Inspiring Change Agents to Transform Engineering Education

Challenges and Strategies of Engineering Education Pioneers

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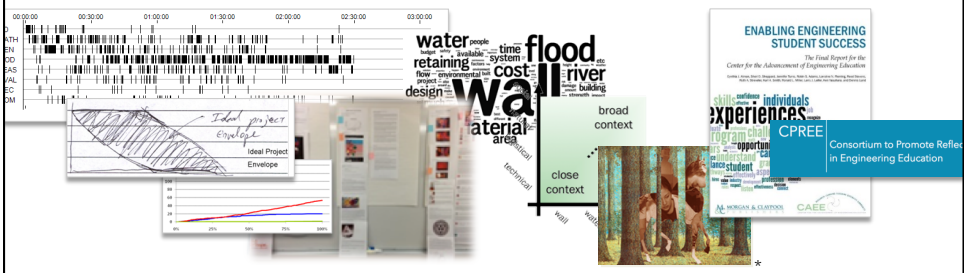
Engineering education community

- A personal journey…
- First ASEE paper in 1992:
  Constructivism: Appropriate for engineering education? (Atman & Nair)



- …in a welcoming community:
  "People look you in the eye, not over your shoulder."

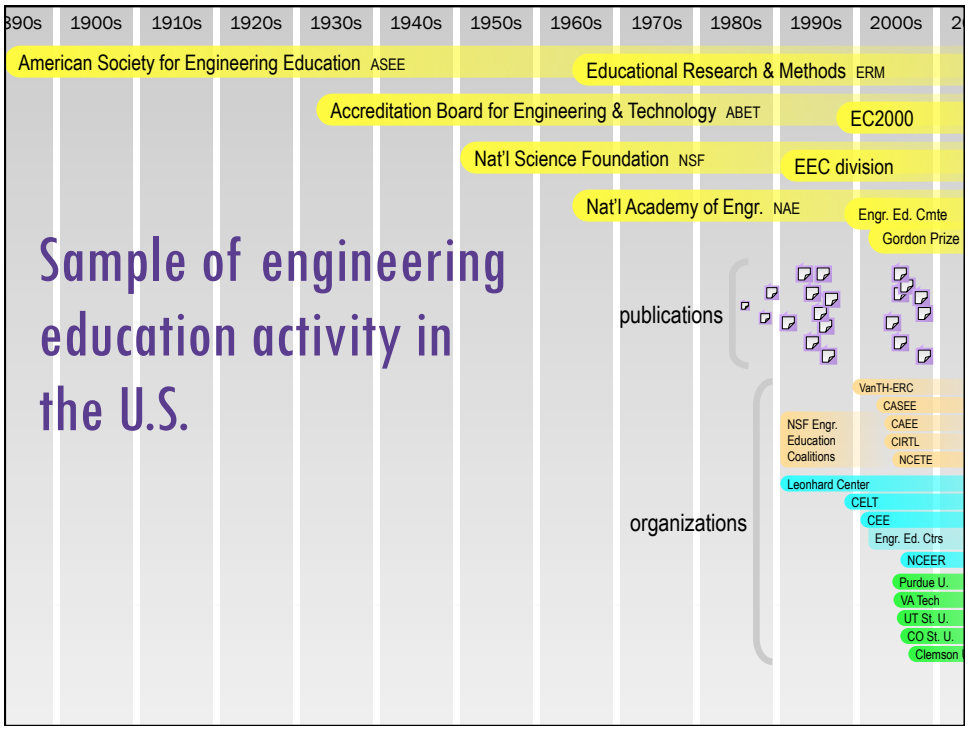
*based on painting by Magritte

Engineering education community

- Many personal journeys…
  - Many areas of investigation
  - Many motivations
  - Many contexts
  - Many pathways
- …in a welcoming, rapidly growing community.

Challenges and Strategies of Engineering Education Pioneers

- **Setting the stage**
- Insights from pioneers
- Insights from graduate students
- Next steps?



A rapidly growing community

- Community awareness of growth
  - Community events
  - Papers on community/history (See posted slides.)
- Challenges and Strategies of Pioneers in Engineering Education
  - NSF-funded grant to interview pioneers
  - What is the back story?
    Well, it all began with Charlie…

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It all began with Charlie…

- Charlie Yokomoto retired from IUPUI in 2006.
- Oh no! 14 years of conversations with Charlie ending, and new members of the community won't get to know Charlie.
- How can this be remedied?

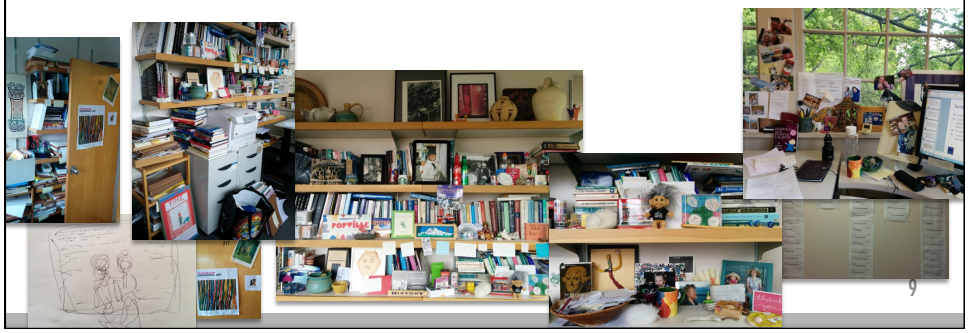
Thinking about history

"Few will have the greatness to bend history; but each of us can work to change a small portion of the events, and in the total of all those acts will be written the history of this generation."

