EER&I Networking Session
Connecting and Expanding the Engineering Education Research & Innovation (EER&I) Communities

ASEE/IEEE Frontiers in Education Conference – October 22, 2015 – T1A – 11:00 pm – 12:30 pm

Facilitated By

Karl A. Smith
Purdue University and University of Minnesota

Ruth A. Streveler
Purdue University

Rocio Chavela Guerra
American Society for Engineering Education
# Agenda

<table>
<thead>
<tr>
<th>Activity</th>
<th>Duration</th>
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<tbody>
<tr>
<td><strong>Introduction of session and facilitators</strong></td>
<td>10 min</td>
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<tr>
<td><strong>Brief report on status of EER&amp;I</strong></td>
<td>25 min</td>
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<tr>
<td>• Update on Departments, PhD programs, and Centers</td>
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<td>• Update on EER initiatives – NRC DBER, ASEE VCP</td>
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<td>• Update on EEI initiatives – NAE FOEE &amp; NSF I-Corps L</td>
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<tr>
<td><strong>Participant Networking</strong></td>
<td>30 min</td>
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<td>• Rapid introductions around guided questions – Four to five conversations in groups of 3 – as a way to meet many people</td>
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<td>• Identification of “intellectual neighborhoods” around research and innovation questions and opportunities – individual reflection and writing</td>
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<td><strong>Brainstorming on strategies to connect, expand, and sustain</strong></td>
<td>20 min</td>
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<td>the emerging EER and EEI communities</td>
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<td>• Summary of ideas for (a) local, (b) national – conferences, etc. and (c) virtual community</td>
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<td>• Individuals share reflections with the large group, facilitators sum up the session and participants complete feedback forms</td>
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The Pathway to Establishing a Department

Inaugurate a Center for Research in Engineering & Technology Education

ESTABLISHED TO INSPIRE, INNOVATE & IMPACT ENGINEERING EDUCATION
CONSENSUS FOR TRANSFORMING UTEP ENGINEERING EDUCATION IN THE NATIONAL CONTEXT OF CALL FOR REFORM
Leadership for the Conceptual Age Engineering Lecture Series

Exploring The Conceptual Age and LEARNING & BUILDING plans for UTEP’s new programs to Prepare Conceptual Age Leaders
Partnership with Olin College – Sharing Capacity for Development of Student-Centered Experiential Learning Paradigms

FACULTY IMMERSION AT OLin, WORKSHOPS, OLLABORATORY, JOINT PLANNING AND REGULAR VISITS OF OLin FACULTY TO UTEP
Department of Engineering Education & Leadership

eel.utep.edu

FORMAL DEPARTMENT eel.utep.edu ESTABLISHMENT and NEW DEGREE PROGRAMS APPROVED
Engineering Education at The Ohio State University

Engineering Education Innovation Center (EEIC) (established 2007)

- Engineering Graphics
- 1st Year Engineering
- Multidisciplinary Capstone
- Engineering Sciences Minor
- Instructional Technology

Department of Engineering Education (pending approval Nov. 2015)

- Enhanced EEIC
- Innovative Graduate Program,
- Game Changing Research
- Groundbreaking Collaborations

Website: https://engineering.osu.edu/eeic
Current Efforts

• Faculty Hiring (Assistant, Associate, and Full Profs) (First Hires Fall 2016)
• Graduate Student Recruitment (First Cohort Enrollment in Fall 2016)
• Unique Opportunities
  – Create a department informed by the known strengths, weaknesses, opportunities, and threats within current engineering education departments and centers
  – Connect deliberately to engineering disciplines in an effort to produce graduates who are technically and educationally competent and to strengthen engineering education and disciplinary connections
  – Emphasize professional skills development across the engineering education curricula
  – Develop emerging engineering education research areas that advance the field and meet the needs of broader society
  – Create innovative curricula to attract and retain diverse students in engineering
  – Offer engineering education specializations in areas such as Higher Education, Public Policy, and professional fields (e.g., Law or Medical Education)

• For more information, contact: christy.14@osu.edu
First-Year Engineering Experience:
Three courses offered to all first-year engineering students focusing on hands-on experience and bridging knowledge areas through computing.

Alumni Engineering Learning Center:
Newly renovated facility featuring state-of-the-art classrooms and a variety of collaborative learning spaces.

High School Teacher Preparation:
Newly offered certificate program aimed at preparing high school teachers to introduce engineering and address the Next Generation Science Standards.

Preparation for Future Faculty:
Certificate program being developed to prepare current graduate students for a career in academia, focusing on pedagogical development and the scholarship of teaching and learning.

Leaders in Innovative Pedagogy:
Courses offered by DEE have become a testbed for new and innovative pedagogies, such as flipped classrooms and experiential and challenged-based learning.

