Engineering Education Research Networking Session

Connecting and Expanding the Engineering Education Research (EER) and Engineering Education Innovation (EEI) Communities

Special Session F3B in partnership with the
Rigorous Research in Engineering Education Initiative
(DUE 0817461)
CLEERhub.org

ASEE/IEEE Frontiers in Education Conference – October 14, 2011 – F3B – 2:30 pm – 4:00 pm

Facilitated By

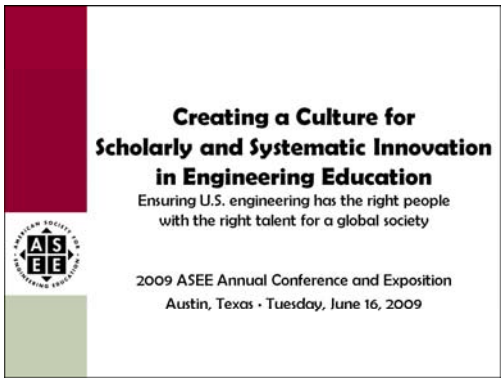
Karl A. Smith
Purdue University and
University of Minnesota

Ruth A. Streveler
Purdue University

Qaiser Malik
Purdue University

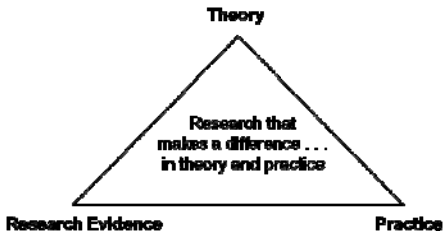
Activity	Time Allotted
Introduction of session and facilitators	10
Brief report on status of RREE project and NAE FOEE	
Update on CLEERHub.org (Collaboratory for Engineering Education Research	10
Update on EER workshops and JEE collaboration	5
Update on EEI – NAE FOEE & NSF TUES	10
Participant Networking	
Rapid introductions around guided questions – Four to five conversations in groups of 3 – as a way to meet many people	25
Identification of "intellectual neighborhoods" around research and innovation questions and opportunities – individual reflection and writing	5
Brainstorming on strategies to connect, expand, and sustain the emerging EER and EEI communities	15
Summary of ideas for (1) local, (2) national – conferences, etc. and (3) virtual community	5
Individuals share reflections with the large group, facilitators sum up the session and participants complete feedback forms	10

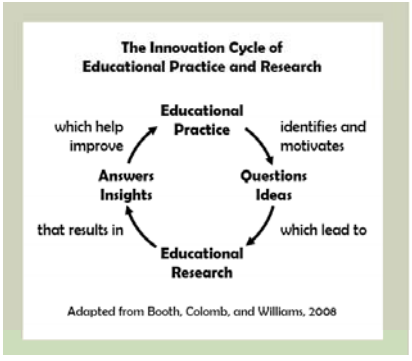
Celebration of Two Major ASEE Milestones



2011 ASEE Annual Conference and Exposition
Vancouver, British Columbia • Monday, June 27, 2011

One BIG Idea; Two Perspectives





Jamieson & Lohmann (2009)

Engineering Education Innovation

ASEE Main Plenary, 8:45 a.m. – 10:15 a.m.
Vancouver International Conference Centre, West Ballroom CD
Expected to draw over 2,000 attendees, this year's plenary features Karl A. Smith, Cooperative Learning Professor of Engineering Education at Purdue University and Morse–Alumni Distinguished Teaching Professor & Professor of Civil Engineering at the University of Minnesota.
Smith has been at the University of Minnesota since 1972 and has been active in ASEE since he became a member in 1973. For the past five years, he has been helping start the engineering education Ph.D. program at Purdue University. He is a Fellow of the American Society for Engineering Education and past Chair of the Educational Research and Methods Division. He has worked with thousands of faculty all over the world on pedagogies of engagement, especially cooperative learning, problem-based learning, and constructive controversy.
On the occasion of the 100th anniversary of the Journal of Engineering Education and the release of ASEE's Phase II report *Creating a Culture for Scholarly and Systematic Innovation in Engineering Education* (Jamieson/Lohmann report), the plenary will celebrate these milestones and demonstrate rich, mutual interdependences between practice and inquiry into teaching and learning in engineering education. Depth and range of the plenary will energize the audience and reflects expertise and interests of conference participants. One of ASEE's premier educators and researchers, Smith will draw upon our roots in scholarship to set the stage and weave the transitions for six highlighted topics selected for their broad appeal across established, evolving, and emerging practices in engineering education.