—Robert F. Kennedy

Other inspirations

- "It's not easy being green." —Kermit the Frog
- "Until the lions have their own historians, the history of the hunt will always glorify the hunter…" —Chinua Achebe
- "Chance favors the prepared mind." —Louis Pasteur
- "I changed my mind. No, my mind changed me."
  —Toby Meyer (age 4)



From pilot interviews to today's project

- Conversations at CELT: Jennifer Turns, Ken Yasuhara, Jim Borgford-Parnell, Brook Sattler
- Two pilot projects
  - FIE 2010: Brook Sattler interviewed John Heywood.
  - 2011: 16 graduate students interviewed 16 pioneers. ASEE 2011, 2012, 2013: informal graduate student-pioneer gatherings
- 2013–2015: NSF-funded project

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Engineering education pioneers and trajectories of impact

- Goals
  - Connect across generations of engineering education community
    - 40 graduate students interview 40 pioneers
  - Catalyze new generation of engineering education scholars
  - Gain insights from pioneers for broader community
    - Producing and publishing pioneer profiles (on the web)
    - Analyzing pioneer experiences
- Project team at CELT: Cindy Atman, Jennifer Turns, Ken Yasuhara, Brook Sattler, Cheryl Allendoerfer, Dennis Lund
- Advisors: Robin Adams, Susan Ambrose, Jim Borgford-Parnell, Adam Carberry, Micah Lande, Alice Pawley, Larry Richards, Elaine Seymour, Charles Yokomoto

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Identifying pioneers

- We sought nominations from the broad community.
  - ASEE-ERM, ASEE-MIND, ASEE-WIED, WEPAN, NACME, NAE-CASEE, NSF
  - Editors of engineering education journals
  - Chairs of engineering education departments/schools
  - Engineering education e-mail list
- 93 people were nominated by more than 30 individuals.
- 47 were interviewed (includes 5 project team members and 4 international pioneers).
- Pioneers were selected through a complex process by team and advisory board with multiple criteria, including participation in pilot, number of nominations, diversity, year of entry into engineering education, engineering education-related awards, contributions to the field.

