The Final Phase of a Multi-Year Initiative

Leah H. Jamieson
Jack R. Lohmann
...and many colleagues!

2011 ASEE Conference — Vancouver
29 June 2011
U.S. engineering education for the 21st century

“How could/should ASEE contribute?’

2004
Discussion and planning

2005
“Year of Dialogue”

2006
Two Phase Project

2007
Community Feedback

2008
Synthesis of Results

2009

2010

2011

Phase 1 Report: “Creating a Culture for Scholarly and Systematic Innovation in Engineering Education”

Over 500 Contributors

Phase 2 (Final) Report

Survey of Faculty, Chairs & Deans

2011 ASEE Conference & Exposition — Vancouver
Summarize key points from Phase 1

Share some survey data and observations from Phase 2
“The state of the culture”

Seek your thoughts: where do we go from here?
Q: “How can we create an environment in which many exciting, engaging, and empowering engineering educational innovations can flourish and make a significant difference in educating future engineers?”

A: “Create and sustain a vibrant engineering academic culture for scholarly and systematic educational innovation — just as we have for technological innovation — to ensure that the U.S. engineering profession has the right people with the right talent for a global society.”
Most reports emphasize “what” needs to change (e.g., topics to cover, experiences to offer)

“Who” should drive the change and “how” have not been as fully discussed — but they largely determine how quickly and how well “what” occurs and how it is sustained
“who” should drive change?
engineering education depends on many stakeholders, but...

...engineering faculty and administrators are key
They determine the content of the program, decide how it is delivered, and shape the environment in which it is offered

We need to –
• strengthen career-long professional development
• create supportive environments
• form broader collaborations
“what” change is needed?

Integrate what we know about engineering with what we know about learning

High-quality learning environments are the result of attention to both content and how people learn.

There is ample evidence that our engineering programs need to be more—

• engaging
• relevant
• welcoming
“How” to drive change
connecting communities

Engineering education innovation depends on a vibrant community of scholars and practitioners working in collaboration to advance the frontiers of knowledge and practice…and it also depends on support –

• Adequate fiscal resources
• Appropriate facilities
• Reputable journals
• Highly-regarded conferences
• Prestigious recognitions
Phase 2 — feedback and a baseline study
heart of the feedback — two samples of engineering programs

156 Engineering Schools invited

Random Sample
100 colleges and 200 designated departments selected randomly

Focused Sample
73 “Top 20” colleges and ~140 undesignated departments by selected attributes (e.g., size, degrees, diversity)

Carnegie Classification
26 Bachelors
40 Masters
90 PhD

Research Team
Barbara M. Olds, Chair
National Science Foundation

Maura J. Borrego, Vice Chair
Virginia Tech

Mary Besterfield-Sacre
University of Pittsburgh

Monica F. Cox
Purdue University
Faculty Committee

Q1: Most compelling parts of the report, specifically, top three priorities?

Q2: Principal opportunities/challenges to achieve priorities?

Quantitative: 12 “check the box” statements

Chairs/Heads & Deans

Q: Principal opportunities/challenges to help create a culture for scholarly and systematic educational innovation in…

… your department? (chair)

… your college? (dean)
classifying faculty committee results
example of “check the box” statements

<table>
<thead>
<tr>
<th>Importance</th>
<th>Degree of Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Important</td>
<td>Highly Important</td>
</tr>
<tr>
<td>Somewhat Important</td>
<td>We currently do not practice this</td>
</tr>
<tr>
<td>Important</td>
<td>We practice this somewhat</td>
</tr>
<tr>
<td></td>
<td>We practice this routinely</td>
</tr>
<tr>
<td></td>
<td>We consider ourselves leaders in this</td>
</tr>
</tbody>
</table>

1. Collaborate with the following stakeholders in educational innovations:
   a. Mathematics and natural sciences
   b. Humanities and social sciences
   c. Business, architecture, law, etc.
   d. Education, learning science, psychology, etc.
   e. Industry and employers
   f. Pre-colleges and community colleges
compiling the responses

we’re leaders
practice routinely
practice somewhat
don’t practice

↑ not
↑ somewhat
↑ important
↑ highly

1 10 13 24 7 5 3
four categories of responses

- Important and practiced
- Important and somewhat practiced
- Somewhat important, practiced less
- Somewhat important yet practiced (!)

practiced

somewhat practiced

somewhat important

important
dominant response

- important and practiced
- important and somewhat practiced
- somewhat important, practiced less
- somewhat important yet practiced (!)

practiced

- important
- somewhat important
- not practiced

somewhat practiced

- important
- somewhat important
- not practiced

somewhat important

- important
- somewhat important
- not practiced
displaying dominant response

practiced
somewhat practiced

important and practiced
important and somewhat practiced
not important and practiced less
not important yet practiced (!)

