

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

ASEE Headquarters Session T106E in partnership with the
 Rigorous Research in Engineering Education Initiative
 (DUE 0817461)
<http://CLEERhub.org>

ASEE Annual Conference – June 25, 2013 – T106E – 7:00 am – 8:30 am

Facilitated By

Karl A. Smith
 Purdue University and
 University of Minnesota

Ruth A. Streveler
 Purdue University

Slides posted - <http://www.ce.umn.edu/~smith/links.html>

Activity	Time Allotted
Introduction of session and facilitators	5
Brief report on status of EER & EEI	
Update on RREE – CLEERHub.org (Collaboratory for Engineering Education Research), AERA, Featured Resources (Ruth); RREE network (Krishna Madhavan)	10
Updates - NRC DBER practitioner guide (Karl), ASEE (Norman Fortenberry or Rocio Chavela), JEE (Michael Loui), NAE (Beth Cady), EER Taxonomy (Cindy Finelli), EER Networkshop (Becky Bates and Lisa Benson), EER Website (Adam Carberry and Ken Yasuhara)	35
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	10



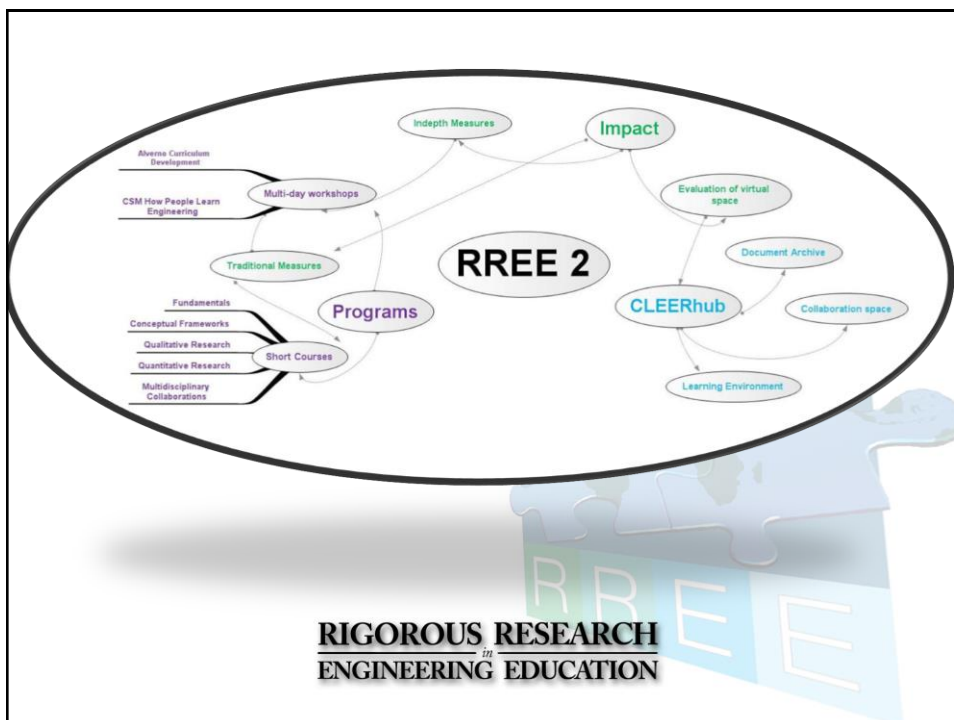
**RIGOROUS
RESEARCH**
in
**ENGINEERING
EDUCATION**

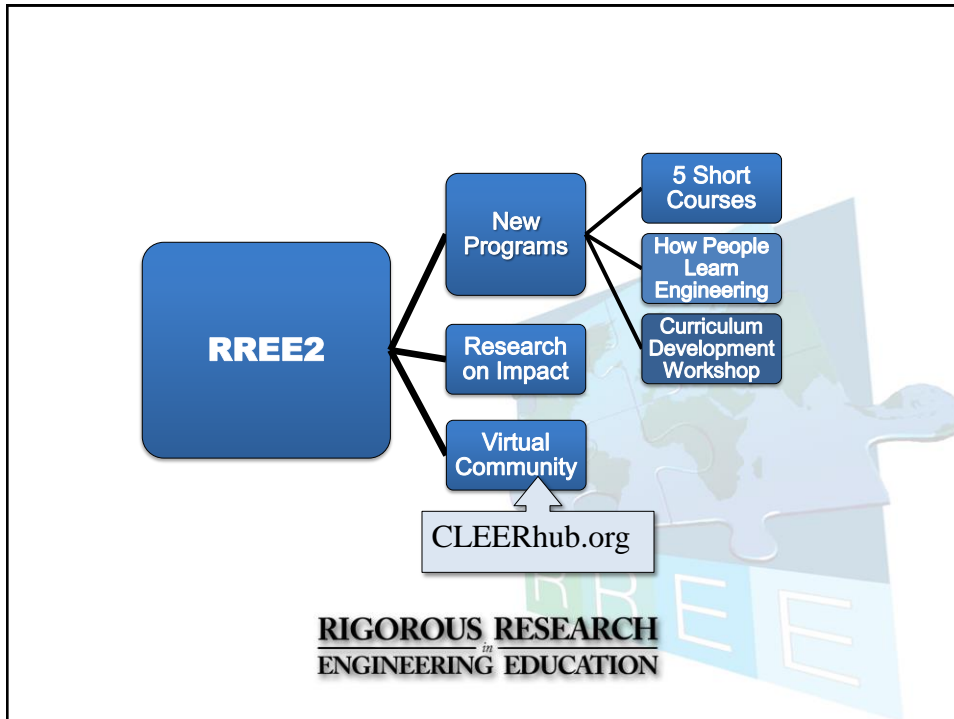


Funded by the
National Science Foundation
through awards DUE 0341127
and DUE 0817461

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

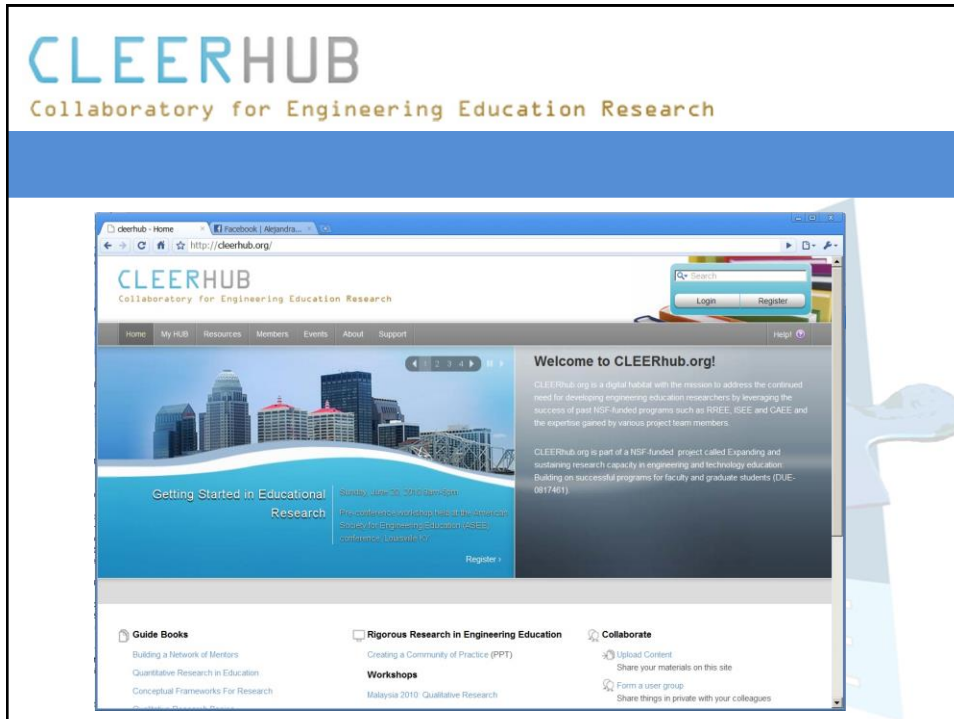
*Collaborative partners: Purdue (lead),
Alverno College, Colorado School of
Mines, Howard University, Madison
Area Technical College, National
Academy of Engineering*