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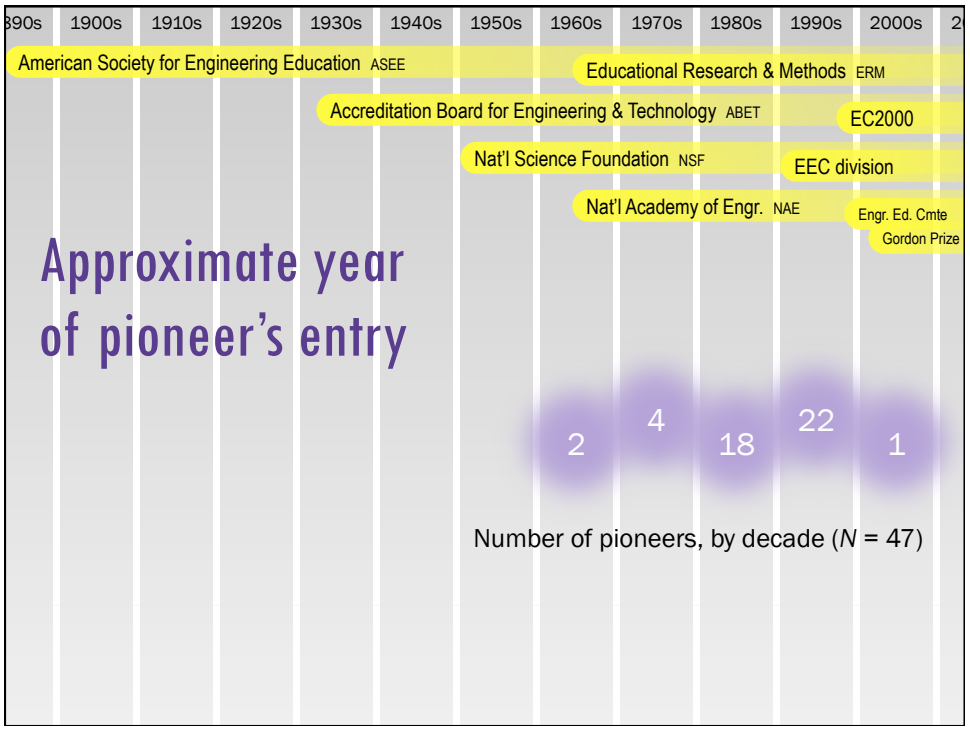
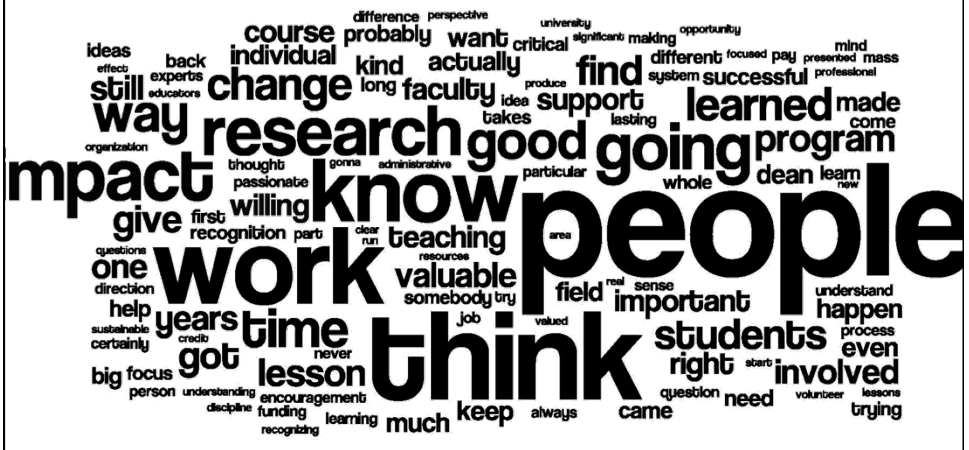
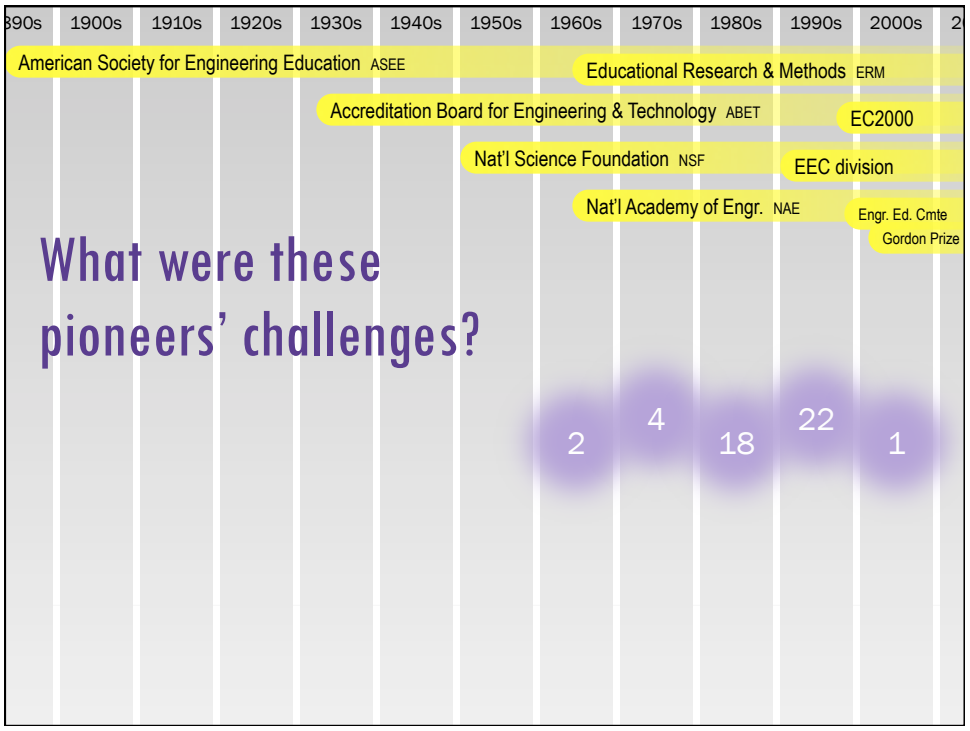

390s
1900s
1910s
1920s
1930s
1940s
1950s
1960s
1970s
1980s
1990s
2000s
2
American Society for Engineering Education ASEE
Educational Research & Methods ERM
Accreditation Board for Engineering & Technology ABET
EC2000
Nat'l Science Foundation NSF
EEC division
Nat'l Academy of Engr. NAE
Engr. Ed. Cmte
Gordon Prize
Approximate year of pioneer's entry
2
4
18
22
1
Number of pioneers, by decade (N = 47)

Interview questions

- How did you get involved?
- Who/what were significant influences?
- What kinds of challenges did you face?
  - How did you overcome them?
- Describe your contributions/impact
- Valuable lessons?
- Advice for new graduate students?

Pioneer interviews: Many ideas, perspectives





Challenges and Strategies of Engineering Education Pioneers

- Setting the stage
- **Insights from pioneers**
- Insights from graduate students
- Next steps?

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Insights from the pioneer interviews
(Cheryl Allendoerfer)

- Preliminary qualitative analysis was first done on 6 pilot interviews to identify emergent themes.
- Using these themes as a lens, an initial reading of 38 of the pioneer interview transcripts was conducted.
- Representative quotes for each theme were identified.
- (Additional quotes in posted slides)

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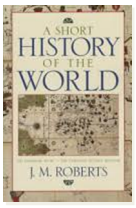
Pioneer insights

A short history of engineering education



"A broad community of practice started to develop as a result [of the Engineering Education Coalitions], and engineering educators began looking seriously at questions about the cultures of engineering, engineering education, and engineering education research in a way that had never been done before."

