

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

Jack Lohmann
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Purdue University

Satish Udpa
Michigan State University

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ASEE

Agenda

What are we going to do?

- **Welcome and Overview (~ 10 min)**
- **Introductions and Brief Statement from Representative of Established EER PhD Programs (~20 min) – Ten Briefings, ~2 min each**
 - When the PhD program was started
 - Where it is located
 - Number of PhD students and graduates
- **Participant Networking Activity (~ 30 min)**
- **Brainstorming Strategies to Connect, Expand, and Sustain the Emerging EER Community (~ 10 min)**
- **Wrap Up and Next Steps (~ 5' min)**

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



Utah State UNIVERSITY

Creating tomorrow...today!

COLLEGE OF ENGINEERING

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Welcome

Students & Visitors

- Clubs & Organizations
- Prospective Students
- Academic Programs
- Advising Office
- Engineering Scholarships
- Ph.D. Engineering Education
- Undergraduate Research
- Faculty
- Engineering Week

Research

College News & Events

Calendar

Facilities & Resources

Advising Office

Development

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Map & Driving Directions

Information for College Faculty and Staff

Doctorate of Philosophy in Engineering Education

The Doctorate of Philosophy in Engineering Education is offered through the Engineering and Technology Education Department. Emphasis is on the training and teaching of engineering design. Engineering Design is a decision-making process, which obtains results from basic sciences, mathematics, and the engineering sciences. The program provides doctoral students with problems in developing engineering design skills in others, and expertise in research into how these skills are best learned and taught.

Program graduates are expected to:

- be familiar with the theory and practice of engineering education and are able to focus experts within their specific area of engineering specialization.
- Have the ability to conduct research in engineering education in areas such as engineering demographics, engineering learning, mathematics, engineering teaching systems, engineering design and development, technology-enhanced learning, distance delivery, and engineering assessment.
- Have the ability to develop, implement, and assess engineering curricula at high school and university levels.

Curriculum Requirements: Most program requirements, students will complete a minimum of eight credit hours, combining course work and research. The curriculum is divided into three components:

- Engineering Education Core**
This curriculum component recognizes that engineering education is an emerging discipline. As such, students must earn an accredited degree in an engineering discipline.
- Area of Specialization**
This component allows students to develop an in-depth knowledge in one area of engineering education. Students will identify a research area approved through the department and take courses within that area. The research area and courses will be identified and chosen with the advice and approval of the student's doctor's advisory committee. These credits of these courses must be taken outside the ETE Department.
- Research Component**
This component ensures that program graduates have the skills

Kurt Becker – Utah State University

<http://www.engineering.usu.edu/htm/information/phd-engineering-education>

PURDUE UNIVERSITY School of Engineering Education

Home About Us Our People Academics Research Schools Programs Contact

Academics

Doctoral Program in Engineering Education

Purdue has been a powerhouse for educating engineers for more than 130 years, but the scholarly study of how best to educate engineers has emerged in just the past few decades. Determined to lead in the discipline, in 2004 Purdue established the Department, now School, of Engineering Education (ENE), the world's first such academic unit, and, along with it, the world's first engineering education doctoral program.

In ENE, an enthusiastic and committed community of scholars provide ongoing national leadership in building the discipline's intellectual framework (e.g., through the NSF-sponsored Engineering Education Research Collaborative). Faculty and doctoral students work collaboratively across the entire educational continuum (pre-school through college, extending into the workplace) to develop a research base for guiding engineering education practice, developing curricula, assessing how students learn, and moving those findings into the classrooms of tomorrow's engineers.

Why study engineering education at Purdue?

National reputation: of our faculty, graduate students, and doctoral program as agents of change. The American Society of Engineering Education, the National Academy of Engineering, the National Science Foundation, and others have recognized the School of Engineering Education (ENE)'s leadership, honored our scholarship, and/or funded our research.

Living laboratories: for conducting your research, including ENE's [Eppit-Case Engineering Program](#), our [Multidisciplinary Engineering Program](#), our [Institute for P-12 Engineering Research and Learning \(INPERL\)](#), and the [Engineering Projects in Community Service program \(EPVCS\)](#).

Flexible programs: to accommodate your personal interests, background, and career aspirations. Our program draws from many disciplines, and we actively seek students across a range of academic interests and life experiences.