New Research Venue for EER

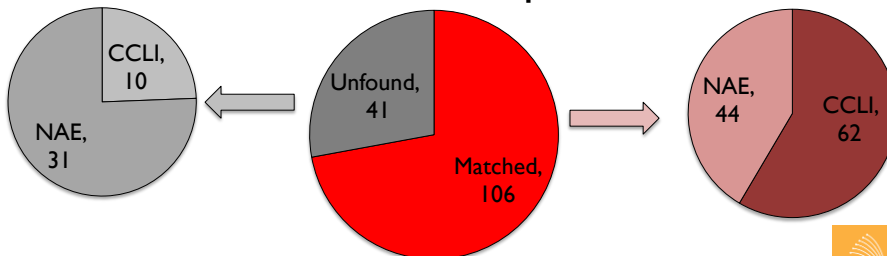
- American Educational Research Association (AERA) www.aera.net
 - Division C – Learning and Instruction
 - Section E- Engineering and Computer Science Education
- Important Dates
 - Annual conference - April 3-4, 2014, Philadelphia
 - Submission Deadline – July 22, 11:59pm PT
 - Note that submissions for AERA are very different than for ASEE. Read the call for submissions for details.



Dataset

2003-2012
21 Journal and Conf. Publications
25,225 Documents
26,985 Authors

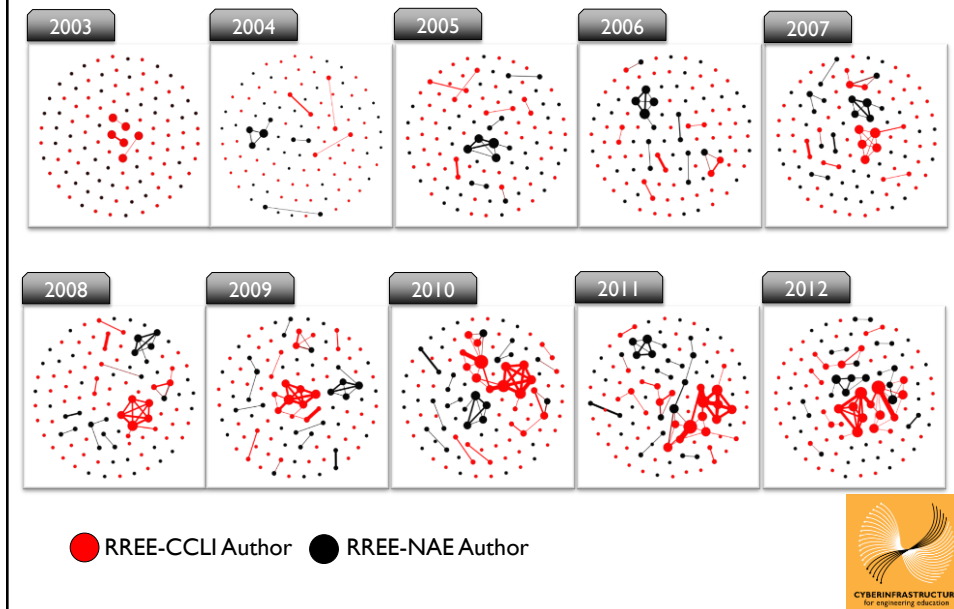
147 RREE Participants



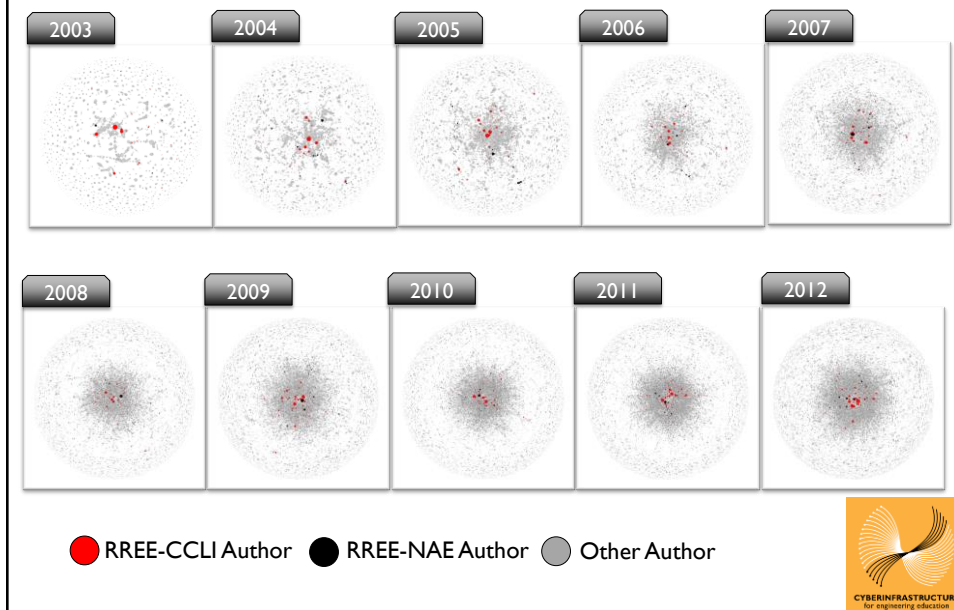
Krishna Madhavan

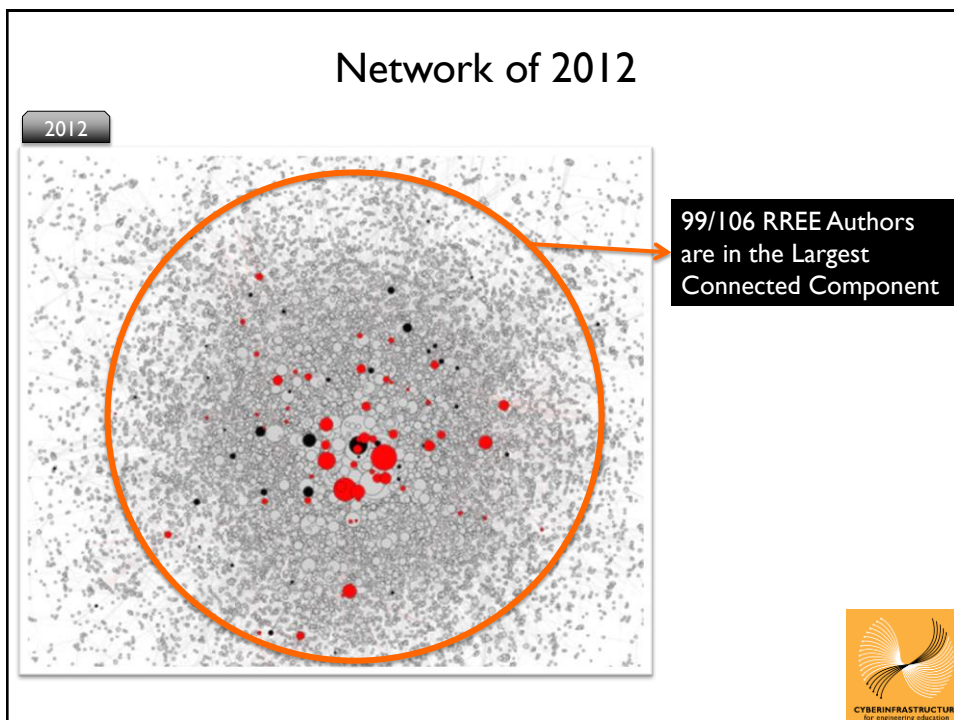
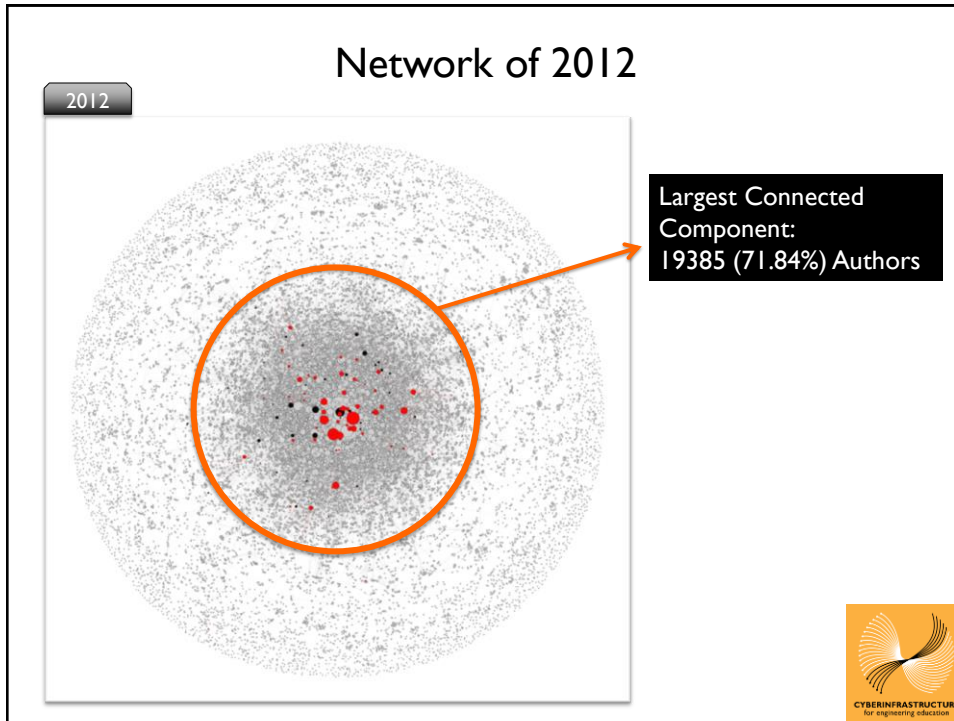


