A Celebration of the Engineering Education Research Community

Special ERM Session in partnership with the
The Journal of Engineering Education (JEE)
Rigorous Research in Engineering Education Initiative (DUE 0817461)
CLEERhub.org

ASEE Annual Conference – June 27, 2011 – MT22A – 6:00 pm – 8:00 pm

Facilitated By

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Agenda
What are we going to do?

• Welcome and Overview (~5 min)
• Brief Report on Status of RREE Project (~15 min)
  – EER workshops and EER – JEE Collaboration
  – Collaboratory for Engineering Education Research (CLEERhub.org)
• Update on EER (~15 min)
  – ASEE 2010 EER & FIE 2010 Networking Sessions
  – National Research Council – Discipline Based Education Research
• Participant Networking Activity (~60 min)
  – Representatives of EER Centers and PhD programs
• Strategies to Connect, Expand, and Sustain the Emerging EER Community (~10 min)
• Wrap Up and Next Steps (~5 min)
Status of RREE Project

- EER workshops and EER - JEE Collaboration
  - Fundamentals of Educational Research
    - ASEE 2010
    - FIE 2010
  - Selecting Conceptual Frameworks for Engineering Education Research
    - RCEE/UTM Malaysia 2010
    - ASEE 2010
  - Understanding Qualitative Research
    - FIE 2010
  - Quantitative Research
    - ASEE 2011
- Collaboratory for Engineering Education Research (CLEERhub.org)

Getting Started in Engineering Education Research
Fundamentals of Engineering Education Research

sponsored by the ASEE Educational Research and Methods Division

in partnership with Rigorous Research in Engineering Education Initiative CLEERhub.org
And the Journal of Engineering Education

Ruth A. Streveler
Purdue University

Karl A. Smith
Purdue University and University of Minnesota
Levels of Engineering Education Inquiry

• **Level 0**  Teacher
  – Teach as taught ("distal pedagogy")

• **Level 1**  Effective Teacher
  – Teach using accepted teaching theories and practices

• **Level 2**  Scholarly Teacher
  – Assesses performance and makes improvements

• **Level 3**  Scholar of Teaching and Learning
  – Engages in educational experimentation, shares results

• **Level 4**  Engineering Education Researcher
  – Conducts educational research, publishes archival papers


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Some history about this workshop

• **Rigorous Research in Engineering Education (RREE1)**
  – One-week summer workshop, year-long research project
  – Funded by National Science Foundation (NSF), 2004-2006
  – About 150 engineering faculty participated

• **Goals**
  – Identify engineering faculty interested in conducting engineering education research
  – Develop faculty knowledge and skills for conducting engineering education research (especially in theory and research methodology)
  – Cultivate the development of a Community of Practice of faculty conducting engineering education research
RREE Approach

Theory
(study grounded in theory/conceptual framework)

Research that makes a difference . . . in theory and practice

Research
(appropriate design and methodology)

Practice
(implications for teaching)

http://inside.mines.edu/research/cee/ND.htm

Research can be inspired by ...

<table>
<thead>
<tr>
<th>Understanding (Basic)</th>
<th>Use (Applied)</th>
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</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Pure basic research (Bohr)</td>
</tr>
<tr>
<td>No</td>
<td>Pure applied research (Edison)</td>
</tr>
</tbody>
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Guiding Principles for Scientific Research in Education

1. **Question**: pose *significant* question that can be investigated *empirically*
2. **Theory**: link research to relevant theory
3. **Methods**: use methods that permit direct investigation of the question
4. **Reasoning**: provide coherent, explicit chain of reasoning
5. **Replicate and generalize** across studies
6. **Disclose** research to encourage professional scrutiny and critique

*National Research Council, 2002*

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**Research Process**

![Diagram of the research process](image)
Follow-up proposal has been awarded (RREE2)

- Includes a series of 5 short courses*
  - Fundamentals of Engineering Education Research
  - Selecting Conceptual Frameworks
  - Understanding Qualitative Research
  - Designing Your Research Study
  - Collaborating with Learning and Social Scientists

*To be recorded and posted on the CLEERhub.org

http://cleerhub.org
Engineering Education Research Networking Session
Connecting Engineering Education
Research Programs from Around the World

sponsored by the
ASEE International Division

in partnership with
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CLEERhub.org
And the Journal of Engineering Education

