FYEE 2019 Conference Workshops

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Sponsored Workshops – Sunday 2:30 – 4:00 PM

S1A: Growth & Grit: Encouraging a growth mindset and grit for first year students

Room: 206

Facilitator: Stephanie Leigh Cutler (slc5822@psu.edu) and Sarah Zappe, The Leonhard Center for the Enhancement of Engineering Education, Penn State

As students begin their journey in higher education, they can face new challenges and opportunities that will impact their success. How students react to those challenges can be influenced by their mindset (fixed or growth) and grit. As defined by the psychology literature, mindset refers to an individual's beliefs about the flexibility of human characteristics (Yeager & Dweck, 2012). For individuals with a growth mindset, they believe characteristics (like intelligence) can be enhanced through practice and effort. In contrast, individuals with a fixed mindset believe that one's characteristics are innate and unchangeable. Grit is defined in the literature "as perseverance and passion for long-term goals" (Duckworth, et al. 2007). Grit can be conceptualized as the confluence of three components "(a) having interest or passion in a given area; (b) preferring long-term, rather than short-term, goals; and (c) overcoming obstacles or setbacks." (Almeida, 2016). Students with a growth mindset and grit are more likely to overcome obstacles and failures in their academic careers (Aguilar, et al., 2014).

In the classroom, unintentional messages can be communicated to students that promote a fixed mindset making it less likely that students will take on new challenges in their academic journey. Given that students likely experience their first engineering class during their freshman year, first-year instructors should be cognizant about unintended messages that they may implicitly communicate through their teaching and interactions with students. The goal of this workshop is to help first-year engineering instructors to become aware of mindset and grit to see how their teaching strategies can promote perspectives that encourage the continuous success of their students.

Workshop Goals:

Following this workshop, participants will:

- Gain an understanding of grit and fixed versus growth mindset as defined in the literature.
- Identify strategies to promote fixed versus growth mindset and grit within first-year courses.
- Reflect on their own teaching to discover current practices that promote a fixed versus growth mindset and grit, then explore opportunities for adapting their teaching practices.

This workshop will be interactive using a puzzle activity, group discussions, and reflection. The workshop will focus on practical instructional strategies for participants to walk away with concrete strategies they can use when interacting with their students.

References

Aguilar, L., Walton, G., & Wieman, C. (2014) *Physics Today*, *67*(5), 43-49.

Almeida, D. J. (2016)In *Higher education: Handbook of theory and research* (pp. 559-609).

Duckworth, A. L., et al. (2007). Journal of personality and social psychology, *92*(6), 1087.

Dweck, C. S. (2008). *Mindset: The new psychology of success*.

Yeager, D. S., & Dweck, C. S. (2012) *Educational psychologist*, *47*(4), 302-314.

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S1B: Deployment of Educational Modules in a First-Year Engineering Design Course

Room: 207

Facilitator:Sarah C. Ritter (scr15@psu.edu) including Andrew M. Erdman, Sean D. Knecht, Andy S. Lau, Nicholas A. Meisel, Scarlett R. Miller, Matthew B. Parkinson, and Sven G. Bilén School of Engineering Design, Technology and Professional Programs The Pennsylvania State University

Brief Description: This workshop provides an overview of six educational modules that have been developed over the past three years with support from the Leonhard Center for the Enhancement of Engineering Education and deployed in EDSGN 100—the cornerstone engineering design course at Penn State University. These modules focus on the six core topics, which align with competencies required for engineering students: World-Class Engineering Attributes; Big Picture (Systems) Thinking; Innovation Processes; Communication; Making; and Grand Challenges. For each of these modules, a series of lessons, which rely heavily on hands-on activities and reflections to engage students in the content, have been developed by faculty across six Penn State campuses. To provide easy access by EDSGN 100 instructors across the 20 Penn State campuses offering EDSGN 100, the modules have been integrated into a common location in Canvas, Penn State's learning management software. The content of this workshop is broadly applicable for faculty teaching project-based courses and, more specifically, "cornerstone design" courses for first-year engineering students. This workshop will overview the topics covered in the six modules and provide best practices for presenting the content in an online platform. Additionally, the workshop will provide a framework for integrating the lessons into already established courses to support student learning. Workshop attendees will be provided with some example materials developed for the described modules.