RREE Authors Collaboration

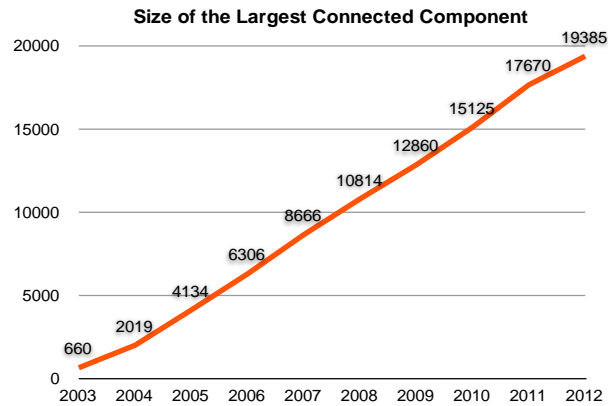


RREE Authors Highlighted in Overall Networks

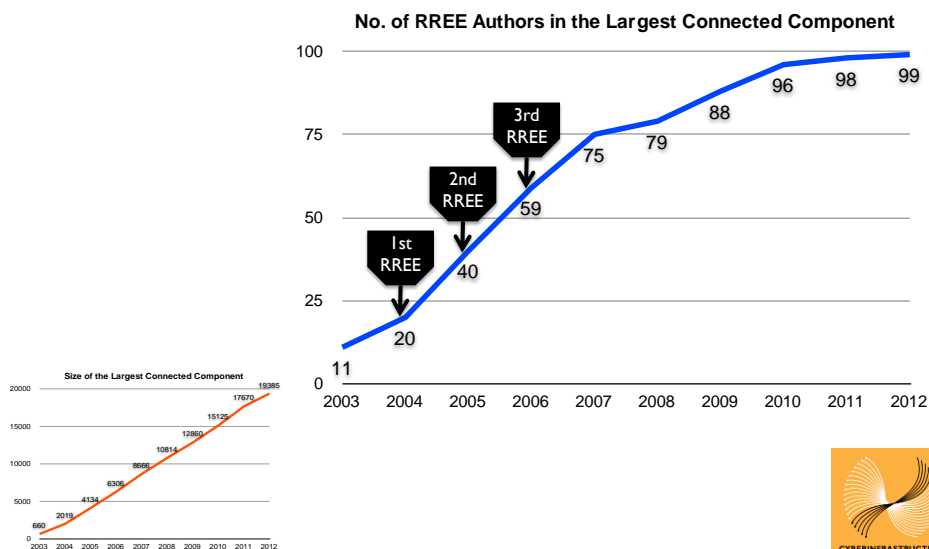




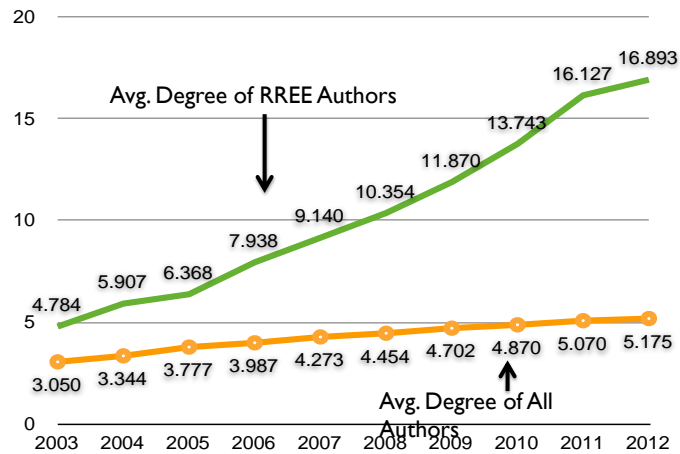
Size of the Largest Connected Component Growing over the Years



Size of the Largest Connected Component Growing over the Years



Average Degree of Authors

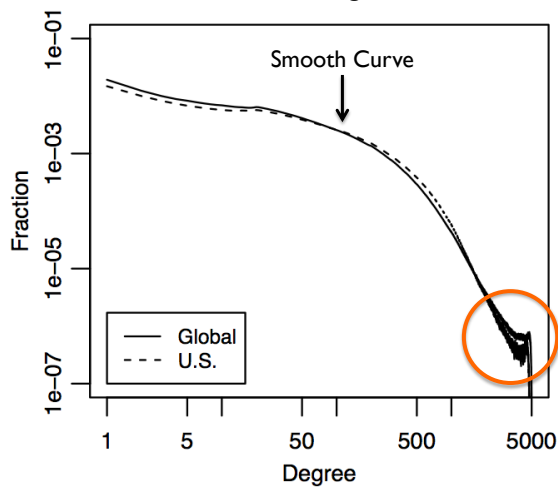


Degree: The number of links each node (author) in a network has.



Degree Distribution

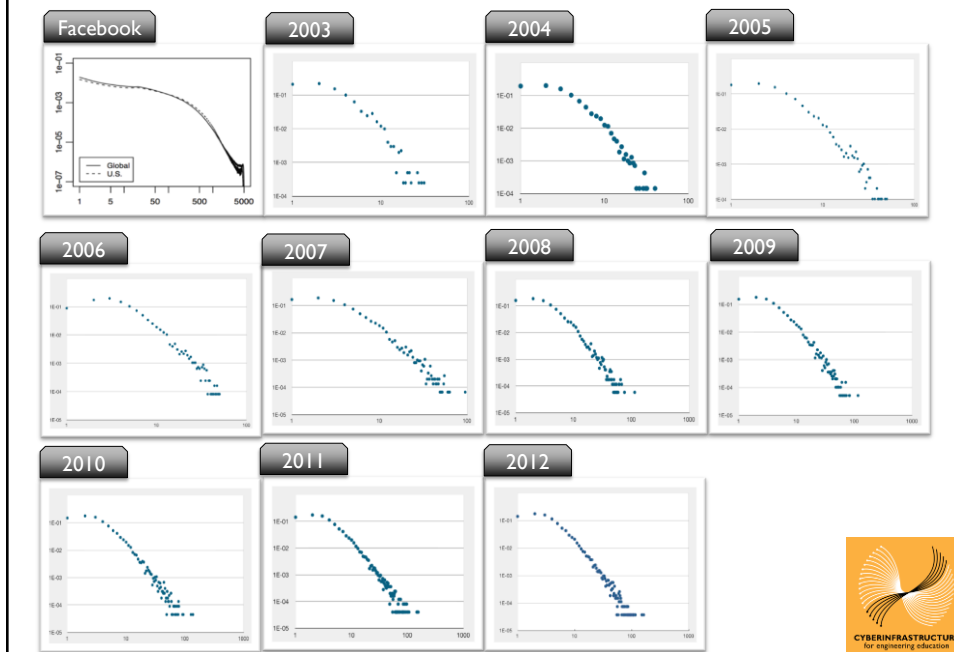
Facebook Network Degree Distribution



Ugander, Johan, Karrer, Brian, Backstrom, Lars, & Marlow, Cameron.
(2011). The anatomy of the Facebook social graph. arXiv:1111.4503v1



