Inspiring Change Agents to Transform Engineering Education

Challenges and Strategies of Engineering Education Pioneers

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This material is based upon work supported by the National Science Foundation under Grant No. 1263512.

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Road Map to This Session

- Introduction
- Activity 1: What's "Our" Capital?
- Activity 2: Lacking capital, Findings & Personal mapping
- Activity 3: Gaining capital, Findings & Personal mapping
- Activity 4: Leveraging capital, Findings & Personal mapping
- Wrapping up

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Engineering Education Community

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

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A Rapidly Growing Community

- Community awareness of growth
  - Community events
  - Papers on community/history
  - Number of individuals
  - Number of organization
  - Publication venues

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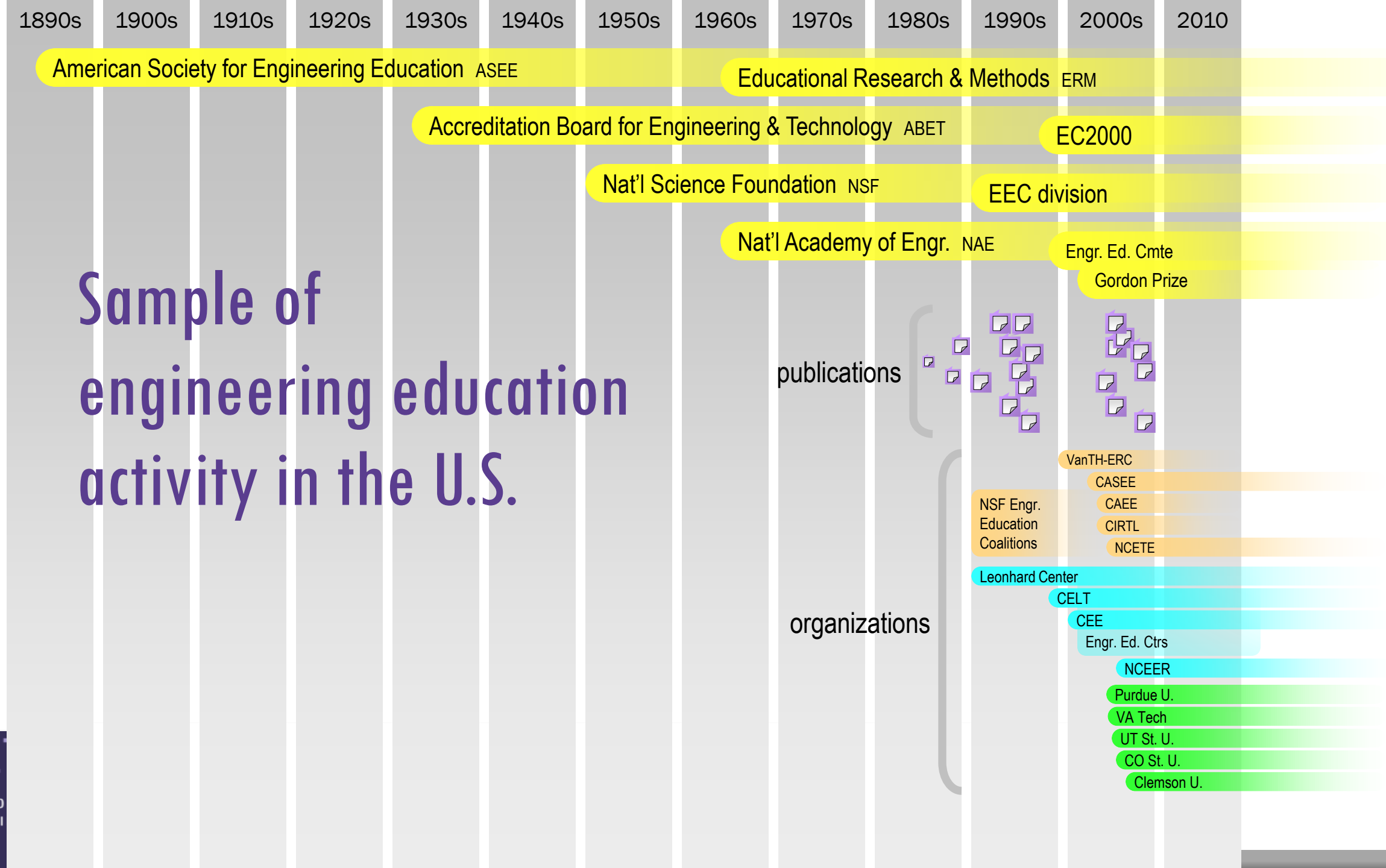
Sample of engineering education activity in the U.S.