Highlights from Monday:

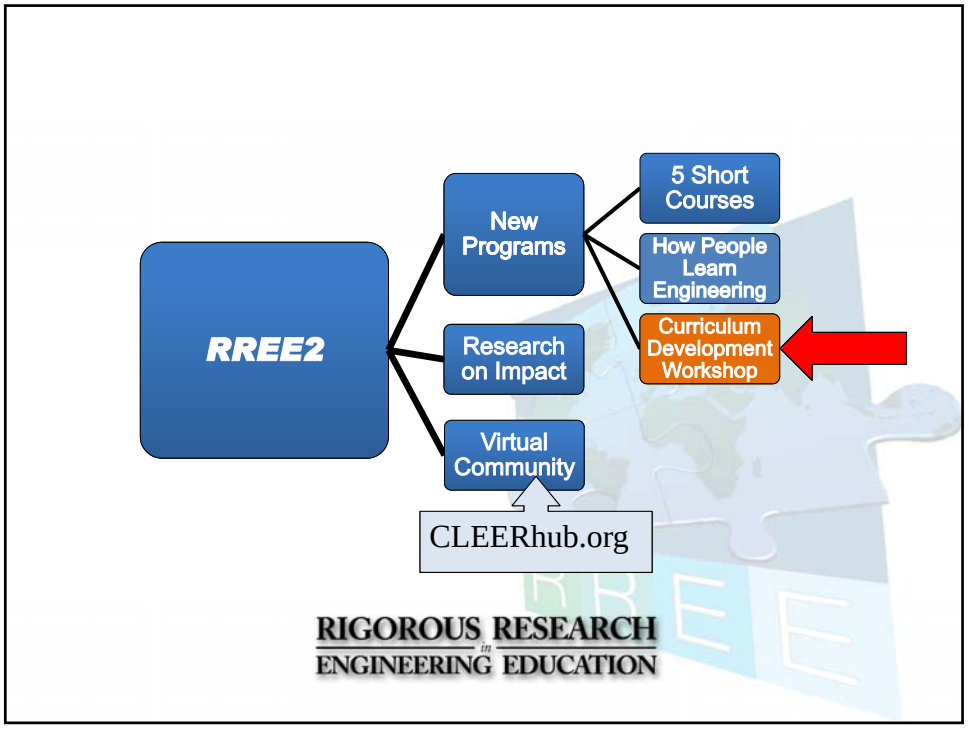
Monday's **Main Plenary** by Karl A. Smith, Cooperative Learning Professor of Engineering Education at Purdue University and Morse-Alumni Distinguished Teaching Professor & Professor of Civil Engineering at the University of Minnesota, focused on six highlighted topics (presented by six different educators) selected for their broad appeal across established, evolving, and emerging practices in engineering education.

Video: https://secure.vimeo.com/27147996
Slides: http://www.ce.umn.edu/~smith/links.html
http://www.asee.org/conferences-and-events/conferences/annual-conference/2011/program-schedule/conference-highlights

RREE
RIGOROUS RESEARCH in ENGINEERING EDUCATION
Funded by the National Science Foundation through awards DUE 0341127 and DUE 0817461

Expanding and sustaining research capacity in engineering and technology education: Building on successful programs for faculty and graduate students

Collaborative partners: Purdue (lead), Alverno College, Colorado School of Mines, Howard University, Madison Area Technical College, National Academy of Engineering


RREE2
New Programs
Research on Impact
Virtual Community
5 Short Courses
How People Learn Engineering
Curriculum Development Workshop
CLEERhub.org
RIGOROUS RESEARCH in ENGINEERING EDUCATION


CLEERHUB
Collaboratory for Engineering Education Research
Welcome to CLEERhub.org!
Getting Started in Educational Research
Guide Books
Rigorous Research in Engineering Education
Collaborate
Workshops

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*

ASEE Annual Conference – June 20, 2010 – Session 0230

Ruth A.Streveler
Purdue University

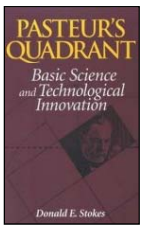
Karl A. Smith
Purdue University and
University of Minnesota

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

Source: Streveler, R., Borrego, M. and Smith, K.A. 2007. Moving from the "Scholarship of Teaching and Learning" to "Educational Research:" An Example from Engineering. *Improve the Academy,* Vol. 25, 139-149.