Degree Distribution



Discipline-Based Education Research (DBER) Report Update



Discipline-Based
Education Research

Practitioner Guide

In Preparation
Coming 2014


ASEE Prism Summer 2013

National Research Council
Summer 2012 – http://www.nap.edu/catalog.php?record_id=13362

SCIENCE EDUCATION AT THE NATIONAL RESEARCH COUNCIL
www.nationalacademies.org/bose

Discipline-Based Education Research (DBER)

Understanding and Improving Learning in Undergraduate Science and Engineering



http://www.nap.edu/catalog.php?record_id=13362

Undergraduate Science and Engineering Education: Goals

- Provide all students with foundational knowledge and skills
- Motivate some students to complete degrees in science or engineering
- Support students who wish to pursue careers in science or engineering

Undergraduate Science and Engineering Education: Challenges and Opportunities

- Retaining students in courses and majors
- Increasing diversity
- Improving the quality of instruction

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What is Discipline-Based Education Research?

- Emerging from various parent disciplines
- Investigates teaching and learning in a given discipline
- Informed by and complementary to general research on human learning and cognition

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Study Charge

- Synthesize empirical research on undergraduate teaching and learning in physics, chemistry, engineering, biology, the geosciences, and astronomy.
- Examine the extent to which this research currently influences undergraduate science instruction.
- Describe the intellectual and material resources that are required to further develop DBER.

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Committee on the Status, Contributions, and Future Directions of Discipline-Based Education Research

- **SUSAN SINGER** (Chair), Carleton College
- **ROBERT BEICHNER**, North Carolina State University
- **STACEY LOWERY BRETZ**, Miami University
- **MELANIE COOPER**, Clemson University
- **SEAN DECATUR**, Oberlin College
- **JAMES FAIRWEATHER**, Michigan State University
- **KENNETH HELLER**, University of Minnesota
- **KIM KASTENS**, Columbia University
- **MICHAEL MARTINEZ**, University of California, Irvine
- **DAVID MOGK**, Montana State University
- **LAURA R. NOVICK**, Vanderbilt University
- **MARCY OSGOOD**, University of New Mexico
- **TIMOTHY F. SLATER**, University of Wyoming
- **KARL A. SMITH**, University of Minnesota and Purdue University
- **WILLIAM B. WOOD**, University of Colorado

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Structure of the Report

- Section I. Status of Discipline-Based Education Research
- Section II. Contributions of Discipline-Based Education Research
- Section III. Future Directions for Discipline-Based Education Research

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Section I. Status of Discipline-Based Education Research

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Status of DBER: Goals

- Understand how people learn the concepts, practices, and ways of thinking of science and engineering.
- Understand the nature and development of expertise in a discipline.
- Help to identify and measure appropriate learning objectives and instructional approaches that advance students toward those objectives.
- Contribute to the knowledge base in a way that can guide the translation of DBER findings to classroom practice.
- Identify approaches to make science and engineering education broad and inclusive.

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Status of DBER: Types of Knowledge Required To Conduct DBER

- Deep disciplinary knowledge
- The nature of human thinking and learning as they relate to a discipline
- Students' motivation to understand and apply findings of a discipline
- Research methods for investigating human thinking, motivation, and learning

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Status of DBER: Conclusions

- DBER is a collection of related research fields rather than a single, unified field. (Conclusion 1)
- High-quality DBER combines expert knowledge of:
 - a science or engineering discipline,
 - learning and teaching in that discipline, and
 - the science of learning and teaching more generally.(Conclusion 4)

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Section II. Contributions of Discipline-Based Education Research

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Contributions of DBER: Conceptual Understanding and Conceptual Change

- In all disciplines, undergraduate students have incorrect ideas and beliefs about fundamental concepts. (Conclusion 6)
- Students have particular difficulties with concepts that involve very large or very small temporal or spatial scales. (Conclusion 6)
- Several types of instructional strategies have been shown to promote conceptual change.

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Contributions of DBER: Problem Solving and the Use of Representations

- As novices in a domain, students are challenged by important aspects of the domain that can seem easy or obvious to experts. (Conclusion 7)
- Students can be taught more expert-like problem-solving skills and strategies to improve their understanding of representations.

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Contributions of DBER: Research on Effective Instruction

- Effective instruction includes a range of well-implemented, research-based approaches. (Conclusion 8)
- Involving students actively in the learning process can enhance learning more effectively than lecturing.

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Section III. Future Directions for Discipline-Based Education Research

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Future Directions for DBER: Translating DBER into Practice

- Available evidence suggests that DBER and related research have not yet prompted widespread changes in teaching practice among science and engineering faculty. (Conclusion 12)
- Efforts to translate DBER and related research into practice are more likely to succeed if they:
 - are consistent with research on motivating adult learners,
 - include a deliberate focus on changing faculty conceptions about teaching and learning,
 - recognize the cultural and organizational norms of the department and institution, and
 - work to address those norms that pose barriers to change in teaching practice. (Conclusion 13)

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Future Directions for DBER: Recommendations for Translating DBER Into Practice

- **RECOMMENDATION:** With support from institutions, disciplinary departments, and professional societies, faculty should adopt evidence-based teaching practices.
- **RECOMMENDATION:** Institutions, disciplinary departments, and professional societies should work together to prepare current and future faculty to apply the findings of DBER and related research, and then include teaching effectiveness in evaluation processes and reward systems throughout faculty members' careers. (Paraphrased)

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Future Directions for DBER: Advancing DBER through Collaborations

- Collaborations among the fields of DBER, and among DBER scholars and scholars from related disciplines, although relatively limited, have enhanced the quality of DBER. (Conclusion 15)

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Future Directions for DBER: Research Infrastructure

- Advancing DBER requires a robust infrastructure for research. (Conclusion 16)
- **RECOMMENDATION:** Science and engineering departments, professional societies, journal editors, funding agencies, and institutional leaders should:
 - clarify expectations for DBER faculty positions,
 - emphasize high-quality DBER work,
 - provide mentoring for new DBER scholars, and
 - support venues for DBER scholars to share their research findings

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Future Directions for DBER: Some Key Elements of a Research Agenda

- Studies of similarities and differences among different groups of students
- Longitudinal studies
- Additional basic research in DBER
- Interdisciplinary studies of cross-cutting concepts and cognitive processes
- Additional research on the translational role of DBER

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Acknowledgements

- National Science Foundation, Division of Undergraduate Education (Grant No. 0934453)
- Various volunteers:
 - Committee
 - Fifteen reviewers
 - Report Review Monitor (Susan Hanson, Clark University) and Coordinator (Adam Gamoran, University of Wisconsin-Madison)
- Commissioned paper authors
- NRC staff (Natalie Nielsen, Heidi Schweingruber, Margaret Hilton)

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STATUS, CONTRIBUTIONS, AND FUTURE DIRECTION OF DISCIPLINE-BASED EDUCATION RESEARCH (DBER)

The National Science Foundation has funded a synthesis study on the status, contributions, and future direction of discipline-based education research (DBER) in physics, biological sciences, geosciences, and chemistry. DBER combines knowledge of teaching and learning with deep knowledge of discipline-specific science content. It describes the discipline-specific difficulties learners face and the specialized intellectual and instructional resources that can facilitate student understanding.