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A Rapidly Growing Community

- 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?

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The Pioneers Project

- To understand, appreciate, and grow our communities
- Interviews with 47 early contributors to engineering education
- …conducted by prospective pioneers
- Analysis to investigate impact, transformation
- Profiles on web at **http://bit.ly/engredupioneers**

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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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The "Capital Lens"

- **Bourdieu's notion of capital** (Bourdieu, 1986; Mendoza et al., 2012)
  - **Economic** – assets that have direct monetary value
  - **Symbolic** – reputation, recognition, prestige
  - **Social** – social connections, networks, group memberships
  - **Cultural** – shared knowledge, skills, activities

  - Bourdieu theorized that power and hierarchy in any system of social relations (including an academic field or institution) could be understood in terms of possession and exchange of these types of capital.
  - Using this lens, we can understand the Pioneers' career narratives as sequences of lacking, gaining, and leveraging various types of capital.

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Activity 1: What's "our" capital?

Type of Capital	*How Defined*	*What might be some examples in engineering education?*	
Economic	Assets that have direct monetary value		
Symbolic	Reputation, recognition, prestige		
Social	Social connections, networks, group memberships		
Cultural	Shared knowledge, skills, activities		

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Activity 2: Lacking capital, Findings

Type of Capital	How Defined	Lacking: In what ways do you lack this capital?
Economic	Assets that have direct monetary value	"There's not a lot of money out there in engineering education. It's the kind of thing you do almost like a hobby, because it's just not heavily funded."
Symbolic	Reputation, recognition, prestige	"If you're in a traditional department, engineering education is still not really considered what you focus your career on. It's not what gets your tenure. It's not what gets you promotion. In many cases, publications in education journals don't count in the same way that disciplinary research journals count." "The first challenge was that [work in engineering education] was not accepted as a way to advance one's career. The accepted thing to advance one's career was to do technical research." "Well, the fundamental problem I have is [that] I'm in a subject area department, and most of the people in that department don't much care about engineering education."
Social	Social connections, networks, group memberships	"When you feel like you're by yourself, and nobody else is interested in doing anything [like this], you can really give up." "It's just so important for people to not feel alone. In these very siloed engineering fields where you really can be still the only woman in your class, the only black person in your class, the only faculty member in your department, you feel so isolated."
Cultural	Shared knowledge, skills, activities	"If you were interested in learning about how students learn, you were just off the deep end."

Activity 2: Lacking capital, Findings & Personal mapping

Type of Capital	*How Defined*	*Lacking*
Economic	Assets that have direct monetary value	
Symbolic	Reputation, recognition, prestige	
Social	Social connections, networks, group memberships	
Cultural	Shared knowledge, skills, activities	

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Activity 3: Gaining capital, Findings

Type of Capital	How Defined	Lacking: In what ways do you lack this capital?	Gaining: How can you go about getting this capital?
Economic	Assets that have direct monetary value	"There's not a lot of money out there in engineering education. It's the kind of thing you do almost like a hobby, because it's just not heavily funded."	"If you are going to have a scholarly field of endeavor, there are certain kinds of things that need to be present. One is, of course, external sources of funding, and NSF filled that role for a lot of faculty."
Symbolic	Reputation, recognition, prestige	"If you're in a traditional department, engineering education is still not really considered what you focus your career on. It's not what gets your tenure. It's not what gets you promotion. In many cases, publications in education journals don't count in the same way that disciplinary research journals count." "The first challenge was that [work in engineering education] was not accepted as a way to advance one's career. The accepted thing to advance one's career was to do technical research." "Well, the fundamental problem I have is [that] I'm in a subject area department, and most of the people in that department don't much care about engineering education."	"I had already accumulated enough technical research, so I didn't have to depend on my education activities for promotion to full professor." "I felt like I had to keep my technical research going while I continued to teach and develop workshops and things in this other area." "A major part of what changed the engineering education establishment was the National Science Foundation began to give grants for educational work. If you're looking at significant influences on engineering education and making education disciplines viable and respectable, it's the fact that the foundation began to provide extra external money to legitimize it."
Social	Social connections, networks, group memberships	"When you feel like you're by yourself, and nobody else is interested in doing anything [like this], you can really give up." "It's just so important for people to not feel alone. In these very siloed engineering fields where you really can be still the only woman in your class, the only black person in your class, the only faculty member in your department, you feel so isolated."	"We used to go to conferences to get feedback and emotional support, because you couldn't get it on your campus in those days." "The ASEE annual conference and the Frontiers in Education annual conference were good, because I could go be among a group of people doing this kind of work." "Another barrier I think is being alone. A way to overcome that was collaborating with people at other institutions in order to...move the work ahead."
Cultural	Shared knowledge, skills, activities	"If you were interested in learning about how students learn, you were just off the deep end."	"A way to overcome [being alone] was collaborating with people at other institutions, in order to get a critical mass and get the expertise needed in order to move the work ahead."