—Rich Felder

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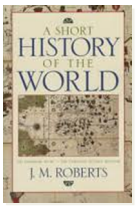
Pioneer insights

A short history of engineering education



"A discipline has emerged… It has grown up from a group of engineers goofing around to the beginnings of a formal discipline with a very large interdisciplinary group of relative professionals who try to tackle really tough, complicated engineering education-related questions, which is very exciting… Looking back on it, boy, we have come a long way in 30 years." —Ron Miller

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Pioneer insights

Challenges

- Difficult to bring about change
- Area not seen as valid
- Access to resources
- Perceived prestige
- Gender
- Feeling alone

Challenge: Difficult to bring about change

"Generally people think…change in engineering education is good…but operationalizing [new ideas] so they really take hold—institutionalizing them across an engineering school or college of science, throughout a university—that's the hard part." —Susan Metz

"It's looking like it takes twenty to thirty years to get an idea from the well-developed research into undergraduate practice." —Karl Smith

Challenge: Difficult to bring about change

"The biggest challenge in bringing about academic change is the academic culture… By far, the greatest number of engineering graduates come from research-intensive institutions with an academic culture that values disciplinary research far above other activities, including educational innovation… Within such a culture, if one wishes to innovate in engineering education, they must take it out of their hide." —John Prados

Challenge: Area not seen as valid

"In the early days, it wasn't traditional engineering research. There was a lot of…disdain for this kind of work, because, for some faculty, it's pretty threatening… It's about studying ourselves, and they didn't think it was worthwhile." —Karl Smith

Challenge: Access to resources

"In the timeframe when I [got involved in engineering education], there weren't the same **publishing outlets**… There weren't a lot of **grant dollars** you could get. You didn't have **Ph.D. students** that were studying and helping you publish…" —Karan Watson (emphasis added)

Challenge: Perceived prestige

"…there weren't the same publishing outlets…even the scrutiny of conferences. Some of the technical [conferences] that I would go…there were 10 to 15% acceptance rates…yet the **ASEE acceptance rate** for papers and proposals was more like 90%, so it's not considered prestigious. There weren't a lot of **grant dollars** you could get. You didn't have **Ph.D. students** that were studying and helping you publish…"

—Karan Watson (emphasis added)

Challenge: Gender

"Another challenge I had was about being a woman in a male-dominated society and profession. I always thought I had to give more than my male colleagues." —Lueny Morell

"In those days…if you had to give an exam, you took it to the copy department. During the first semester I was teaching, I went to go pick my exam up, and they wouldn't give it to me, because they knew there were no women faculty in engineering, and they thought that I was a student trying to steal the test. I had to go to the dean's secretary and get a note from her that said, 'Dr. Anderson teaches for us and she may pick up her exams.'"

—Mary Anderson-Rowland

Challenge: Gender

"…when I was associate dean, I heard many, many stories about the chilly climate. There would be two people in class with industry experience—the only woman and a guy—and the teacher would take anything the guy said if he contributed something about what happens in industry and how that related. The teacher would not ever call on the woman—would not let her say anything—and did not think that what she had to say would be credible at all."

—Mary Anderson-Rowland

Challenge: Feeling alone

"I think the challenge was…I was one person, by myself, working in this area that nobody really understood, and I think there were questions about the importance, the rigor, the relevancy of it that, once my first two NSF grants came, then it became—I became legitimate." —Stephanie Adams

"Another barrier, I think, is being alone, trying to do things, and a way to overcome that was…collaborating with people at other institutions in order to get a critical mass and get the expertise needed in order to build a team and move the work ahead."

—Denny Davis

Pioneer insights

Strategies

- Get funding.
- Be persistent.
- Keep up your technical research.
- Promotion and tenure challenges
  - Wait until you're tenured.
  - Go to a school where this work "counts."
  - Just do it anyway.
- Find community and collaborators.
  They might be outside your home department or institution.

Strategy: Joining the national community

"I used to go to [ASEE and FIE] every year, and that was a really big source of energy to keep going… There was a lot of emotional support, going to those conferences… Many of us came from universities where there was just one or two of us working in engineering education, and we used to go to conferences to get this feedback—the emotional support—because you couldn't get it on your campus…" —Charlie Yokomoto

Strategy: Joining the national community

"One thing that is important is that those of us who have been involved in engineering education be available to those who are coming along… I think that the sense of community is important."

—anonymous

…which leads us to the graduate student interviewers.

Challenges and Strategies of Engineering Education Pioneers

- Setting the stage
- Insights from pioneers
- **Insights from graduate students**
- Next steps?