S1C: Introducing WebAssign for Engineering

Room: 208

Facilitator: Brenna McNally and Tim Anderson

Our goal is for this focus group to be both interactive and beneficial to you. This is an opportunity for our team to showcase what we've been developing for Engineering and to hear feedback directly from you about the direction we're heading with WebAssign! The session will feature an overview of our new WebAssign product which will be available for Fall '19. We'll then discuss your needs and the benefits of Cengage Unlimited!

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Authored Workshops – Sunday 4:15 – 5:45 PM

S2A: Creating the Entrepreneurial Mindset in First-Year Engineering Design Courses
Room: 206

Facilitators: Drs. Peter Rogers (rogers.693@osu.edu) and Krista Kecskemety; (kecskemety.1@osu.edu) - Ohio State University

This workshop is an interactive session where participants learn how The Ohio State University has developed an Entrepreneurial Minded Learning (EML) curriculum framework and piloted the application of KEEN Skillsets in large sections of a first-year engineering design course and how they might apply this framework to their first-year engineering courses. The curriculum framework is shared with workshop attendees and has three overall program goals broken out into 32 learning objectives. Each objective includes three defined proficiency levels (beginner, intermediate, and advanced). This level of detail provides flexibility in designing courses to meet various objectives and proficiency levels. The proposed concept is to begin freshmen with beginner or intermediate levels of skills proficiency appropriate to first-year courses and provide a framework to map upper-level courses against using an increasing level of proficiency culminating with capstone design. Participants will have the opportunity to work with sample assignments to see how the curriculum framework can be applied and used to analyze current courses or develop materials for future courses.

S2B: Best Practices in managing peer teamwork behavior and peer ratings
Room: 207

Facilitator: Dr. Daniel Ferguson (dfergus@purdue.edu) - Purdue University

The goal of this workshop is to introduce participants to tools that can help them form and manage teams in their classes effectively and efficiently. We review factors that instructors should consider when constructing teams and focus on managing teams using and administering self and peer-evaluations. The benefits of using scientifically proven team formation tools and peer feedback as teamwork learning incentives are discussed. Attendees with wireless-network-capable laptop computers will interact with the CATME system in real-time.

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S2C: Introduction to the Multiple Institution Database for Investigating Engineering Longitudinal Development (MIDFIELD): Focusing on First Year Engineering
Room: 208

Facilitators: Hossein Ebrahiminejad (Purdue University)

The Multiple Institution Database for Investigating Engineering Longitudinal Development (MIDFIELD) is expanding from 14 to nearly 100 U.S. academic institutions. MIDFIELD includes registrars' data including high school information, SAT, ACT, college coursework, terms attended, major, demographics, and graduation date for more than 200,000 engineering students since 1987. This session aims to familiarize participants to MIDFIELD as a resource to the academic community. This will include an introduction of the landscape for both current and future MIDFIELD, a glimpse into how the data looks like, historical research findings using the dataset, and an illustration on the process to access the dataset using an R package. The session is intended to be interactive where participants will be able to identify both new research questions of their interest and identify institutions which may be interested in joining MIDFIELD and using it as a resource.

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Workshops – Monday 4:00 – 5:30 PM

M4A: Fusion 360 takes your ideas and makes them real
Room: 205

Facilitators: David Taylor, Synergis Technologies EDS david.taylor@synergis.com
https://www.synergis.com/press_release/synergis-welcomes-david-taylor/

Fusion 360 helps students and educators prepare for the future of design. It's the first 3D CAD, CAM, and CAE tool of its kind, connecting your entire product development process into one cloud-based platform. You should attend this workshop If you're looking for foundational concepts explaining software features and skills. This workshop provides you with training on specific Fusion 360 skills and vocabulary that will help you get started with the software in your classroom while showcasing the latest software applications.

Additionally, Fusion 360 is free for students and educators. Get your free copy before the workshop here: https://www.autodesk.com/products/fusion-360/students-teachers-educators

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M4B: Teaching with MATLAB: Instructor Hands-On Workshop
Room: 206

Facilitator: Jerry Brusher, PhD – Mathworks, e-mail: jbrusher@mathworks.com

MATLAB is rooted in education, historically enabling students to implement, evaluate, and explore their understanding of course concepts. To continue to meet the ever-increasing demand for graduates with strong technical and problem-solving skills, MathWorks has developed several cloud-based tools to afford instructors and students anytime, anywhere access to their course content. In this 90-minute, hands-on, self-paced workshop, you will learn how these tools fit together to support your course development and delivery workflow, and how to enlist their immediate use in the classroom.