ENE seminars series: Learn what your colleagues at Purdue and beyond are doing to define and further engineering education research—and add your own contributions to the mix. [Weekly seminars](#) foster community-building and provide opportunities for professional development.

Culture of innovation: In ENE, we share a palpable sense of mission for bettering engineering education and shaping the future of this developing discipline. That means we're out in front—on campus, regionally, and nationally—testing new approaches to education and research.

Collaborative, inclusive environment: ENE attracts faculty and students from across the country and around the world into a welcoming and supportive community.

Apply online!

Graduate Programs

- Home
- ENE Doctoral Program
- Graduate Certificates
- Doctoral Program
- Admissions
- Student Testimonials
- Centers and Alumni

Robin Adams – Purdue University

<https://engineering.purdue.edu/ENE/Academics/Graduate/Doctorate/index.html>

Universidad de las Américas Puebla
Mexico

Doctoral Program in Science, Engineering, and Technology Education

UDLAP
UNIVERSIDAD DE LAS AMÉRICAS PUEBLA

GOALS

- Conduct world-class research on teaching and learning of science, engineering and technology
 - *Scholarship of discovery*
- Use the results of that research to continually improve instruction at UDLAP, Mexico and other Ibero-American countries to better support the learning process of our students
 - *Scholarship of application, integration, and teaching*
- Support the educational needs of science, engineering and technology teachers and learners at the P-12, University, and continuing professional development levels
 - *Scholarship of application, integration, and teaching*

Timeline:

- **Fall 2003**
 - Center for Science, Engineering, and Technology Education
- **Fall 2006**
 - PhD program
- **Spring 2008**
 - program accredited by the National Council of Science and Technology (CONACYT) of Mexico
- **Fall 2009**
 - first graduate
- **Fall 2010**
 - ≈ 40 PhD students

Universidad de las Américas Puebla

- Mexican private institution of higher learning
 - accredited in the US since 1959 by SACS

www.udlap.mx/ofertaacademica_eng/doctorados/educacioncienciasingenieria/Default.aspx

VirginiaTech
Invent the Future

College of Engineering

Department of Engineering Education

Welcome to the Virginia Tech Department of Engineering Education. The department continues to expand the boundaries of engineering education by teaching first-class, modern courses for first-year engineering students at Virginia Tech and by offering innovative graduate programs including a PhD in Engineering Education.

Our mission is to be inventive, inclusive, interdisciplinary, and international as we conduct cutting-edge research and scholarship, primarily in the emerging discipline of Engineering Education, simultaneously developing and delivering meaningful and memorable learning experiences for future engineers and educators.

News Highlights

- Johri and Lohani Receive 2010 Dean's Awards
- College of Engineering Dean's Teaching Fellows Announced
- Castles, wins FIRST Prize in a Student Design Poster Competition
- Watford Named Interim Department Head

First-Year Engineering Graduate Program

Maura Borrego – Virginia Tech
<http://www.enge.vt.edu/>

UTM
UNIVERSITI TEKNOLOGI MALAYSIA
www.utm.my

UTM student profile

Year	Bachelor	Graduate
1984	3,886	2
1990	5,348	175
2004	17,897	3,291
2007	14,792	3,942
2008	14,456	4,850
2009	14,245	6,432
2010	13,000	8,000
2011	11,500	9,000
2012	10,000	10,000

UTM in brief: From imperial technical school to national research university
 by Zaini UJANG, UTM President

- The oldest university in Malaysia
- Alumni more than 200,000
- More than 43% enrolment at graduate levels in engineering and technology in Malaysia
- 10 engineering schools
- 2000 tenured academics
- 5000 students Global Outreach Program
- 2,800 foreign students
- 2010 Initiatives with Oxford, Imperial College, MIT, Harvard, Tokyo, Caltech, Penn State etc
- Prof. Richard R. Ernst *Nobel Laureate in Chemistry 1991* "...fulfills a major ... highly qualified graduate engineers and professionals ... become an **international center of knowledge and education.**"

zaini@utm.my and
<http://www.utm.my/vc>

INSPIRING CREATIVE AND INNOVATIVE MINDS



CLEMSON
ENGINEERING AND SCIENCE
EDUCATION

Vision: The department will be an international leader in engineering and science education through discipline-based education research, preparation of future faculty, and implementation of inclusive, evidence-based curricula.