51%

Displayed here as

practiced
somewhat practiced

important
somewhat important

practiced
somewhat practiced

important
somewhat important

1 10
13 24 7
7 7 3
5 5 7 3
broaden pedagogical approaches to include...
(undergraduates, have graduates, too)

- 58% • Collaborative learning
- 57% • Experiential learning
- 43% • Inquiry-based learning

practiced

somewhat practiced

2nd highest percentage

somewhat important

important
broaden pedagogical approaches to include . . .
(undergraduates, have graduates, too)

95% • Laboratories
56% • Co-op and internships
53% • Research
44% • Engineering competitions

43% • International programs
47% • Entrepreneurship programs
61% • Service learning programs

At odds with national reports
We have created highly experiential learning experiences in our labs that encourages students to work in self-directing teams. It is expensive but we believe in their long-term value. [chair]

Incorporating more humanities, social sciences, the arts, and entrepreneurship in ways that do not diminish the rigor and quality of the technical component of the curriculum continues to be a challenge. [chair]

We do well in the number of undergraduates who participate in co-op/internships, and in the number who have research experiences. [dean]

There is a portion of faculty who view “professional skills” as less valuable than “technical skills”. [chair]
form broader collaborations with . . .

69% • Industry and employers
47% • Mathematics and natural sciences
47% • Education, learning sciences, psychology, etc.

practiced

somewhat practiced

2nd highest percentages

36%

important

important
form broader collaborations with . . .

At odds with national reports
form broader collaborations with . . .

- 69% • Industry and employers
- 47% • Mathematics and natural sciences
- 47% • Education, learning sciences, psychology, etc.
- 45% • Business, architecture, law, etc.
- 55% • Humanities and social sciences
- 60% • Pre-colleges and community colleges
Our faculty are generally not motivated to go beyond what is necessary for ABET. [chair]

The main challenge is to leverage the existing passion for excellent teaching into a passion for engineering education innovation based on research rather than the “what seems to work” model. [chair]

It is difficult enough to collaborate with the sciences that are closer to engineering but collaboration with the social sciences and humanities can be both frustrating and difficult. [chair]

Multi-disciplinary connections with faculty in other areas, such as psychology and education, need to be developed. This is a challenge, but a great opportunity. [chair]
preparing new and future faculty by . . .

52% • Engaging in career-long development programs in teaching and learning

51% • Integrating instruction/practice of pedagogy into graduate programs

41% • Encouraging industry experience for faculty and future faculty

66% • Providing graduates opportunities in engineering education research
supporting communities in innovation

- Practiced
- Somewhat practiced
- Somewhat important
- Important

51% • Create physical infrastructure
64% • Obtain fiscal resources
64% • Have supportive policies & practices
I do not subscribe to the idea that new tools, styles or technologies should be our focus to enhancing teaching. A solid blackboard-based style will continue to be our most salient approach. [chair]

We do not have a college of education. To compensate, our goal is to establish an endowed chair in engineering education to drive systemic change. [dean]

I share my faculty’s discomfort in engineering education as a distinct field. We favor creating cross-cutting communities where engineering educators are supported by learning specialists. [chair]

We are launching a program enhancement for PhD students interested in academic careers. I believe this will help bridge the schism in the community between those originally from engineering fields and those from education fields. [dean]
There is significant support for . . .
...career-long faculty development programs
...integrating pedagogy in graduate education
...better infrastructure for education innovation

However, . . .
...the focus is largely on teaching rather also educational scholarship
...collaborations beyond engineering and industry are not a priority
...rewards, incentives, time, financial support, etc, remain impediments
It is clear that engineering programs . . .

...value active modes of learning (to a degree)

...prefer innovating in established learning environments

However, . . .

...support is lacking for some learning approaches that also favor
  making programs more engaging, relevant, and welcoming

...“buy-in” (at all levels) remains a challenge
There is significant support for . . .
...more physical and fiscal resources and policies and practices supporting educational innovation (duh!)

But there is not a consensus about . . .
...what constitutes educational innovation: better teaching? assessment/ABET? education research? . . .
...how to go about doing it: “in-house”? in collaboration? “ad hoc”? systematically? . . .
Improve the environment for educational innovation for engineering faculty to help them advance both their pedagogical abilities and their educational scholarship.

→ Begin with their graduate education and continue throughout their careers.

→ Encourage movement into new and diverse learning environments.

→ Facilitate their ability to work in broader disciplinary environments and across educational system boundaries.
So where do we go from here?

1. Unstructured Q&A
2. Structured feedback
How can ASEE and its members help address these issues?

1) Promote career-long faculty development beginning with graduate education?

2) Encourage movement into new and diverse learning environments?

3) Facilitate broader disciplinary and educational system collaborations?
“think - pair - share”

Think (5 minutes)
- Pick one (or more) questions
- Think for a few moments, then write your thoughts on the card

Pair (10 minutes)
- Turn to your neighbor, introduce yourself
- Talk about your responses

Share
- As a group, we’ll share responses
- Turn in your cards to be part of the Phase 2 report
your turn

How can ASEE and its members help address these issues?

1) Promote career-long faculty development beginning with graduate education?
2) Encourage movement into new and diverse learning environments?
3) Facilitate broader disciplinary and educational system collaborations?
Thank you!
Don’t forget your cards!!!