This 20-month study will build on two workshops held in 2008 to explore Evidence on *Promising Practices in Undergraduate Science, Technology, Engineering, and Mathematics (STEM) Education*. It will answer questions that are essential to advancing DBER and broadening its impact on undergraduate science teaching and learning. An interdisciplinary panel of experts will synthesize empirical research on undergraduate teaching and learning in the sciences; explore the extent to which this research currently influences undergraduate instruction; and identify the intellectual and material resources required to further develop DBER.

The final product will be a consensus report that will provide guidance for future DBER research. In addition, the findings and recommendations of this study may invite, if not assist, postsecondary institutions to:

- increase interest and research activity in DBER, and improve its quality and usefulness, across all natural science disciplines
- guide instruction and assessment across natural science courses to improve student learning
- bring greater focus to issues of student attrition in the natural sciences that are related to quality of instruction

MEETINGS	LOCATION	RESOURCES
Committee Meeting 1 June 28-29, 2010	Krack Center, Room 101 500 5 th Street, NW Washington, DC	Agenda
Committee Meeting 2 October 18-19, 2010	Krack Center, Room 101 500 5 th Street, NW Washington, DC (limited space)	Agenda Includes links to papers and presentations
Committee Meeting 3 December 3-4, 2010	Beckman Center Irvine, CA	Agenda Includes links to papers and presentations
Committee Meeting 4	Krack Center, 500 5 th Street, NW Washington, DC (limited space)	Agenda Commissioned Papers
Committee Meeting 5	Jonsson Center Woods Hole, MA	This meeting is closed to the public

COMMITTEE

Committee Membership

STAFF

Natalie Nielsen Study Director

Heidi Schwenghuber, Deputy Director, BOSE

Margaret Hillen, Senior Program Officer, BOSE

Anthony Brown, Senior Program Assistant, BOSE

http://www7.nationalacademies.org/bose/DBER_Homepage.html

ASEE

AMERICAN SOCIETY FOR ENGINEERING EDUCATION

ASEE

Connecting and Expanding the Engineering Education Research and Innovation Communities

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Faculty Development Manager

American Society for Engineering Education

r.chavela@asee.org

June 25, 2013

21

National Science and Technology Council Committee on STEM Education

Five-year Strategic Plan:

“...identify and broaden implementation of **evidence-based** instructional practices and innovations to improve undergraduate **learning** and **retention** in STEM . . .”



Gathering Community Input



- **Transforming Undergraduate Engineering Education**

Phase I: An effort to understand desired knowledge, skills, and abilities sought in engineering undergraduates and to better define the curricular, co-curricular, and practice-based experiences that will enhance those KSAs. (May 9-10, 2013, Arlington, VA)

- **Understanding and Surmounting Impediments to Diversification**

Exploring the social, economic, political, and other impediments to implementing the recommendations that have been made for over four decades to enhance the participation of underrepresented minority populations in engineering.

(September 26-29, 2013, Washington, DC)

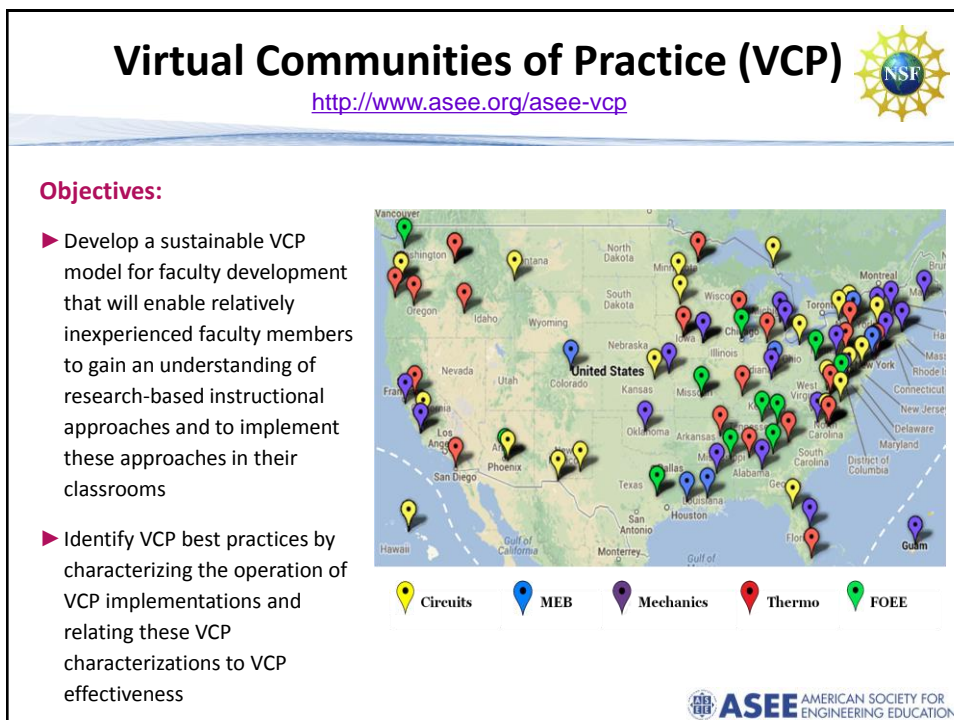
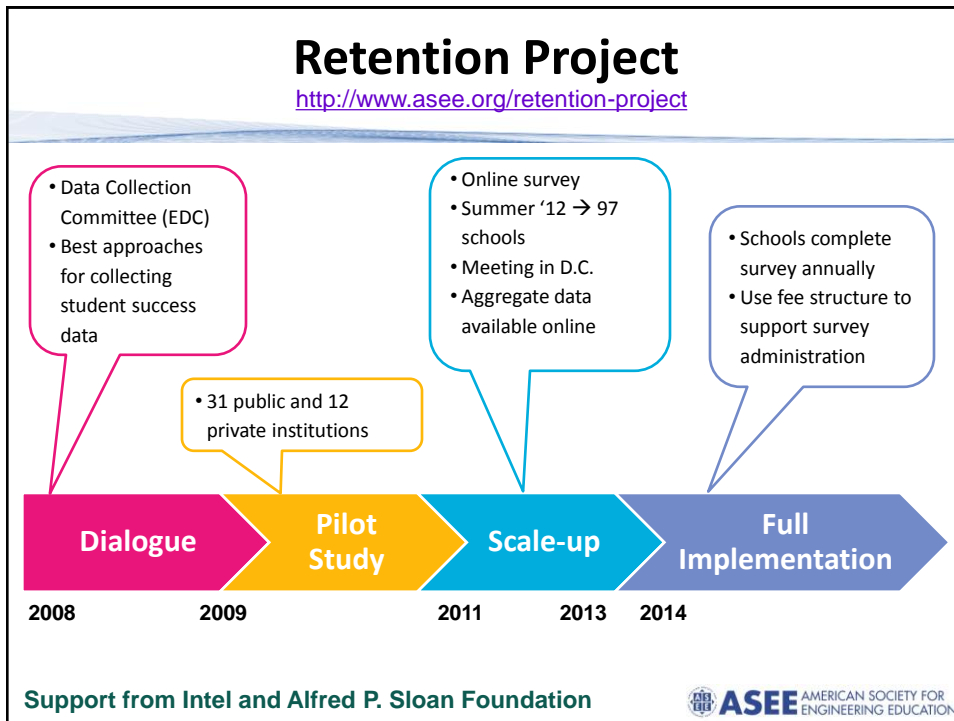
- **Transitioning Veterans to Engineering Related Careers**

What measures have to be taken and by which actors in order to enhance the participation and success of military veterans in careers in engineering and engineering technology?