Identifying graduate student interviewers

- Graduate student interviewers for pilot project invited through ERM and engineering education student organizations
- 40 graduate student interviewers for NSF-funded project
  - 8 from original set of pilot interviewers (all now graduated)
  - 32 new graduate students from 42 applicants

Insights from the graduate students
(Jennifer Turns, Brook Sattler)

- Graduate students participated in five online workshops (Jan.–May, 2014) and a final workshop on Sunday at this conference.
- Topics covered: project overview, engaging in qualitative data collection and analysis, authoring a profile
- Students gave reflective feedback for all experiences (surprised, excited, frustrated, “aha” moments).

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Pioneers making an impact

"Aha" moment: "I really liked that my pioneer said something about feeling like he was more of an explorer than a pioneer. When he was doing this research, he didn't even know what to expect, because so little had been done. Pioneers know some of what's out there but are the first to inhabit the new place (comparing himself to Lewis and Clark over the settlers in the West)." —interviewer

Pioneers making an impact

Surprised: "I was really surprised to hear that things like active learning were 'new innovations' when my pioneer got started. Now they are so mainstream that thinking of them as innovative is surprising, but I guess back then they were new and different." —interviewer

Understanding the system

Unsung heroes

Excited: “The idea that some/most? of the pioneers may be ‘unsung heroes’…in engineering education. I am really excited to understand and help communicate a story that may not have had other means to get out and be heard. I think these stories will really enhance the historical perspective of and insights to our field.”

Understanding the system

Pioneer interests are diverse.

Surprised: “I’m surprised to hear all of the different career paths that some of our pioneers took. It’ll be interesting to see what commonalities we can find with so many different people we are interviewing.”

—interviewer

Understanding the system

Looking forward

- "Aha" moment: "Engineering education (and disciplinary education generally) faces a monumental challenge of maintaining strong dialogue between researchers and practitioners." —interviewer
- "Aha" moment: "…our jobs are incredibly flexible with respect to opportunities that arise. Collaborations can lead to life-changing roles and career focus." —interviewer

Impact of the project

- "This was such a great opportunity to learn about a research field of which I consider myself a member, and a great experience for thinking about my career trajectory. Now that I have a better understanding of the groundwork associated with this field, I feel like I have a better understanding of the bodies of work associated with this field, and where I can advance the frontiers of this body of knowledge."

—anonymous workshop feedback

Challenges and Strategies of Engineering Education Pioneers

- Setting the stage
- Insights from pioneers
- Insights from graduate students
- **Next steps?**

Inspiring Change Agents to Transform Engineering Education

An Emergent Engineering Curriculum (Bertoline)

- Ideas for Curricular Change
  - Common Core & first-year experience
  - Learn by doing
  - Real-world, immersive capstone experience
  - Global perspectives program
  - Polytechnic field experience
  - Applied Innovation certificate program
  - Humanities, science, and math integration

Inspiring Change Agents to Transform Engineering Education

Challenges and Strategies of Engineering Education Pioneers (Atman)

- Challenges
  - Difficult to bring about change
  - Area not seen as valid
  - Access to resources
  - Perceived prestige
  - Gender
  - Feeling alone
- Strategies
  - Get funding.
  - Be persistent.
  - Keep up your technical research.
  - Promotion and tenure challenges
  - Find community and collaborators.

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Next steps: Inspiring change agents

- If we have inspired you, we have made you…
  - More curious
  - More prepared
  - More likely to use something in the future
  - More confident
  - Increase your sense of what is capable to accomplish

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Next steps: Inspiring change agents

A chance to compare notes

- Is there anything from the presentation today that made you…
  - More curious about something?
  - More prepared to do something?
  - More likely to use something that was discussed today in the future?
  - More confident as a change agent?
  - Increase your sense of what is capable to accomplish in terms of being a change agent?

"No, you are a frog."

In the summer of 1999, on vacation at a beach, I was putting up netting on a deck to keep Toby, my toddler, from falling over the side. Abby, my older daughter, picked up one of the cable ties I was using and pointed it at me…

Abby: "This is a magic wand."

Cindy: "Ah, I feel all the stress leaving me, and I am calm!"

Abby: "No, you are a frog."

—Abby Meyer, age 5

Questions?

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We would like to thank John Heywood, Alan Cheville, Donna Riley, Sue Kemnitzer, the advisors on this project, and all the pioneers and graduate students who are taking part in the project. We would also like to thank Julie Provenson and Stacia Green.

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Sample resources on engineering education's history/evolution

Adams, R. S., Allendoerfer, C., Bell, P., Chen., H., Fleming, L., Leifer, L., Maring, B., & Williams, D. (2006). A model for building and sustaining communities of engineering education research scholars. In Proc. of ASEE.

Adams R. S., Allendoerfer, C., Bell, P., Fleming, L., & Leifer, L. (2005). Communities in practice in engineering education: What are we learning? In Proc. of ASEE.

Adams, R., Evangelou, D., English, L., De Figueiredo, A. D., Mousoulides, N., Pawley, A. L., Schiefellite, C., Stevens, R., Svinicki, M., Trenor, J. M., & Wilson, D. M. (2011). Multiple perspectives on engaging future engineers. *JEE, 100*.

Atman, C. J. (2007). Engineering education research: Some history and examples from the U.S. Opening address, Danish Centre for Engineering Education Research and Development, Copenhagen U. & Aalborg U.