Research can be inspired by …



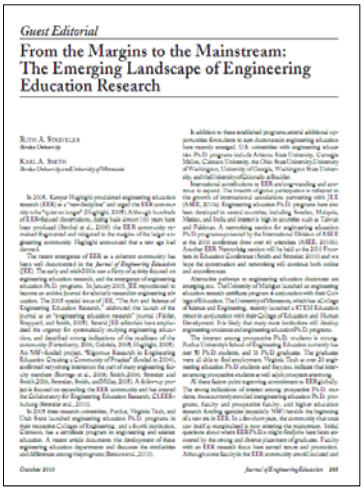
Understanding (Basic)	Use (Applied): No	Use (Applied): Yes
Yes	Pure basic research (Bohr)	Use-inspired basic research (Pasteur)
No		Pure applied research (Edison)

Source: Stokes, D. 1997. Pasteur's quadrant: Basic science and technological innovation. Washington, DC: Brookings Institution.

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



Guest Editorial

From the Margins to the Mainstream: The Emerging Landscape of Engineering Education Research

RUTH A. STREVELER
Purdue University

KARL A. SMITH
Purdue University and University of Minnesota

Streveler, R.A. & Smith, K.A. 2010. From the Margins to the Mainstream: The Emerging Landscape of Engineering Education Research. *Journal of Engineering Education*, 99(4), 285-287.

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.

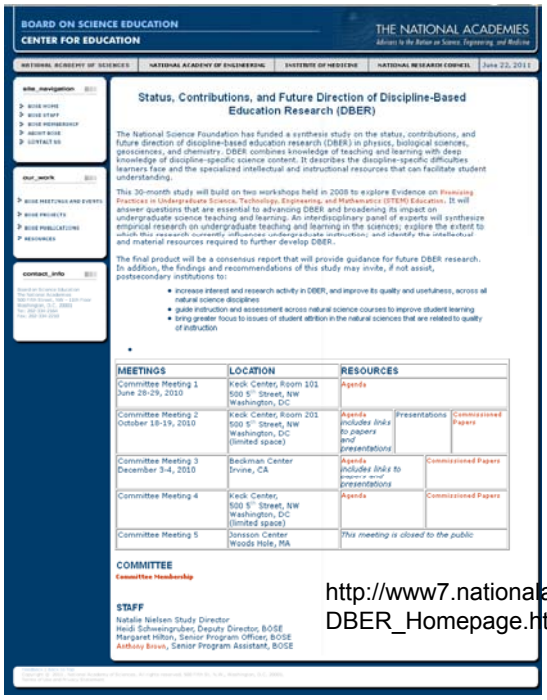
http://www.asee.org/papers-and-publications/publications/jee

Engineering Education: Departments, Degrees and Directions*

LISA C. BENSON,[1] KURT BECKER,[2] MELANIE M. COOPER,[3] O. HAYDEN GRIFFIN[4] and KARL A. SMITH[5]
[1] *Department of Engineering and Science Education, Clemson University, Clemson, SC 29634, USA E-mail: lbenson@eces.clemson.edu*
[2] *Department of Engineering and Technology Education, Utah State University, 4000 Old Main Hill, Logan, UT 84322-4000, USA*
[3] *Department of Engineering, College of Technology and Computer Science, East Carolina University, Greenville, NC 27858-4353 USA*
[4] *School of Engineering Education, Purdue University, West Lafayette, IN 47907, USA*

Benson, L.C., Becker, K., Cooper, M.M., Griffin, O.H. & Smith, K.A. 2010. Engineering Education: Departments, Degrees and Directions. *Int. J. Engng Ed.* Vol. 26, No. 5, pp. 1042–1048.