(February 25, 2013, Washington, DC)

http://www.asee.org/Final_Report_-_Transitioning_Veterans_to_Engineering_Related_Careers.pdf





International Activities

- **2013 ASEE International Forum**

Saturday June 22, 2013

<http://www.asee.org/conferences-and-events/conferences/international-forum/2013/program>

- **2014 ASEE International Forum**

Join us in Indianapolis next year! Saturday June 14, 2013

- **2016 ASEE Global Colloquium**

Submission deadline: Friday, August 29, 2014

Proposals must be sent as a PDF document via email to aseeexec@asee.org

http://www.asee.org/conferences-and-events/conferences/2016_GC_Proposal_Guidelines.pdf



JOURNAL OF ENGINEERING EDUCATION

Michael Loui
Editor

JEE
JOURNAL OF ENGINEERING EDUCATION

THE
RESEARCH
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EDUCATION



JEE publishes original research on engineering education

- Articles should significantly advance knowledge about engineering education, with implications for practice or research
- Two kinds of articles: empirical investigations, research reviews
- Quantitative, qualitative, and mixed methods studies are welcome



JEE is now based at the University of Illinois at Urbana-Champaign



I thank the members of the JEE Editorial Board for their service

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Associate editors: Caroline Baillie, Maura Borrego, Sean Brophy, Alan Cheville, Ton de Jong, Elliot Douglas, Jenefer Husman, Jennifer Turns



ASEE now publishes JEE in partnership with John Wiley & Sons



Wiley handles

- Institutional subscriptions
- Typesetting, artwork
- Online access, search

ASEE members can access JEE at www.jee.org via asee.org login





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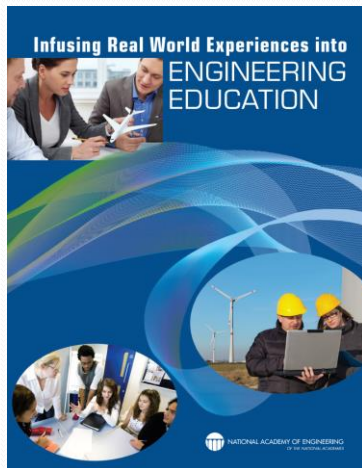
Engineering Education Research and Innovation Programs Update

Beth Cady, Program Officer, NAE
ecady@nae.edu

Frontiers of Engineering Education

- Fifth symposium will be held October 27-30, 2013
 - Nominations have closed
 - Applications due 6/28
- Brings together faculty who are developing innovative approaches in engineering education
- Creates a community to share knowledge, encourage collaboration, and promote dissemination of innovative practice in engineering education
- Opportunities to share work, get feedback on own educational approaches, and provide feedback to others
- Several opportunities to network with peers and with speakers and committee members

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

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[Educating Engineers: Preparing 21st Century Leaders in the Context of New Modes of Learning](#)

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Meetings & Events

- Annual Meetings
- Educating Engineers: Preparing 21st Century Leaders in the Context of New Modes of Learning**
- Media Room
- Fellowships

Educating Engineers: Preparing 21st Century Leaders in the Context of New Modes of Learning

Engineering education is changing in the United States and around the world. Forces include integration with new science, particularly nano-scale science and biology; increased emphasis on innovation and entrepreneurship to drive economic growth; accelerating speed, complexity and globalization of engineering functions; preparation of graduates to address the Grand Challenges; empowering a more diverse population of young American engineers; renewing a commitment to design and production; and developing new approaches to large-scale engineering systems that must engage society. As in all of higher education, there also are vast challenges such as declining financial support and equally vast opportunities such as the approaching tsunami of interactive on-line learning and massively open online courses.

What lies ahead? What are the ramifications for engineering schools? In this year's Forum, *Educating Engineers: Preparing 21st Century Leaders in the Context of New Modes of Learning*, an expert panel will explore many facets of these challenges and opportunities and offer guidance on the roles and responsibilities of 21st century engineering educators.

Panelists

- Ali Velshi, Chief Business Correspondent, CNN will moderate the panel.
- Anant Agarwal, President, edX and Professor, Massachusetts Institute of Technology
- Linda P. Katehi, Chancellor of University of California, Davis
- Salman Khan, Founder of the Khan Academy
- Richard K. Miller, President of Olin College
- Richard (Rick) Stephens, Senior Vice President for Human Resources and Administration, The Boeing Company
- Tuula Teeri, President, Aalto University, Finland

October 1, 2012
09:30 AM – 12:30 PM
 National Academy of Sciences Building
 2101 Constitution Ave. NW
 Washington, DC

Useful Links

- Educating Engineers: Preparing 21st Century Leaders in the Context of New Modes of Learning:**

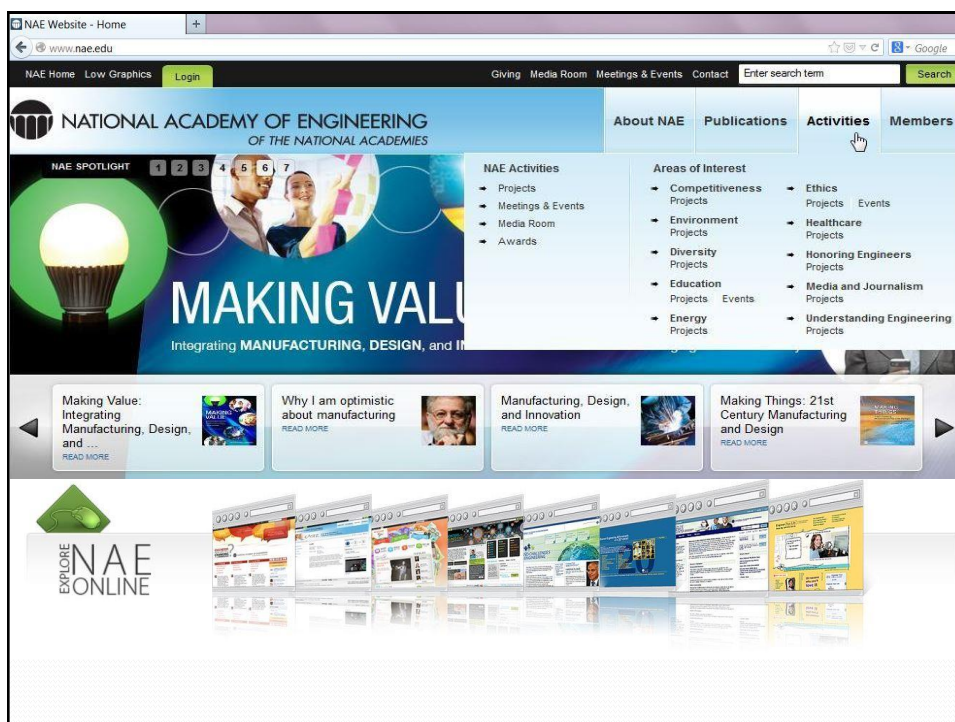
In response to integration with new science, particularly nanoscale science and biology; increased emphasis on innovation and entrepreneurship to drive economic growth.
- 2012 NAE Annual Meeting**
- Annual Meeting Video**

Educating Engineers: Welcome Video from the 2012 Forum

<https://www.nae.edu/Projects/Events/2012Events/62374.aspx>

Web-based Resources

- CASEE Website www.nae.edu/casee
 - Extensive set of research-to-practice documents, reports from CASEE projects, videos, and other resources
 - Equity-related resources at www.nae.edu/casee-equity
- **COMING SOON:** FOEE website (www.naefoee.org)
 - Will have a public side for links to presentations, directories, videos, and uploaded resources
 - Will also have a password-protected area for community members to allow for collaboration and resource-sharing
 - Will have both public and private social network components



www.onlineethics.org

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OEC News
2012-13 Ethics Video Winners
Congratulations to the winners of the 2012-2013 Ethics Video Challenge on Energy Ethics!