Learn more!
http://ceas.uc.edu/dee
Department Head Position
Department of Engineering Education

The Department of Engineering Education in the College of Engineering and Applied Science at the University of Cincinnati invites applications for the position of Department Head. The principal responsibility of this position is to provide leadership and management of the department including responsibility for planning, fiscal management, human resources, and departmental communications. The Department Head is expected to advance the research and teaching missions of the department, nurture collaborations across the college and campus, and work to achieve departmental, college, and university strategic goals.

For more details and to submit an application, please visit: https://career8.successfactors.com/sfcareer/jobreqcareer?jobId=5701&company=UCPROD&username

Application must include a cover letter, curriculum vitae, a statement of experience, vision, and leadership and at least three references. References will only be contacted for those candidates who are selected for the short list. Applications will be reviewed on a rolling basis until the position is filled.

UC is an affirmative action/equal opportunity institution.
The University of Cincinnati does not discriminate on the basis of disability, race, color, religion, national origin, ancestry, medical condition, genetic information, marital status, sex, age, sexual orientation, veteran status or gender identity and expression in its programs and activities. The complete Notice of Nondiscrimination can be found at http://www.uc.edu/about/policies/non-discrimination.html.
University of Michigan Engineering Education Research (EER)

Next steps

- Multiple tenured/tenure-track faculty positions in EER currently posted
- College-wide EER PhD program under development
- Community building initiatives underway and more planned

cfinelli@umich.edu
PURDUE UNIVERSITY PhD in ENGINEERING EDUCATION

WE RESEARCH HOW ENGINEERING IS BEST TAUGHT LEARNED PRACTICED

First PhD Program
26 Faculty
32 Staff
60 PhD students
66 graduates
State-of-the-Art Research Lab

GRADUATE OPEN HOUSE
OCTOBER 28-29, 2015

- Learn about our PhD program
- Meet our faculty and students
- Attend our weekly research seminar
- Tour the campus and facilities

purdue.edu/ENE/InfoFor/GraduateStudents
Engineering Education Community Resource

A web catalog for the international engineering education community, including...

- Degree programs and centers
- Societies, conferences, and journals
- Job listings

Follow the Evidence

Discipline-based education research dispels myths about learning and yields results—so why would an educator use it?

Last year, the National Research Council released a report called Discipline-Based Education Research: Understanding and Improving Learning in Undergraduate Science and Engineering. This comprehensive study, on which we served as committee members, brings together experts in physics, chemistry, biology, the humanities, social sciences, and engineering, to examine learning in STEM courses.

One key conclusion is that students perform better in courses where active, engaged learning activities are taught by professors who are knowledgeable about learning. These instructors know what to do because they have learned from their own experiences in terms of what works and what doesn’t. They understand the challenges students face and are able to use their knowledge to help students succeed.

The report also highlights the importance of evidence-based teaching practices. The authors recommend that instructors use evidence-based strategies to improve student learning, such as providing regular feedback on assignments, using active learning techniques, and encouraging students to work in groups. They also recommend that instructors use assessment tools to evaluate the effectiveness of their teaching methods.

In conclusion, discipline-based education research provides valuable insights into what works and what doesn’t in STEM education. By applying evidence-based teaching practices, instructors can improve student learning and help students succeed in their courses.


ASEE Prism Summer 2013

National Research Council – 2015
http://www.nap.edu/catalog/18687/reaching-students-what-research-says-about-effective-instruction-in-undergraduate
FACULTY DEVELOPMENT USING VIRTUAL COMMUNITIES OF PRACTICE

NSF Award DUE-1224217

http://vcp.asee.org/
VCP Model for Faculty Development

- **Two-tier structure**
  - **First tier: Leadership VCP** – trains the leaders of the second tier
  - **Second tier: Faculty VCPs** – two leaders head each faculty VCP

- **Two preparation cycles**
  - Knowledge building phase and practical phase

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<th>Cycle</th>
<th>Spring 2013</th>
<th>Summer 2013</th>
<th>Fall 2013</th>
<th>Spring 2014</th>
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<tr>
<td>Cycle I</td>
<td>LVCP</td>
<td>FVCPs</td>
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<tr>
<td>Cycle II</td>
<td>LVCP</td>
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<td>FVCPs</td>
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Engineering Education Research and Innovation Programs Update

Beth Cady, Program Officer, NAE
cady@nae.edu
Frontiers of Engineering Education (FOEE)

- Brings together engineering faculty members doing innovative teaching activities in their classrooms to:
  - Recognize their accomplishment
  - Broaden collaborations between faculty members/institutions
  - Promote the dissemination of innovative practices
- Invited Attendees are nominated by their dean or an NAE member, apply, and are selected by the FOEE Advisory committee.
Since 2009, 384 individuals from 127 institutions have attended FOEE.