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

Emphasis on Innovation

- NSF TUES (CCLI) PI Meeting
  - TUES (Transforming Undergraduate Education in STEM)
  - Myles Boylan presentation
  - Carl Wieman presentation – White House – Office of Science and Technology Policy
  - http://ccliconference.org/meetings/2011-tues-conference/
- NAE Frontiers of Engineering Education (FOEE)
  - http://www.nae.edu/Activities/Projects20676/CASEE/26338/35816/FOEE.aspx

16

The Federal Environment for STEM Education Programs: Implications for TUES

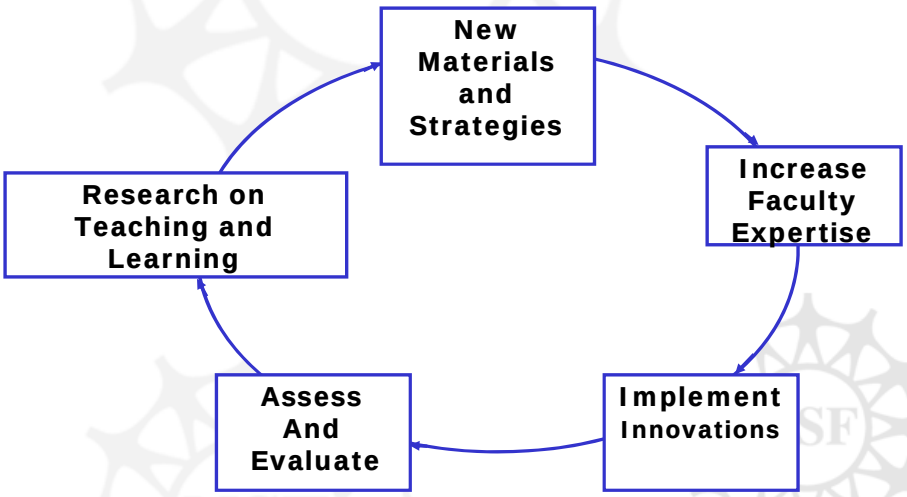
& Some of your suggestions

Myles Boylan
Division of Undergraduate Education
National Science Foundation

CCLI PI Meeting January 28, 2011

17

Cyclic Model for Creating Knowledge and Improving Practices in STEM Education



18

Engineering Education Research Networking Session

Connecting Engineering Education Research Programs from Around the World

sponsored by the
ASEE International Division

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

ASEE Annual Conference – June 22, 2010 – Session 2123

Facilitated By

Karl A. Smith
Purdue University and University of Minnesota

Ruth A. Streveler
Purdue University

Jack Lohmann
Georgia Tech

Satish Udpa
Michigan State University

Hans Hoyer
ASEE

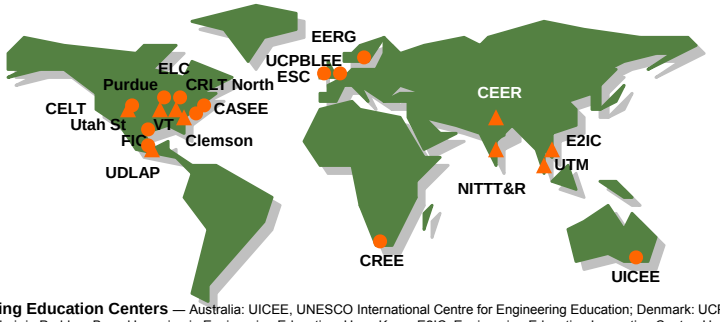
Stephanie Eng
ASEE

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

Groups, centers, departments…



Engineering Education Centers — Australia: UICEE, UNESCO International Centre for Engineering Education; Denmark: UCPBLEE, UNESCO Chair in Problem Based Learning in Engineering Education; Hong Kong: E2IC, Engineering Education Innovation Center, Hong Kong University of Science and Technology; Pakistan: Center for Engineering Education Research, NUST, National University for Science and Technology; South Africa: CREE, Centre for Research in Engineering Education, U of Cape Town; Sweden: Engineering Education Research Group, Linköping U; UK: ESC, Engineering Subject Centre, Higher Education Academy; USA: CELT, Center for Engineering Learning and Teaching, U of Washington; CRLT North, Center for Research on Learning and Teaching, U of Michigan; Faculty Innovation Center, U of Texas-Austin; Engineering Learning Center, U of Wisconsin-Madison; CASEE, Center for the Advancement of Scholarship in Engineering Education, National Academy of Engineering.