Upon completion of this workshop, participants will have

- Created an interactive Live Script;
- Uploaded and run files in MATLAB Online;
- Synced their cloud-based MATLAB Drive files with a local folder;
- Used MATLAB Drive to share files with collaborators and students;
- Learned how to incorporate MathWorks learning resources into their courses;
- Developed automated assessment problems with feedback in MATLAB Grader.

Pre-requisites:

- The workshop assumes participants are familiar with MATLAB and already use or are considering using MATLAB content in their courses.
- The workshop assumes participants have a MathWorks Account and have access to MATLAB Online through their institution's Campus-Wide License.
    - Create a MathWorks Account here.
    - Associate a MathWorks Account to a license here.
- For those who do not have access to MATLAB Online, we will make a trial license available for the duration of the workshop.
- **Please bring your laptop!**

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M4C: (Dis)connected: Low-tech teaching strategies for engaging first-year engineering students

Room: 207

Facilitator: Kristine Craven – Tennessee Tech

Recent research has suggested that although the integration of technology into teaching and learning has enabled many benefits; there have also been opportunity costs associated with it; i.e. key features or skills that we may have (perhaps unintentionally) lessened, given up, or omitted in order to embrace technological change. One seminal study concluded, for example, that students are less able to retain and receive course content if they take notes using an electronic device, versus doing so by hand (Mueller & Oppenheimer, 2014). Similarly, others have noted that graphic design and computer science students exhibit lower ability to do creative problem-solving when they spend significant amounts of classroom time learning to use necessary software tools (Alhajri, 2016). There is growing recognition across a number of disciplines that students, especially in the novice stages of their education, would benefit from a more intentional balance between low-tech and high-tech approaches to learning (Meijer, 2016; Shaver, 2019). That balance would enable them to master the best of both worlds; and with each approach allow them to gain distinctive skills, knowledge and perspectives.

In this interactive workshop, participants will enhance their ability to identify opportunities for re-framing the content of their first-year engineering courses to integrate new, evidence-based low-tech teaching and learning strategies.

*Strengthen their ability to identify opportunities for integrating low-tech teaching and learning strategies

*Increase their instructional toolkit to include a number of evidence-based, active, low-tech teaching and learning strategies

*Assess new models of technology-mediated instruction for first-year engineering courses (especially larger ones)

*Creating and applying their own low-tech teaching and learning strategies to address persistent challenges in student learning for their own classrooms

References

Alhajri, S. (2016). The effectiveness of teaching methods used in graphic design pedagogy in both analogue and digital education systems. *Universal Journal of Educational Research*, *4*(2), 422-425.

Meijer, S. (2015). The power of sponges: Comparing high-tech and low-tech gaming for innovation. Simulation & Gaming, 46(5), 512-535.

Mueller, P. A., & Oppenheimer, D. M. (2014). The pen is mightier than the keyboard: Advantages of longhand over laptop note taking. *Psychological science*, *25*(6), 1159-1168.

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Shaver, M. P. (2010). Using low-tech interactions in the chemistry classroom to engage students in active learning. *Journal of chemical education*, *87*(12), 1320-1323.

M4D: Virtual Product Dissection Educational Modules - A Tool for Learning and Creativity During Engineering Design Projects

Room: 208

Facilitator: Elizabeth Starkey, Ph.D - Pennsylvania State University

Physical product dissection has been utilized in engineering classrooms for the last 30 years to guide student learning about how products work and assist in engineering design as a tool for redesign. Although physical product dissection has been a part of engineering design courses in the past, limitations exist such as recurring costs and laboratory requirements. These expenses can be mitigated by turning to a virtualized product dissection where students can take apart products on a computer, tablet, or smartphone. Due to the monetary and accessibility advantages of virtualizing product dissection, recent research has investigated the differences between virtual and physical dissection. These studies have found that virtual dissection can be used as a proxy for physical dissection when used as a tool for conceptual understanding of a product or as a tool to encourage creativity during idea generation. This workshop will provide an overview of the research conducted by the authors over the last 3 years through an NSF funded project and disseminate curricular activities and materials developed for engineering design classrooms. This will be accomplished through presentation, discussion, and active participation in product dissection activities. The workshop facilitators will provide techniques, lessons learned, and copies of course materials for participants. Participants should bring a laptop with SolidWorks eDrawings installed.

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