ASEE Annual Conference – June 22, 2010 – Session 2123
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ASEE 2010 – EER PhD Program Briefings

• Utah State University - Kurt Becker
• Purdue University - David Radcliffe & Robin Adams
• Universidad de las Americas, Puebla, Mexico - Enrique Palou
• Virginia Tech - Maura Borrego
• Universiti Teknologi Malaysia - Zaini Ujang
• Clemson University - Lisa Benson
• NITTTRs - India - R. Natarajan
• Arizona State University - Tirupalavanam Ganesh & Chell Roberts
• University of Washington - Cindy Atman
• Ohio State University - Lisa Abrams
• Carnegie Mellon University - Paul Steif
• University of Michigan - Cindy Finelli
• Washington State University - Denny Davis
• University of Georgia - Nadia Kellam & Joachim Walther
• Michigan State University - Jon Sticklen
• University of Colorado - Boulder - Daria Kotys-Schwartz

Session slides and links to programs posted to CLEERhub.org
We have set out to trace the current landscape of engineering education research programs. The emergence of many new programs globally as well as the success of recent EER Ph.D.s and faculty provide evidence that the community is no longer marginalized but is heading toward mainstream acceptance. Exciting opportunities await us to build knowledge that will make a difference in engineering education curricula and pedagogy.


There is growing acceptance of discipline-based education as a valuable research enterprise, on the same level as research into, say, mechanical engineering or organic chemistry. Evidence of innovative ways that discipline-based education programs are taking root in higher education include the establishment of cross-disciplinary departments in science, technology, and engineering education. These departments bring together faculty whose research area is education, who can tackle large-scale problems across the curriculum in addition to discipline-specific research projects.


http://www7.nationalacademies.org/bose/DBER_Homepage.html
# Participant Networking

## Engineering/STEM Education Graduate Programs

- Arizona State University
- University of California-Berkeley
- Clemson University
- University of Cincinnati
- University of Kentucky
- Linkoping University (Sweden)
- University of Minnesota
- The College of New Jersey
- Niagara University
- North Carolina State University
- Old Dominion University
- The Ohio State University
- Purdue University
- Tufts University
- Universidad de las Americas Puebla (Mexico)
- Universiti Teknologi Malaysia
- Uppsala University (Sweden)
- Utah State University
- Virginia Tech
- The Ohio State University
- Purdue University
- Tufts University
- Universidad de las Americas Puebla (Mexico)
- Universiti Teknologi Malaysia
- Uppsala University (Sweden)
- Utah State University
- Virginia Tech
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- Universidad de las Americas Puebla (Mexico)
- Universiti Teknologi Malaysia
- Uppsala University (Sweden)
- Utah State University
- Virginia Tech

## Participant Networking

### Engineering Education-Related Certificate Programs

- Arizona State University
- Boise State University
- Clemson University
- Michigan State University
- University of Michigan
- North Carolina State University
- Virginia Tech
- Wichita State University
- Old Dominion University
- The Ohio State University
- Purdue University
- Tufts University
- Universidad de las Americas Puebla (Mexico)
- Universiti Teknologi Malaysia
- Uppsala University (Sweden)
- Utah State University
- Virginia Tech
Participant Networking

Innovative Engineering and Inter/Cross-Disciplinary Programs

- Aalborg University (Denmark)
- Carnegie Mellon University
- North Dakota State University
- Stony Brook University
- Texas A&M University
- University of Georgia
- University of Washington


Participant Networking Activity (~60 min)

- Introductions with Guided Format
- Four (~10 min) Conversations in Groups of 2-3
  - Your Name & Organization
  - Status of EER Center or PhD Program/Interest in EER
  - 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 9 min and twice after 10 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 ASEE conference and beyond
  – EER Networks - CLEERhub, REEN, SEFI
  – Meet again at FIE Conference, October, 2011
Acknowledgement

• We acknowledge the National Science Foundation for funding Karl Smith and Ruth Streveler’s participation (DUE 0817461)
  – COLLABORATIVE RESEARCH: Expanding and sustaining research capacity in engineering and technology education: Building on successful programs for faculty and graduate students
• And the ASEE ERM Division and JEE for Sponsoring

Thank you!

An e-copy of this presentation will be posted to: http://CLEERhub.org