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Welcome to the Online Ethics Center (OEC). The Center for Engineering, Ethics and Society (CEES) at the National Academy of Engineering (NAE) manages the OEC. CEES and the OEC have benefited through generous grants from the National Science Foundation and support from NAE members, in particular Harry E. Boyer Jr. You can read more about the history of the OEC in the [About section](#).

What's on the OEC?

Resources by Type:

- [Cases and Scenarios](#) for use in classes, seminars, or research
- [Ethics Codes and Guidelines](#) from scientific and engineering professional societies
- [Teaching Tools](#) including Exercises and Assignments, Modules, and Syllabi
- [Annotated Bibliographies](#) of resources on various topics related to ethics in science and engineering
- [Evaluation Tools](#) and essays for evaluating the effectiveness of ethics education programs
- [Education Resources](#) including [Mentoring](#) resources, [Essays on Ethics Instruction](#), [Guides and Advice for Ethics Instructors](#), [Pre-College Materials](#) for teaching and course planning, and a [Glossary](#) of useful definitions in engineering and science ethics

Resources Collections on Topics:

- [Environment, Safety & Sustainability](#) which also includes focused collections on [Climate Change](#), [Engineered Systems and Society](#) and [Energy Ethics](#)
- [Professional Practice](#) that covers a range of engineering disciplines including civil, electrical and biomedical
- [Employment and Legal Issues](#) that focus on the ethical issues for employees, managers, and organizations
- [Responsible Research](#) that includes issues of research integrity and treatment of research subjects
- [Emerging Technologies](#) that focus generally as well as specifically on [Synthetic Biology and Genetic Engineering](#) and [Nanoscience and Nanotechnology](#) and [Computers and Information Technology](#)
- [Diversity Issues](#) that cover both issues in the workplace and in academia for under-represented groups

Projects by the NAE Center for Engineering, Ethics, and Society (CEES)

What's New?

Military Technologies

PBL Course

2012-13 Ethics Video Winners

Oaths & Pledges

Forums

OEC Forum
A moderated space for general informal comments, questions, and answers.

Synthetic Biology Points of View
Enter the discussion about synthetic biology. Add your comments to this forum to let us know what you think.

Announcements

Perspectives on the Responsibilities of Scientists and Engineers
The Ethics and Human Rights Working Group of the AAAS Science and Human Rights Coalition and the AAAS Program on Scientific Responsibility, Human Rights and Law invite scientists and engineers to complete a brief questionnaire aimed at identifying how they view their responsibilities. Queries about the questionnaire can be directed to Mark Frankel at mfFrankel@aaas.org.



Developing and Refining a Taxonomy for Engineering Education Research

Cindy Finelli
University of Michigan

cfinelli@umich.edu



Rationale for a Taxonomy

- Engineering education research is:
 - ◆ Broad-based
 - ◆ Rapidly-evolving
 - ◆ Diverse
 - ◆ Interdisciplinary, and
 - ◆ International
- We need a standardized terminology and organizational system to map and communicate research initiatives.



Audiences for the Taxonomy

- **Researchers and community members**
 - ◆ Situate individual research initiatives in the broader field
 - ◆ See connections with others
 - ◆ Plan future work
- **Funding agencies**
 - ◆ Classify research portfolios
 - ◆ Identify areas for capacity building, frame solicitations
 - ◆ Recruit reviewers for panels
- **Journal editors**
 - ◆ Organize related research or authors and readers
 - ◆ Create a reviewer database



Project Goals

1. Create a taxonomy that is:
 - ◆ A concise and comprehensive map for the field
 - ◆ A complete enough outline to describe any research initiative using four to six keywords
 - ◆ A useful tool for multiple audiences
 - ◆ Not an exhaustive list of every idea
2. Establish a process that is inclusive of the diverse national and international community



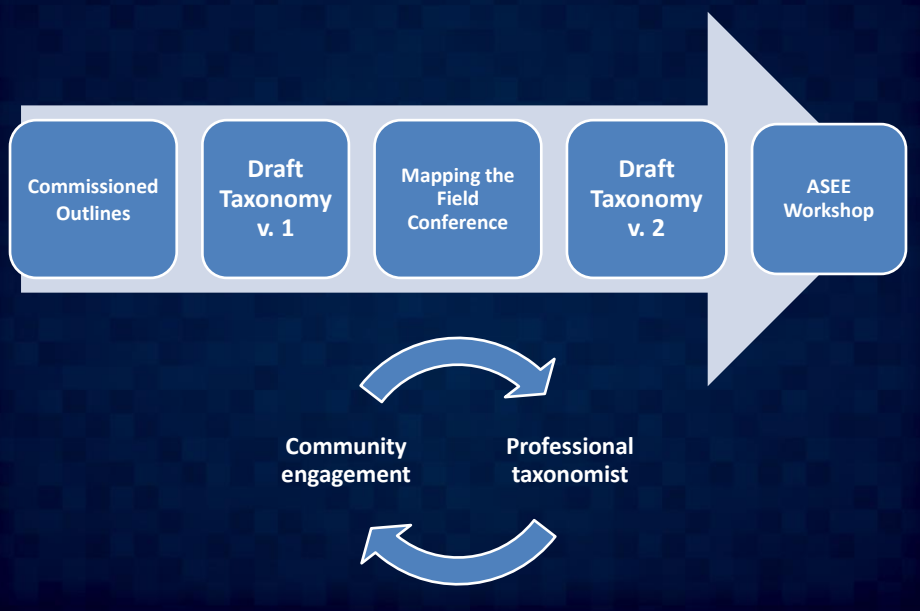
People Involved

- The Planning Committee
 - ◆ Cindy Finelli. U Michigan
 - ◆ Maura Borrego. Virginia Tech
 - ◆ Marjorie Hlava. Access Innovations
- The Advisory Board

◆ Stephanie Adams. Virginia Tech	◆ Euan Lindsay. Central Queensland University
◆ Cindy Atman. U Washington	◆ Tom Litzinger. Penn State
◆ Erik de Graaff. EJE & Aalborg University	◆ Michael Loui. JEE & U Illinois
◆ Jeff Froyd. IEEE Trans Ed & Texas A&M University	◆ David Radcliffe. Purdue
◆ Ahmad Ibrahim. IJEE	◆ Sheri Sheppard. Stanford
- 3 commissioned authors and 85 participants from across the world