Atman, C. J. (2006). The growth of research in engineering education in the U.S.: Some personal observations. CELT Internal Technical Report CELT-06-1. Seattle, WA: CELT, UW.

Borrego, M. (2007). Development of engineering education as a rigorous discipline: A study of the publication patterns of four coalitions. *JEE, 96*(1), 5–18.

Borrego, M. & Bernhard, J. (2011). The emergence of engineering education research as an internationally connected field of inquiry. *JEE, 100,* 14–47.

Felder, R. M., Sheppard, S. D., & Smith, K. A. (2005). A new journal for a field in transition. *JEE, 94,* 7–10.

Fink, L. D., Ambrose, S., & Wheeler, D. (2005). Becoming a professional engineering educator: A new role for a new era. *JEE, 94*(1), 185–194.

Xian, H., & Madhavan, K. (2014). Anatomy of scholarly collaboration in engineering education: A big-data bibliometric analysis. *JEE*.

Lohmann, J. R. (2011). JEE and its second century. *JEE, 100*, 1–5.

Shulman, L. S. (2005). If not now, when? The timeliness of scholarship of the education of engineers. *JEE, 94*(1).

Shuman, L. J., Atman, C. J., Eschenbach, E. A., Evan, D., Felder, R. M., Imbrie, P. K., McGourty, J., Miller, R. L., Richards, L. G., Smith, K. A., Soulsby, E. P., Waller, A. A., & Yokomoto, C. F. (2002) The future of engineering education. In Proc. of FIE.

Turns, J., Atman, C. J., Adams, R. S., & Barker, T. (2005). Research on engineering student knowing: Trends and opportunities. *JEE, 94*(1), 27–40.

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Appendix/Back-up

The remaining slides were not presented.

Pioneers in NSF-funded project

Stephanie Adams
Mary Anderson-Rowland
Rebecca Brent
Dick Culver
Denny Davis
Russell Dean
Clive Dym
Lyle Feisel
Rich Felder
Cindy Finelli
Norman Fortenberry
Eli Fromm
Larry Grayson
John Heywood
Leah Jamieson
Edwin Jones
Sue Kemnitzer
John Lindenlaub
Tom Litzinger
Jack Lohmann
Louis Martin-Vega
Susan Staffin Metz
Lueny Morell
Barbara Olds
Mike Pavelich
Percy Pierre
John Prados
David Radcliffe
Jim Rowland
Sheri Sheppard
Karl Smith
Jim Stice
Ruth Streveler
Wallace Venable
Dave Voltmer
Phil Wankat
Bevlee Watford
Karan Watson

Project team
Robin Adams
Cindy Atman
Jennifer Turns
Larry Richards
Charlie Yokomoto

International
John Cowan
Duncan Fraser
Roger Hadgraft
Anette Kolmos

Interviewers in NSF-funded project

Graduate students

Gina Adam
Chelsea Andrews
Mel Chua
Dara Fisher
Scottie-Beth Fleming
Todd France
Stacie Gregory
Tim Hellickson
Wayne Hilson
Stefany Holguin
James Huff
Bram Lewis
Jeremi London
Aisha Mahmood
Rachel McCord
Mary McCormick
Joel Mejia
Angie Minichiello
Libby Osgood
Matthew Priddy
Gurlovleen Rathore
Rebecca Reck
Beth Rieken
Kevin Roth
Janille Smith-Colin
Mallory Squier
Scott Streiner
Denver Tang
Natasha Trellinger
Janet Tsai

New faculty

Adam Carberry
Micah Lande
Rachel Kajfez
Jay Pembridge

Postdoc/university professional

Alex Coso
Stephanie Cutler
Alisha Diggs
Geoffrey Herman
Lauren Thomas

Pioneer interview questions

1. Could you describe how you got involved in engineering education work?
2. Who or what were your most significant influences in your engineering education work?
3. In your engineering education work, what kinds of challenges did you face and how did you overcome them?
4. As someone whom others regard as a pioneer, how would you describe your contributions or impact in engineering education?
5. What is the most valuable lesson you have learned about making a lasting impact in engineering education?
6. Do you have any specific advice for contemporary graduate students who aspire to making a lasting impact in engineering education?

Graduate-student observation on project design

"The project design (for this overall study) became more apparent to me in today's session.

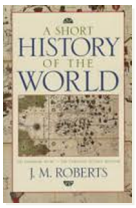
It just hit me—the PIs on the project wove together a study that contributes to the professional development of the next generation of [engineering education] scholars, and provides an opportunity for the pioneers in the field and the next generation of scholars to connect, while also conducting a full-scale, qualitative research project that captures the [engineering education] pioneers' stories/documents their impact…

As someone who longs to be known for doing good research someday, I tip my proverbial hat to the PIs and key personnel leading this project."