Lisa Benson – Clemson University

<http://www.clemson.edu/ese/>

PHD PROGRAMS IN ENGINEERING EDUCATION IN INDIA

- **Doctoral Programs in Engineering Education are offered in the four NITTTRs (National Institutes of Technical Teachers' Training Institutes) at Bhopal(West zone), Chandigarh(North zone), Chennai(South zone), and Kolkata(East zone).**
- **The candidates are essentially from Engineering Colleges, Polytechnics, NITTTRs and Industry. The Guides are from the host NITTTRs. The degrees are conferred by a neighboring University .**

R. Natarajan – IIT Madras


Engineering Education - Arizona State University
<http://engineeringed.asu.edu/>

ASU Mary Lou Fulton Institute and Graduate School of Education ARIZONA STATE UNIVERSITY

ENGINEERING EDUCATION Doctor of Philosophy (PhD) Curriculum & Instruction

home program faculty in the news

Discover **ENGINEERING**, foster engineering habits of mind; **ENHANCE** K-12 STEM education; retain undergraduate engineering students; **ENCOURAGE** mathematical thinking; systems thinking; **CREATIVITY, OPTIMISM, COLLABORATION, COMMUNICATION, ETHICAL** considerations research, innovation; scholarship of teaching and learning engineering; address the **GRAND CHALLENGES** of our time



No profession unleashes the spirit of innovation like engineering. The Doctor of Philosophy in Curriculum and Instruction with a concentration in Engineering Education was created to prepare the next generation of thought leaders and experts to devise improved strategies for engineering teaching and learning across the education spectrum. Developed and proposed as a collaborative of the Mary Lou Fulton Institute and Graduate School of Education and the Ira A. Fulton Schools of Engineering, ASU's PhD program in Engineering Education provides students a multidisciplinary academic experience that bridges fundamental research and best practices to improve learning.

Graduates of the program will emerge with the knowledge and abilities needed to

ADMISSION & PROGRAM INFORMATION

Admission requirements:

- Minimum grade point average of 3.0 (on a 4.0 scale) is required for graduates of accredited United States institutions
- Current score on the general Graduate Record Examination (GRE)
- Three letters of recommendation
- Statement of academic and career objectives

Arizona State University: Engineering Education Doctoral Program
<http://engineeringed.asu.edu>
 Program Coordinator: Tirupalavanam Ganesh, tganesh@asu.edu

TWO PATHS

PHD Mechanical Engineering (Engineering Education Concentration)

The engineering education concentration is interdisciplinary and will combine research in engineering with research in education. The concentration provides students with an opportunity to explore pedagogy, methodology, curriculum and instruction and apply it to engineering.

PHD Curriculum and Instruction (Engineering Education Concentration)

The concentration in engineering education within the Ph.D. in curriculum and instruction provides opportunities for interdisciplinary research in the teaching and learning of engineering, pre-K to college, by integrating research methods in learning theory, curriculum development, assessment, evaluation and education with a particular understanding of engineering content and practice in a variety of contexts.

Chell Roberts – Arizona State University

<http://technology.asu.edu/engineering>

W HUMAN CENTERED DESIGN & ENGINEERING
UNIVERSITY of WASHINGTON

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PhD

Admission FAQ

Application

Curriculum

Progression: Steps Required to Graduate

Costs and Financing

UW Related Information: PhD

Certificate Programs

Technical Japanese Program

Engineering Communication Program

PhD

The PhD in Human Centered Design & Engineering (HCDE) at the University of Washington provides unparalleled depth and experience for students interested in studying the conception, design, implementation, usability, and evaluation of technologies for specific audiences or user groups. In addition to learning through relevant and contemporary coursework, students work closely with faculty on real-world projects and research questions.

HCDE PhD students work with award-winning faculty on directed research projects, often taking a leadership role in these small teams. Research topics are updated quarterly, often focused around grant-funded projects sponsored by regional and national agencies such as NSF and NIH. Research groups have addressed a range of topics including:

- Visualizations to support organizational analysis
- Virtual workspaces
- Technology for health and wellness
- Internet based research
- Human-robot interaction
- Engineering education
- Digital games
- Design for digital inclusion
- Computer supported collaboration

Located in Seattle, the University of Washington has a beautiful campus in the heart of the city. HCDE is housed in the College of Engineering, and benefits from the research tradition of a leading R1 institution. Graduates are prepared to be national and international leaders in the field, securing jobs both in academia and industry. You can access our PhD flyer here.

