a Traditional versus Revised version of an introductory engineering course. Students' perceptions of the class are measured using the MUSIC model of motivation. Using a quantitative approach, descriptive comparisons will be analyzed between students' perceptions of the introductory engineering course. Statistical tests will be conducted comparing the motivation constructs in the two different course types. Motivation constructs included in surveys presented at the end of the semester in the two versions of the course are the measures of students' perceptions used in this study. By measuring students' perceptions using the MUSIC model of motivation, practical implications will be suggested. This information will be especially useful for the instructors and developers of course content and pedagogy.

Student Success & Development - Focus on Mentoring
Tuesday, 12:45 PM - 2:00 PM - Bill France B

Project-Based Service Learning for First-Year Engineering Students in Partnership with the Graduate Teaching Fellows

Alistair Cook, Mona Hemmati, Thomas Siller

Service Learning is one of the emerging concepts that is becoming popular in the education of undergraduate students. Considering the empirical approaches, the objective of service learning is to provide an opportunity for students to be more engaged in using their engineering concepts and potential for satisfying individual human, and community needs. Additionally, Project-Based Service Learning (PBSL) has been recognized as an effective active learning tool in engineering education. The College of Engineering at

Colorado State University has developed a new program entitled the Graduate Teaching Fellowship for 10 graduate students to provide additional assistance in First Year Engineering courses and to do the research about retention data of first year students in collage of engineering. Considering the result of the research, the main goal of this program is to increase the retention statistics for engineering students. Each of these fellows has been assigned to one engineering department. Using the help of this graduate fellow in the Civil and Environmental Engineering department, the curriculum of the first-year course entitled "Engineering Graphics and Computing" has been changed through the addition of a design project that has students work in teams on a service learning related project. This project is based on the Engineering Without Borders (EWB) Challenge (www.ewbchallenge.org) which lets first year engineering students work on an international project which tries to develop the quality of life in locations where people live in poverty such as Mayukwayukwa refugee settlement in Zambia. This paper will discuss the organization of integrating the project into the course, difficulties that have arisen, and benefits of having this project in the first year engineering course. Details of the design of the Graduate Teaching Fellow position and its incorporation into the course organization will also be described. As an experimental program designed to enhance the first year experiences, valuable lessons have been gained.

Freshman Peer Mentoring: Successful Continuous Improvement of the Transition Experience

Kevin Lindsay

The MAPS (Maximizing Academic and Professional Success) program exists to increase the retention and academic performance of students who are committed to earning a degree from the University of North Carolina at Charlotte's (UNC Charlotte) William States Lee College of Engineering. Although the MAPS program was originally developed and implemented through National Science Foundation (NSF) funding more than two decades ago, it is now fully funded by the University as a key component of the Southern Association of Colleges and Schools (SACS) Quality Enhancement Plan (QEP). The MAPS program serves as indoctrination for engineering, engineering technology, and construction management students to learn, understand, and establish personal connections to academic success and professional development strategies, campus-wide resources, networking opportunities, and organizations.

The MAPS program structure is split into two peer-led components: (1) transition, academic, and professional development coaching for students pursuing a degree in the College of Engineering and (2) Supplemental Instruction (SI) for selected freshman gateway courses. This paper will focus exclusively on the coaching component of the MAPS program. The coaching program has evolved based on experiences and feedback from key stakeholders. For example, changes implemented over the past two years have addressed an increase in the number and diversity of program participants and coaches to avoid having to waitlist students. New strategies for improving participant satisfaction, academic and professional success, and retention were also developed in response to stakeholder feedback. This feedback suggested that the program structure and curriculum

lacked certain elements necessary to connect and engage new students with the College of Engineering, the larger University community, and available resources.

Collectively, these enhancements have made a positive impact based on recent assessment results. Participation in MAPS coaching has increased 38% from 183 students in fall 2013 to 295 students in fall 2016. The semester GPA gap between active MAPS participants and non-participants increased from 0.47 in fall 2013 to 0.52 in fall 2016. The fall 2015 to fall 2016 College of Engineering one-year retention rate for active MAPS program participants was 88%, as compared to 65% for non-program participants. Participant satisfaction has continued to improve based on overwhelmingly positive student feedback. As participation in the coaching program is voluntary, the increased desire of participants to give back to the program by becoming MAPS coaches without any solicitation, is of particular interest.

Based on these indicators, continuous process and product improvements have allowed several enhancements, one of which is the addition of a new "Self-Directed Learning" coaching session, developed in collaboration with the University Library. Going forward, changes to the program will continue to be based on the needs and interests of student participants, with the expectation that they will continue to enrich and enhance their academic and professional experience.