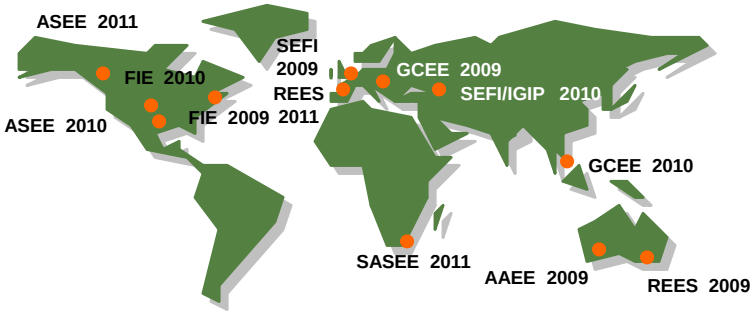
Engineering Education Degree-granting Departments — USA: School of Engineering Education, Purdue U; Department of Engineering Education, Virginia Tech; Department of Engineering and Science Education, Clemson U; Department of Engineering and Technology Education, Utah State U; Malaysia: Engineering Education PhD program, Universiti Teknologi Malaysia; India: National Institute for Technical Teacher Training and Research; Mexico: Universidad de las Americas, Puebla

Engineering education societies…

Societies with Engineering Education Research Groups — ASEE, American Society for Engineering Education, Educational Research Methods Division; SEFI, Société Européenne pour la Formation des Ingénieurs (European Society for Engineering Education), Engineering Education Research Working Group; Australasian Association for Engineering Education, Engineering Education Research Working Group; Community of Engineering Education Research Scholars, Latin America and Caribbean Consortium for Engineering Institutions

Societies with Engineering Education Research Interests — Indian Society for Technical Education, Latin American and Caribbean Consortium of Engineering Institutions, Asociación Nacional de Facultades y Escuelas de Ingeniería (National Association of Engineering Colleges and Schools in Mexico), Internationale Gesellschaft für Ingenieurpädagogik (International Society for Engineering Education), International Federation of Engineering Education Societies, South African Engineering Education Association (SASEE)

Forums for dissemination…



Conferences with engineering education research presentations:

- **ASEE** — Annual Conference, American Society for Engineering Education, see www.asee.org
- **AAEE** — Annual Conference, Australasian Association for Engineering Education, see www.aaee.com.au
- **FIE** — Frontiers in Education, sponsored by ERM/ASEE, IEEE Education Society and Computer Society, /fie-conference.org/erm
- **GCEE** — Global Colloquium on Engineering Education, sponsored by ASEE and local partners where the meeting is held, see www.asee.org
- **SEFI** — Annual Conference, Société Européenne pour la Formation des Ingénieurs , see www.sefi.be
- **REES** — Research on Engineering Education Symposium, rees2009.pbwiki.com/
- **SASEE** – South African Society for Engineering Education,

Engineering Education Research Networking Session

Connecting and Expanding the Engineering Education Research Community

Special Session in partnership with the
Rigorous Research in Engineering Education Initiative
(DUE 0817461)
CLEERhub.org

ASEE/IEEE Frontiers in Education Conference – October 29, 2010 – F3B – 4:30 pm – 6:00 pm

Facilitated By

Karl A. Smith
Purdue University and
University of Minnesota

Ruth A. Streveler
Purdue University

Qaiser Malik
Purdue University

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 – M722A – 6:00 pm – 8:00 pm

Facilitated By

Karl A. Smith
Purdue University and
University of Minnesota

Jack Lohmann
Georgia Tech

Ruth A. Streveler
Purdue University

Jeff Froyd
Texas A&M

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**

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

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

http://engineeringeducationlist.pbworks.com/w/page/27610307/Engineering-Education-Degree-and-Certificate-Programs

Participant Networking Activity (~25 min)

- Introductions with Guided Format
- Three (~8 min) Conversations in Groups of 2-3
  - Your Name & Organization
  - Status of EER 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 Networks – CLEERhub, REEN, SEFI**
  - **Meet again at ASEE Conference, June, 2012**

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/IEEE Frontiers in Education Conference for hosting

Thank you!

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

ASEE/IEEE Frontiers in Education Conference – October 14, 2011 – F3B – 2:30 pm – 4:00 pm

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Karl A. Smith
Purdue University and
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Ruth A. Streveler
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Qaiser Malik
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