University of Washington | Home | Site Map

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Cindy Atman – University of Washington

<http://www.hcde.washington.edu/nav-prog-advise/phd>



Ohio State University: College of Engineering and College of Education and Human Ecology
Contact: Robert J. Gustafson (Engineering) Gustafson.4@osu.edu or Paul E. Post (Education) post.1@osu.edu

Guide for New Ph.D. Students in ENGINEERING EDUCATION

The Doctoral Program in Engineering Education is designed to help develop the highest levels of professional competence in technology and engineering education and to develop the capacity to contribute knowledge into their field. At Ohio State, doctoral degree programs consist of a coherent pattern of courses and other educational experiences, a candidacy examination, a dissertation, and a final oral examination.

Program content is selected to fit the individual student's background, experience, and professional goals. Students admitted to the program will be assigned initial faculty advisers who will provide guidance as they begin the program. Students have the option of choosing new advisers as their program evolves. This document serves as a resource to be used by the student and adviser in developing the individualized program. The adviser and the Ph.D. Advisory Committee retain the right to substitute other courses as appropriate. The program is approved by the student's Ph.D. Advisory Committee and is subject to the rules of the Graduate School and school's Graduate Studies Committee.

ADVISORY COMMITTEE

After the second quarter of enrollment, the student and their advisor will choose an advisory committee consisting of four professors, a minimum of two of whom shall be members of the STEM Area of Study. The student will plan the doctoral program in consultation with this committee. This committee also will be responsible for developing and assessing the Candidacy Examination. Upon completion of the examination, the student may reorganize the committee to reflect the expertise needed for the dissertation.

PROGRAM OF STUDY

Students should develop a tentative program plan with their faculty advisers during the first year. This plan will be reviewed during the second year for revision or continuation. A copy of the final, approved program plan should be submitted to the Office of Academic Services prior to the Candidacy Exam. The program of study should include the following categories:

Learning, Teaching, and Social Context Component - 15 hours

Edu T&L 721	Logic and Psychology in School Science/Mathematics, or equivalent
Edu T&L 975	Theoretical Perspectives on Learning, Teaching and Social Contexts

Lisa Abrams – Ohio State University

<http://people.ehe.ohio-state.edu/stem/>

Participant Networking Activity (~ 30 min)


- **Introductions with Guided Format**
- **Four (~7 min) Conversations in Groups of 2-3**
 - Your Name & Organization
 - Status of EER PhD Program/Interest in EER PhD Program
 - 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 6 min and twice after 7 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 Write on 3x5 card**

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 – REEN, SEFI, CLEARhub
 - Meet again at ASEE/IEEE FIE Conference, October, 2010



The screenshot shows the REEN website interface. At the top, there is a navigation menu with links: Home, My Profile, People, Map, Forum, Blogs, Photos, Calendar, Wiki, Files, Chat. Below the navigation is the main header with the title "Research in Engineering Education Network" and a tagline "Helping engineering education researchers around the world." The main content area is divided into several sections: "Online Members" (showing a list of member avatars), "Welcome" (a central message from the REEN team), "Top Contributors" (a list of members with their avatars), "Latest Members" (a list of new members), "Wiki" (a section for REEN Mission and Vision), and "Map" (a map showing the global distribution of members). On the right side, there are several widgets: "Sponsor Us" (a call to action for advertising), "Powered by" (a logo for GROU.PS), "Calendar" (a calendar for June 2010), "Forum" (a section for discussions), "Newsfeed" (a section for updates), and "What are you doing?" (a section for user activity). The website is powered by GROU.PS.

<http://grou.ps/reen>

SEFI European Society for Engineering Education
Europäische Gesellschaft für Ingenieur-Ausbildung
Société Européenne pour la Formation des Ingénieurs

Home » Working Groups » Working Group on Engineering Education Research

Working Group on Engineering Education Research

Print this page

WG EER brochure

Background

Higher engineering education has become field of scholarly research in its own right. It is no longer sufficient that engineering education development is based on experience and beliefs. We need evidence and knowledge about the effect of our educational choices. This development towards a more research based approach is sustained by the growth in conferences, journals and publications dedicated to the subject.