—graduate student interviewer

Pioneer insights

A short history of engineering education



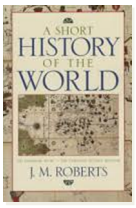
"ERM was a bunch of kooks. I think it's more mainstream now. But ERM was a bunch of kooky guys and gals—mainly guys—who were kooky who—'Gee, they're off the deep end and think this touchy-feely stuff about teaching.' That was the attitude that prevailed. If you were interested in learning about, say, learning how students learn, you were just off the deep end." —David Voltmer

"I think we need to reach out to the world, understand what's going on in science and in education, especially in engineering education. We need to partner with them, and we need to develop the talent that global problems—global challenges need. It's no longer a U.S. problem. It's no longer a Brazil problem. It's no longer an EU problem or Asia problem. It's a global problem."

—Lueny Morell

Pioneer insights

A short history of engineering education



"[Today the field is] much bigger. Obviously, a lot more people are involved. It's much broader, so the areas that people are studying are a lot more diverse. It is viewed as a legitimate area of research, which I think is enabling people at institutions that wouldn't normally be able to think about engineering education to do it. It is also a lot more rigorous.

—Cindy Finelli

"I actually think we are still arguing whether it is a field, discipline, or research area…I think we are still a really fledgling community in some ways, although there has always been—or at least as long as I've been around—a group that is really interested in doing work to improve engineering education." —anonymous

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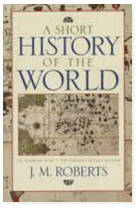
Pioneer insights

A short history of engineering education



"I feel that the work that we did with EPICS is a part of telling that story of how you…expand your definition of what an engineering education means. That…it's not only engineering knowledge—the fundamentals of math and science, the engineering, the discipline-specific knowledge—but it really is about collaboration and teamwork, about leadership, about effective communication, and about—not only solving problems but understanding and having both the interest and the ability in looking around and identifying problems that need to be solved and then bringing this whole broader toolkit to bear."

—Leah Jamieson

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Strategy: Joining the national community

"I'd been here [at Stanford] about two years when I was approached by a consortium of six other schools that was putting together a large NSF grant on engineering education… For me, it was seeing that there was a community out there that wanted to ask questions about how you educate engineers. Some of those people…have remained lifelong friends and colleagues." —Sheri Sheppard

Strategy: Joining the national community

"I did different things, but it was tolerated… It's not nearly as wonderful as being a member of a community, but at least it lets you do the work without too much harassment. And then I got support from the broader community of engineering education folks distributed around the world." —Karl Smith

(Karl credits Morton Deutsch for the term, "tolerated deviant.")

Lessons learned about making an impact

"Maybe the valuable thing was just hopefully inspiring an interest among others to do research and better understand the teaching and learning process. Part of that, for those who had not thought of engineering education sort of as its own discipline, to help people understand that it actually is its own discipline, and that there actually is a science to it, and by applying that science and some engineering principles that you can actually improve teaching, that it really isn't just a gut reaction, and I think that we had that effect with some young faculty when they came to these conferences." —anonymous

Lessons learned about making an impact

"You can either look at it positively as you make a little bit of progress, or you recognize that if you don't keep pushing on a system, it will revert. You have to keep pushing to maintain what little progress you have. You can't stop pushing, is the lesson that I take from it." —Norman Fortenberry

"In order to make a lasting impact, you still have to be available and accessible to others. There's an obligation to some extent, because other people did it for you." —Stephanie Adams

Lessons learned about making an impact

"In order to make lasting effect, you have to make sure you get to full professor, because they listen to full professors more than they listen to associate professors, and clearly if you don't get your tenure, nobody is going to listen to you… Even if you are in engineering education, you have to find out, in order for me to get my tenure, do I need to do technical research? You need to ask. Too many people were caught by the wayside, and they found out after years of doing one thing—they found out, 'Oh, nobody appreciates this.' Okay, so if you want to have lasting effect, you have to have a lasting presence. So you have to figure out, how do I get my promotion and tenure?" —Charlie Yokomoto

"The other thing is that you cannot sit in the back of the room and just stay by yourself or with other grad students. You have to get involved. You have to get involved with people in positions where they can help you." —Charlie Yokomoto

Lessons learned about making an impact

"Any idea you have in education, somebody will muck it about. And there's a whole theory of the development of ideas which shows that if you kick them off, other people may somewhere else in the world have the same idea, and you have no idea that they have this, even though you do the biggest literature search in kingdom come. And people come along and they modify and adapt your ideas, and so if you live in this world of idea development and innovation, you've got to appreciate that people will muck it about. I think that's very important." —John Heywood

"First of all, [educational innovations] have to be plausible. Secondly, people have to have sufficient knowledge to be able to see that they are relevant and can be developed. That's probably the most important thing. If you think of the way we study, prior knowledge is very, very important, and what is missing from engineering education is a lot of prior knowledge. One of the reasons for this has to be that there's no training—no formal training for engineering educators. So the prior knowledge is tremendously important. That it is plausible—creating the ideas, creating the plausibility—that's what an innovator has to do." —John Heywood

Lessons learned about making an impact

"I was in a facilitative role more than in an investigative or idea-person role. I supported many of these. I read and became aware of them, but I didn't do as much on the generation of—introducing new ideas. More, as I use the word again, 'facilitator,' administrator, or whatever you want to call it." —David Voltmer