This paper describes, based on both quantitative and qualitative measures, how by having adopted a philosophy of continuous improvement utilizing stakeholder insights and experiences, the MAPS program has steadily grown while improving upon measures of participant satisfaction, academic and professional success, and retention.

Helping Orient Minorities to Engineering (HOME) Program: A Pre-College Bridge Program

Leotis Parrish, Ava Dickens, Tamara Fuller

This complete evidence-based practice paper will describe the successes of the Helping Orient Minorities to Engineering Program in the College of Engineering at North Carolina Agricultural and Technical State University. This 5-1/2-week residential pre-college bridge program is used to recruit, retain, and graduate minority freshmen engineering and computer science students and to provide a sense of community. Since the inception in 2005, the HOME Program has recruited 189 students into the program. Each summer, a cohort of approximately 20 students are immersed into college life with the support of faculty, staff, and upperclassmen who serve as peer mentors.
During the HOME Program, students participate in intellectual, personal/professional, and cross-cultural development activities. The intellectual development occurs through enrollment in Calculus I, supplemental instruction support, and a team project. The personal/ professional development occurs through networking opportunities and college-readiness workshops. The cross-cultural development occurs through early establishment of community and accountability with peer mentors. Activities are held throughout the academic year to continue engagement with the students.
As for data, the high school GPAs for both groups were within 0.2 points. The average

first-year retention rate (Table II) for the HOME Program participants was 90% as compared to 81% for non-HOME participants. The average second-year retention rate (Table III) for the HOME Program participants was 91.6% as compared to 56.5% for non-HOME Program participants. Further, the average six-year graduation completion rate within the major for HOME Program participants was 66.6% (local database) as compared to 40% (Office of Institutional Research) for non-HOME participants. Depending on the cohort, the cumulative GPAs (Table IV) for HOME students ranged from 3.03 to 3.53 as compared to 2.23 to 3.1 for non-HOME Program students. For future study, the authors recommend evaluations at regular intervals with validated instruments as well as a longitudinal study.

Enhancing Engineering First-Year Experience (FYrE) through Supplemental Instruction

Sharri Kornblum, Zanj Avery El, Gustavo Menezes, Deborah Won

The College of Engineering, Computer Science and Technology (ECST) at Cal State LA recently introduced the First-Year Experience (FYrE@ECST) program that focuses on building a more academically focused engineering mindset in freshmen engineering majors during their first year of college. While FYrE@ECST consisted of a number of proven practices integrated into the freshmen experience, the goal of this paper is to present the benefits of implementing a supplemental instruction (SI) model, adapted from the UMKC model to enhance student learning in Calculus and Physics, which are pre-requisite courses for most core upper division engineering courses, but have very high attrition level. In 2014 leading up to the development of FYrE@ECST, we examined 6-year graduation rates of the most recent 5 years, and thus we had data from the Office of Institutional Research for the Fall 2007 through Fall 2011 first-time freshmen cohorts. Out of those total 1052 students, only 567 even took Calculus I, and out of those who took Calculus I, 203 failed the course on the first try, yielding 35.8% of students needing to repeat the course. Historically, very few (~6%) of our freshmen completed their Physics I requirement within their first 2 terms. Therefore, FYrE@ECST interventions focused on effective learning pedagogy and practices in these traditionally challenging but foundational courses. In particular, we wanted to demonstrate the benefit of SI workshops in a majority first-generation, underrepresented minority, predominantly academically unprepared student population. The peer-led workshops are mandatory for FYrE@ECST students and designed to promote inquiry-based and collaborative learning environment and increase students' mathematics self-efficacy. Supplemental Instruction was assessed using self-efficacy surveys, physics and math grades, pre- and post-tests, and focus groups. FYrE@ECST students were compared to concurrent (CG-2) and historical (CG-3) control groups. The math average GPA for FYrE@ECST students at the end of the first year was 2.9, compared to 2.2 and 2.45 for CG-2 and CG-3, respectively, and completion rate of Physics I within the first 2 terms for FYrE@ECST students was 81%, compared to 9.4% for CG-2 and 6.3% for CG-3. Results from focus groups and surveys indicated that students had a very positive experience in the SI workshops.

Engineering Education Research - Focus on Engineering Design.