Progress to Date



Draft Taxonomy v. 2


- 14 branches, 6 levels, 971 total terms

1. Assessment	2. Collaboration	3. Communication	4. Design
1.a. Organizational assessment	2.a. Collaborative design	3.a. Audiences	4.a. Design activities
1.b. Professional accreditation	2.a.i. Team based design	3.b. Communication skills	4.a.i. Creative design
1.b.i. Chartered engineer accreditation	2.b. Informal collaboration	3.b.i. Etiquette	4.a.ii. Design benchmarking
1.b.ii. Professional engineer accreditation	2.c. Teamwork	3.b.ii. Interpersonal skills	4.a.iii. Design for assembly
1.c. Program evaluation	2.c.i. Group functioning	3.b.iii. Protocol	4.a.iv. Design for manufacturing
1.c.i. Accreditation	2.c.i.i. Group decision making	3.b.iv. Rhetoric	4.a.v. Design needs analysis
1.c.i.i. ABET	2.c.i.ii. Nominal group technique	3.c. Language	4.a.vi. Design portfolios
1.c.i.i.i. EC 2000 criteria	2.c.ii. Interdisciplinary teamwork	3.c.i. Foreign languages	4.a.vii. Design research
1.c.i.ii. ABET outcomes	2.c.iii. International teamwork	3.c.ii. Language effects	4.b. Design approaches
1.c.i.iii. Program educational objectives	2.c.iv. Multidisciplinary teamwork	3.c.iii. Second languages	4.b.i. Heuristics
1.c.ii. Course assessment	2.c.v. Professional team work	3.d. Modes of communication	4.b.ii. Human centered design
1.c.iii. External evaluation	2.c.vi. Social and task dimensions	3.d.i. Multimedia communication	4.b.iii. Product development
1.d. Student assessment	2.c.vii. Team activities	3.d.ii. Nonverbal communication	4.b.iv. Product dissection
1.d.i. Assessment criteria	2.c.vii.i. Collaborative engineering	3.d.iii. Oral communication	4.b.v. Reverse engineering
1.d.i.i. Academic performance	2.c.vii.ii. Collaborative reverse engineering	3.d.iv. Visual communication	4.b.vi. Sustainable design
1.d.i.ii. Body of knowledge	2.c.viii. Team formation	3.d.iv.i. Engineering graphics	4.b.vii. Systems based design
1.d.i.iii. Evidence based improvement	2.c.ix. Team performance	3.d.iv.ii. Sketching	4.b.viii. User centered design
1.d.ii. Performance measures	2.c.ix.i. Team roles	3.d.iv.iii. Computer aided design	4.c. Design outcomes
1.d.iii. Assessment methods	2.c.ix.ii. Team notes	3.d.iv.iv. Drafting	4.c.i. Design practice
1.d.iii.i. Assessment reliability	2.c.ix.iii. Collaborative knowledge	3.d.iv.v. Engineering drawing	4.c.i.i. Conceptual design
1.d.iii.ii. Assessment validity	2.c.x. Team skills	3.d.iv.v.i. Feature based representation	4.c.ii. Design problem definition
1.d.iii.iii. Assessment biases	2.c.x.i. Teams	3.d.iv.v.ii. Freehand	4.c.iii. Design problems
	2.c.x.i.i. Distributed teams		4.c.iv. Design testing and evaluation
			4.c.v. Design verification and validation
			4.c.vi. Product design
			4.c.vii. Product realization
			4.c.viii. Prototyping
			4.c.viii.i. Rapid prototyping




Future Opportunities for Engagement

- Online interactions and public comment periods at the website: <http://taxonomy.engin.umich.edu/>
- Open conference sessions
 - ◆ 2013 Research in Engineering Education Symposium. 07/06/13, 3:00 – 4:40 pm, Kuala Lumpur, Malaysia
 - ◆ Other possible sessions:
 - SEFI. 09/16/13 – 09/20/13, Leuven, Belgium
 - Frontiers in Education. 10/23/13 – 10/26/13. Oklahoma City, OK
 - Australasian Association for Engineering Education. 12/08/13 – 12/11/13. Queensland, Australia



Engineering Education Research Leaders NetWorkshop



Rebecca Bates and Lisa Benson
NSF Award # EEC-1314725

EER Leaders NetWorkshop Goals



- **Community:** building a community of EER leaders; preparing new community members rising in academic leadership ranks
- **Communication:** building skills to "manage up," and deal with power differentials
- **Action:** identifying strategies for moving the emerging field forward and supporting rising EER leaders

Outcomes (so far)

- 13 attended pre-ASEE NetWorkshop
- Sustain virtual community – virtual “book club”
- Expand community through formal and informal meetings at future conferences
- Please look forward to an upcoming survey

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engineeringeducationlist

Wiki Pages & Files

VIEW EDIT

Engineering Education Community Resource

last edited by K. Yasuhara 6 hours, 15 minutes ago

This engineering education wiki is a resource created by the [American Society for Engineering Education's Student Division \(ASEE StuD\)](#), in collaboration with the [Center For Engineering Learning & Teaching \(CELT\)](#). The resource offers lists of programs, centers, researchers, societies, publication venues, etc., intended to help in the exploration of the engineering education field. We hope that ultimately this wiki will encourage community members to expand this resource as a place to inform students and other interested individuals new to engineering education about the research happening in this field at institutions and centers all over the world.

Note about user registration: All site content is public. You do *not* need to request access or create a user to view the site. If you are interested in helping maintain the site, we welcome you to request access or contact the co-maintainers listed below.

The resource currently consists of lists in the following categories:

- Engineering Education Departments and Programs
 - [Graduate level](#)
 - [Undergraduate level](#)

bit.ly/engredu

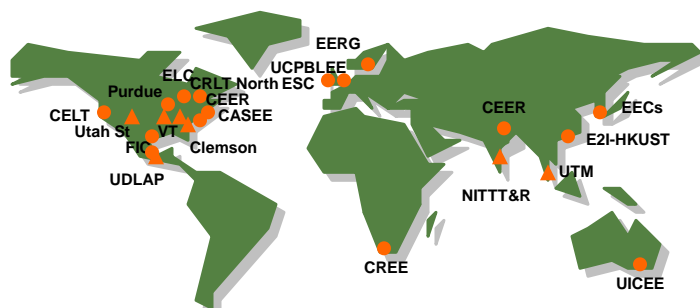
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Navigator:

- Engineering
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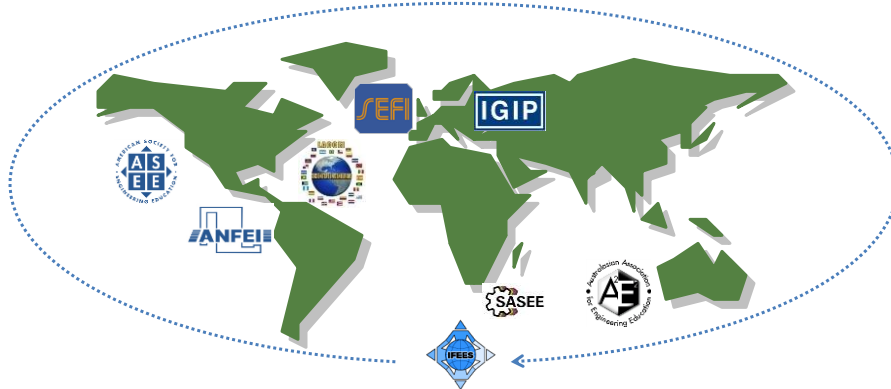
Pages

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: E2I, 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; EEIC, Engineering Education Innovation Center, Ohio State University; CEER, Center for Engineering Education Research, Michigan State University; EECs, Engineering Education Centers in Korea.
- ▲ **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 Américas, Puebla

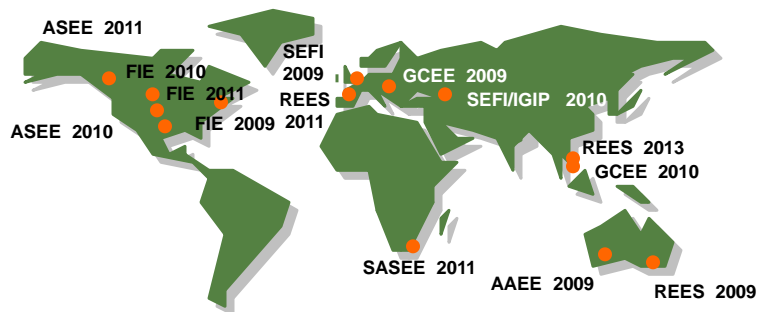
Engineering education societies...



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](http://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,

Participant Networking EER & STEM Centers and Programs

- | | |
|--|---|
| <ul style="list-style-type: none"> – Arizona State University – University of California-Berkeley – Clemson University – University of Cincinnati – University of Georgia – Georgia Tech – University of Kentucky – Linköping University (Sweden) – Michigan State University – University of Michigan – University of Minnesota – North Carolina State University – The Ohio State University – Pennsylvania State University | <ul style="list-style-type: none"> – University of Pittsburgh – Purdue University – Tufts University – Universidad de las Americas Puebla (Mexico) – Universiti Teknologi Malaysia – University of Texas – Austin – Uppsala University (Sweden) – Utah State University – Virginia Tech – Washington State University – University of Washington – Wichita State University |
|--|---|

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 ASEE Headquarters for hosting

Thank you!

An e-copy of this presentation will be posted to:

<http://CLEERhub.org>

<http://www.ce.umn.edu/~smith/links.html>

ASEE Annual Conference – June 25, 2013 – T106E – 7:00 am – 8:30 am

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