"I think my influence has been far less in the scholarly, groundbreaking innovative discoveries, if you will, and far more on the, 'How do we integrate these?' [side]. The translation…of the scholarship into practice and the change management of organizations to do that, and the strategies and the strategic thinking for how to think about that." —Karan Watson

Lessons learned about making an impact

"You start off as what would be called a sort of lone ranger…the lone inventor. You're going to innovate in this class and do this cool thing, but then if you went away, that won't stay because of the rest of the system. So you have to work in ways that will produce change. In other words, behaviors will change…things will be done differently, people will do things differently, and that takes real, sustained effort and time to bring other people on board and for ideas to take hold with other people, or equally, to help other individuals become established in their careers, so when they are wherever they are, their impact will continue. And so that's also part of the sustainability, so it's really embedding the thing, so it's not just, 'Here's a great idea, here's some research, I'll write it up, and I'll write a paper.' It's about how do we translate?… How do achieve a change in the way people do things based on that? It's that sustainability thing." —anonymous

Lessons learned about making an impact

"[The] most valuable lesson learned is that…we all think that we are experts in engineering education because we teach engineering, so therefore we're experts in engineering education… And I think that's the uphill battle, because I think that we're actually still in [the] early stages of [having] a widespread understanding that there is research and scholarship and work to be done in engineering education that is as deep and as profound and as intricate as work in speech recognition or in parallel-processing algorithms… That the methodologies are different but that we're not all experts and that we still have a lot to learn—not only about how people learn engineering, but we have a lot to learn in recognizing that there is more to learn."

—Leah Jamieson

Joining the community

"The research part really started because of the encouragement of a male associate dean… He said, 'Look, I can't go to this conference, and I have the hotel reserved and the airline ticket. Would you go?' It sounded interesting to me, and he said they were going to talk about funding a project for women in engineering, so why didn't I go and see if we should do such projects? So I did, and I thought, 'This is great. We need to do this.'"

—Mary Anderson-Rowland

"One thing that is important is that those of us who have been involved in engineering education be available to those who are coming along… I think that the sense of community is important… I think we need those who toil in the vineyards as well as those with great ideas. We need to find a balance. Right now is a time that people are willing to listen." —anonymous

Joining the community

"I was primarily interested in vehicle dynamics, and we didn't have anybody that was working in vehicle dynamics, and I had no particular intention at all of being in education. I intended to go into research work. I was trying to be an engineer, but as we went along, we became engineers in education—trying to engineer education. It wasn't a matter of moving out of engineering, but seeing engineering in a new way."
—Wallace Venable

"I did different things, but it was tolerated, so—it's not nearly as wonderful as being a member of a community, but at least it lets you do the work without too much harassment. And then I got support from the broader community of engineering education folks distributed around the world." —Karl Smith

Joining the community

"In about 1979, our dean encouraged us to go to an effective teaching institute at the Rose-Hulman Institute of Technology. So, out of deference to our dean, a whole bunch of us went. Now, at that workshop, Lee Harrisberger covered learning styles and the Myers-Briggs Type Indicator, and I had been a tennis coach and a volleyball coach for years and years. And in doing so, I observed that people learn sports, and when he presented that model, everything I knew fell right into the model, or the model covered everything I knew. So that's when I started getting interested to see if it affected how students learn, and right then and there, I started doing some classroom research to validate or contradict my theories. And then I started going to ASEE section meetings and Frontiers in Education meetings, but about that time—about 1980. And from then on, I did a lot of work on engineering education."
—Charlie Yokomoto

"While no one else at N.C. State was conducting engineering education research, several colleagues at other universities significantly influenced me." —Rich Felder

Joining the community

"I was in charge of the part-time day-release courses for a group of people who you would call a combination of craftsmen and junior technicians… And I decided I would investigate my own teaching. And I set up an experiment to do this, which was laughable in the light of what we do these days, but it did illustrate some problems, and there was enough material in it—not only for a dissertation for my studies but enough material for a paper. And I had no idea where to send this paper except that—well, I sent it to *Nature*, the scientific journal…and to my astonishment, they published the wretched thing. And in their editorial, they said there was a need for much more research of this kind. And I used, really, the paper and editorial to get myself a senior research fellowship which happened to be advertised at the time in higher technological education." —John Heywood

Joining the community

"I started to realize that there were people on campus who were actually doing interesting educational things…people who were in the really early days of ASEE's ERM division, which was the only one then. It probably still is the lead division today that really focuses on research. So those people were the pioneers. It just so happened that a couple of those people were at my school, purely by accident really. I was lucky in that sense." —Ron Miller

"It was [difficult], because there were very few people to actually work with who were right in it with me here. I found what did help was that I found someone who had an Ed.D. whose major was educational psychology, whose significant other was an engineering faculty member, and she and I kind of teamed together, because she was able to come at it from a kind of ed. psych. viewpoint. That kept it kind of interesting, and she and I began doing some studies together and publishing together. That kind of kept me going, because the problem was you just kind of lose interest, if you don't have someone to share the work with." —anonymous