7th Symposium is at end of October in Irvine, CA

Nominations will open in spring, 2016. If you are interested in attending please talk to your dean about nominating you.

For more info: http://naefoee.org/
Infusing Real World Experiences into Engineering Education

- 29 exemplar programs that provide students with real-world experiences
- Includes a discussion on potential barriers and ways of overcoming them
- Also available at [www.nap.edu](http://www.nap.edu)
Innovation Corps for Learning

Educational Innovation  
Experiential Program  
Readiness to Sustain & Scale

NSF Innovation Corps  
ASEE  
University of Minnesota  
Arizona State University  
Tufts University  
Colorado State University
I-Corps™ L History

June 2013: Called to Serve
  - Jan-Feb 2014: Pilot Cohort

Mar-Nov 2014: Redesign
  - Jan-Feb 2014: Full Cohort

Mar-May 2015: Redesign
  - Jul-Aug 2015: Full Cohort

Jan-May 2016: Redesign
  - Jul-Aug 2016: Full Cohort Planned
Program Overview (7-8 weeks)

Kickoff Workshop
- Three-day curriculum immersion

Online Sessions
- Five weekly sessions

Closing Workshop
- Two-day lessons learned & next steps showcase

Business Model Canvas (BMC) Discussions

Customer Discovery (Get Out of the Building)

Team Presentations (& Feedback)
THE GROWING NETWORK OF I-CORPS™ L TEAMS
TAKING YOU FROM AN IDEA TO A BUSINESS (SUSTAINABLE SCALABILITY)

The Lean Startup In Three Steps
1. Frame Hypotheses
1. Frame Hypotheses

- Business Model Canvas

- Partners
- Activities
- Product / Service
- Resources
- Costs
- Channel
- Customers
- Get/Keep/Grow
- Revenue

www.businessmodelgeneration.com
2. Test Hypotheses

- Frame Hypotheses ➔ Business Model Canvas
- Test Hypotheses ➔
2. Test Hypotheses

- Frame Hypotheses ➔ Business Model
- Test Hypotheses ➔ Customer Development
3. Build Incrementally & Iteratively

- Frame Hypotheses ➔ Business Model
- Test Hypotheses ➔ Customer Development
- Build the product incrementally & Iteratively ➔ Agile Engineering
Value of I-Corps L (participants’ testimonials)

For their learning innovation...

- “I was really skeptical...I have learned an amazing amount already and look at things very differently than I did two weeks ago”

- “A scientific approach to customer discovery framed within the construct of the business model canvas provides a potentially transformative perspective to propagation of innovations”

- “All faculty who engage in research/funded activities should know this”

And beyond...

- “Already applying it to other projects”

- “Out of my comfort zone, a good challenge”

- “Opens doors to people we wouldn’t normally get to meet”

- “Got an idea of how to use it in my teaching...”

http://www.asee.org/i-corps-l/about
Participant Networking Activity (~25 min)

- **Introductions with Guided Format**
- **Three (~8 min) Conversations in Groups of 2-3**
  - Your Name & Organization
  - Status of EER&I Center or PhD Program/Interest in EER & EEI
  - Suggestions for Starting/Questions About Starting
  - Exchange Business Cards/Contact Information
  - Identify “intellectual neighborhoods” around common research, organization or other questions and interests
  - Talk about ways to follow up
- **Bell will ring once after 7 min and twice after 8 min**
- **Move to a New Group**
Connecting, Expanding & Sustaining the Emerging EER Community (~10 min)

• **Small Group (2-3) Brainstorming**
  – Ideas for (1) local, (2) national, (3) international Community
  – Ideas for Virtual Community
  – Further Ideas

• **Summarize Ideas and Record**
Next Steps (~ 5 min)

• Silently reflect on your interests and plans for engineering education research

• Jot down
  – What do you plan to do next?
  – What are your longer range plans?

• Continue the conversation during the FIE conference and beyond
  – EER&I Networks – CLEERhub, REEN, SEFI, National Innovation Network (NIN)
  – Meet again at ASEE Conference, June, 2016
Acknowledgement

• We acknowledge the National Science Foundation for funding Karl Smith’s participation (NSF DUE-1355431 and DUE-1451245), and Rocio Chavela’s participation (NSF DUE-1355391, and DUE-1450644)

• And the ASEE/IEEE Frontiers in Education Conference for hosting
Thank you!

An e-copy of this presentation will be posted to: http://personal.cege.umn.edu/~smith/links.html

Facilitated By

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