Activity 3: Gaining capital, Findings & Personal mapping

Type of Capital	*How Defined*	*Lacking*	*Gaining*
Economic	Assets that have direct monetary value		
Symbolic	Reputation, recognition, prestige		
Social	Social connections, networks, group memberships		
Cultural	Shared knowledge, skills, activities		

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Activity 4: Leveraging capital, Findings

Type of Capital	How Defined	Lacking: In what ways do you lack this capital?	Gaining: How can you go about getting this capital?	Leveraging: When you have this capital, what else can you do with it?
Economic	Assets that have direct monetary value	"There's not a lot of money out there in engineering education. It's the kind of thing you do almost like a hobby, because it's just not heavily funded."	"If you are going to have a scholarly field of endeavor, there are certain kinds of things that need to be present. One is, of course, external sources of funding, and NSF filled that role for a lot of faculty."	"By getting the external funding, that gave me dollars that compared to the dollars that were being brought in for technical research, and gave me credibility such that I could then publish in this arena." "I think it wasn't until I got my first NSF grant funded that anybody took my work seriously. And I think once my first grant got funded, people were like, 'Oh, ok, yeah.' …It was like automatically, I became a legitimate scholar, if you will."
Symbolic	Reputation, recognition, prestige	"If you're in a traditional department, engineering education is still not really considered what you focus your career on. It's not what gets your tenure. It's not what gets you promotion. In many cases, publications in education journals don't count in the same way that disciplinary research journals count." "The first challenge was that [work in engineering education] was not accepted as a way to advance one's career. The accepted thing to advance one's career was to do technical research." "Well, the fundamental problem I have is [that] I'm in a subject area department, and most of the people in that department don't much care about engineering education."	"I had already accumulated enough technical research, so I didn't have to depend on my education activities for promotion to full professor." "I felt like I had to keep my technical research going while I continued to teach and develop workshops and things in this other area." "A major part of what changed the engineering education establishment was the National Science Foundation began to give grants for educational work. If you're looking at significant influences on engineering education and making education disciplines viable and respectable, it's the fact that the foundation began to provide extra external money to legitimize it."	"I stuck with it and found ways to make it rigorous and published in reputable journals and really helped my colleagues to understand the value of work in engineering education."
Social	Social connections, networks, group memberships	"When you feel like you're by yourself, and nobody else is interested in doing anything [like this], you can really give up." "It's just so important for people to not feel alone. In these very siloed engineering fields where you really can be still the only woman in your class, the only black person in your class, the only faculty member in your department, you feel so isolated."	"We used to go to conferences to get feedback and emotional support, because you couldn't get it on your campus in those days." "The ASEE annual conference and the Frontiers in Education annual conference were good, because I could go be among a group of people doing this kind of work." "Another barrier I think is being alone. A way to overcome that was collaborating with people at other institutions in order to…move the work ahead."	"There was a lot of emotional support going to those conferences, and we all shared the same ideas. 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, you know, the emotional support, because you couldn't get it on your campus in those days."
Cultural	Shared knowledge, skills, activities	"If you were interested in learning about how students learn, you were just off the deep end."	"A way to overcome [being alone] was collaborating with people at other institutions, in order to get a critical mass and get the expertise needed in order to move the work ahead."	[Not explicitly discussed by the pioneers.]

Activity 4: Leveraging capital, Findings & Personal mapping

Type of Capital	*How Defined*	*Lacking*	*Gaining*	*Leveraging*
Economic	Assets that have direct monetary value			
Symbolic	Reputation, recognition, prestige			
Social	Social connections, networks, group memberships			
Cultural	Shared knowledge, skills, activities			

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Wrapping up

- How could you use this framework to help further individual careers?

- How could you use this framework to help advance the community?

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