Tuesday, 12:45 PM - 2:00 PM - Bill France C

Cross-sectional study of engineering student performance across different types of first-year digital logic design laboratories

Akhan Almagambetov, John Pavlina

As a follow-on to our previous effort of designing the lecture and lab courses that would be relevant to a predominantly Aerospace and Mechanical Engineering (AE/ME) undergraduate cohort, this cross-sectional study aims to examine the effect of different types of laboratories on material retention and success in upper level courses. The performance of each of the 159 students who participated in this study is tracked throughout the semester, culminating in a laboratory final that involves applying concepts learned in a practical setting under strict timing constraints.

Data show that students attained a more even level of understanding across multiple topics, could readily apply digital logic design concepts, and were more comfortable with using industry standard equipment and tools when the laboratories were blended between "manual wiring" / "cookbook" and "virtual wiring" / "system design" types of experiments.

This study provides results that may help other first year engineering departments in designing new courses or laboratory curricula.

Integrating an Effective Freshman Seminar Experience into a First Year Engineering Design Course

Paul Lynch, Charlotte de Vries, Dean Lewis

Students at Penn State University planning to major in engineering are pooled together into a general engineering advising cohort for their first two years. Penn State campuses are required to have a First-Year Engagement Plan for incoming freshmen. This can take various forms, but one common method is to require students to complete a first year seminar (FYS) course as part of their initial 27 credits scheduled at Penn State University. The FYS is taught in sections of not more than 25 students and seeks to engage students in learning while acclimating them to the post-secondary academic community with high expectations, demanding workloads, and other features of the transition to life in college. It has long been said within the School of Engineering at Penn State Behrend that first year engineering design courses often get low student rating of teaching effectiveness scores possibly because students don’t see the value in the course and the students are new to providing these ratings. For this reason, it has been common practice for engineering department heads to refrain from assigning junior faculty to teach the first year engineering design courses. It was common for instructors of this course to receive below average course quality ratings. In the past year, two junior

faculty members were assigned to teach this course. The instructors collected satisfaction data on the lecture and recitation sections of the course. The feedback was overwhelmingly positive. At the end of the fall semester, 93% of students agreed or strongly agreed that they were aware of the fields of engineering available to them in the university, and 90% stated that the course introduced them to the tools and resources available at this university. The faculty members received average ratings of 5.7 and 6.1 out of 7.0 for course and instructor quality respectively in the student course satisfaction ratings for the engineering design recitation.

A first year design experience based on SAE Aero Design contest to support ABET learning outcomes and engineering vocation in freshmen students

Felix Martinez Rios

This paper describes the experiences and results with first year students of different Engineering programs, who participate in the contest of SAE Aero design. ABET's learning outcomes related to solving engineering problems, applying mathematics, working in multidisciplinary teams and others are very difficult to work on in the courses of the first few years in classroom. This paper shows results of an experiment group of nineteen students who have participated in a learning experience outside the classroom based on design an unmanned aerial vehicle (UAV), none of these students have previous knowledge about aeronautical engineering or UAV construction, in addition they are from different engineering programs of Aeronautical Engineering. We also show the relation between the different subjects that compose the curricula of five engineering programs and its relation with the outcomes. We also show the academic results of students, the process of recruiting and selecting students for the team, approaching the problem to solve in SAE Aero design contest, assigning tasks, and team results in the last three year competitions that show their improvement and use this to promote the professional development of the first-year student.

Improving the Student Experience in First Year Engineering Design Courses

James McCusker, Aaron Carpenter, Julian Sosnik

First Year Design courses are commonplace in many engineering curriculums. Although the focus of these courses typically revolves around introducing students to various multistep design processes as well as improving student skills in written and oral communication techniques; they can be limited in replicating the experience of working in a real world interdisciplinary design environment. In an industrial setting, design teams are comprised of members that have the complementary skills that are necessary to complete the relevant task. There are many tools, like CATME, available to replicate this process of designing student teams based on complementary skills. Prior studies have illustrated that, although assigned teams can improve the experience for some, it can also drastically diminish the student experience for others. This work focuses on the assignment of student design teams based on both complementary skills as well as shared interests.

As part of the common first year engineering curriculum at Wentworth Institute of Technology in Boston, Ma, students participate on the Introduction to Engineering Design course. This work studies two years-worth of data on the impact of assigned groups in these courses, as they pertain to overall student experience. For this, various sections of the course adopted one of the following structures for group assignments: 1) student selected, 2) skills-based instructor assigned, 3) skills and student interest based instructor assigned. Written feedback and peer assessment, based on ABET Outcome D: Ability to function in multidisciplinary teams, were collected from the students. Our analysis focuses on the process of intelligently assigning student groups and the techniques that can improve the overall student experience. The authors hope to engage in a spirited discussion on the merits of assigned student design teams as well as propose an alternative approach for instructors planning to engage students in interdisciplinary project based courses.

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