Globally, engineering education research is on the agenda for the improvement of higher engineering education and the development of strategies for solving important issues for the future of engineering education, such as recruitment, the need for new competences and the ability to deal with new types of interdisciplinary and complex knowledge.

Engineering education research in Europe, is characterized by a unique interdisciplinary approach. Engineering education researchers do have various backgrounds in engineering, sciences, social science and educational psychology investigating higher engineering education. Many universities in the north-west of Europe have their own centres of expertise for educational development where the research component is directly linked to curriculum or staff development.

Due to this European unique approach to engineering education research, it is very important to initiate a more structured network among European engineering education researchers. Establishment of a SEFI working group means an important step towards the creation of such a network. Higher engineering education has become field of scholarly research in its own right. It is no longer sufficient that engineering education development is based on experience and beliefs. We need evidence and knowledge about the effect of our educational choices. This development towards a more research based approach is sustained by the growth in conferences, journals and publications dedicated to the subject. Globally, engineering education research is on the agenda for the improvement of higher engineering education and the development of strategies for solving important issues for the future of engineering education, such as recruitment, the need for new competences and the ability to deal with new types of interdisciplinary and complex knowledge. Engineering education research in Europe, is characterized by a unique interdisciplinary approach. Engineering education researchers do have various backgrounds in engineering, sciences, social science and educational psychology investigating higher engineering education. Many universities in the north-west of Europe have their own centres of expertise for educational development where the research component is directly linked to curriculum or staff development. Due to this European unique approach to engineering education research, it is very important to initiate a more structured network among European engineering education researchers. Establishment of a SEFI working group means an important step towards the creation of such a network.

Objectives

The overall objective for the SEFI Working Group on Engineering Education Research is to create a European community of engineering education researchers in order to contribute with research evidence to the advancement of engineering education.

Specific objectives are:

- to raise awareness of the need of a research approach to the development of engineering education,
- identify and define the research area of engineering education and the engineering education researchers,
- to support the establishment of engineering education research as a discipline in Europe as a whole as well as regionally,
- to establish and contribute to European research projects,
- to collaborate in the training of PhD students and to establish a European standard for doctoral training for engineering education researchers
- to influence and strengthen the engineering education research dimension at SEFI annual conferences
- to actively support the development of the SEFI Journal European Journal of Engineering Education as a platform for research on engineering education

For further information, please contact: Dr. Jonte Bernhard - jonteb@tlu.se
http://eeraft.tu.nl.com/
http://eerb-eng-ed-research.gtworks.com/FrontPage

SEFI receives the support of

http://www.sefi.be/?page_id=1192

CLEERHUB
Collaboratory for Engineering Education Research

Home | Who We Are | Resources | Members | Events | About | Support

Welcome to CLEERhub.org!

CLEERhub.org is a digital hub of with the mission to address the continued need for developing engineering education researchers by leveraging the resources of peer NSF-funded programs such as RREE, EERC and CACE and the expertise gained by various project team members.

CLEERhub.org is part of a NSF-funded project called Expanding and Sustaining research capacity in engineering and technology education: Building on successful programs for faculty and graduate students (DUE-0817461)

Thermal and Transport Concept Inventory

Learn more

Guide Books

- Building a Network of Mentors
- Quantitative Research in Education
- Conceptual Frameworks For Research
- Qualitative Research Basics

Upcoming Events

- Connecting Engineering Education Research Programs from Around the World
- General assemblies around the world have established or are considering establishing engineering education research (EER) PhD programs. The aim of...
- RREE Advisory Board Meeting
- Advisory Board meeting for the RREE project. Will be held at the Hall of Discovery Learning, on the Purdue Campus, West Lafayette, IN...

More events

Rigorous Research in Engineering Education

Creating a Community of Practice (COP)

Workshops

- Malaysia 2010: Qualitative Research
- ASCE 2010: Connecting EER Programs from Around the World
- Mexico, Mexico 2009
- Taiwan 2009
- Cape Town, South Africa 2008
- more

Collaborate

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<http://cleerhub.org>

Engineering Education Research Networking Session

Connecting and Expanding the Engineering Education Research Community

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Ruth A. Strevler
Purdue University



Karl A. Smith
Purdue University and
University of Minnesota

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Thank you!

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

ASEE Annual Conference – June 22, 2010 – Session 2123

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