Creating Communities of Transformation in STEM Education: Lessons from Research

SENCER Summer Institute
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Key Takeaways

• Defining characteristics of SENCER as a community of transformation
• Lessons around engagement, design, outcomes, and sustainability
Our Time Together Today

• Brief overview of the *Achieving Scale for STEM Reform* study
• Defining SENCER as a community of transformation
• Key findings from the study
• Brief considerations for you as SENCER community members as you begin SSI and as you continue your work
Communities of Transformation and Their Work Scaling STEM Reform

• Funded by the National Science Foundation (NSF DUE-1226242)
• Focus on four faculty communities sharing a common purpose of reforming undergraduate STEM education
• Goal of Study: Understand how communities can be most effectively designed to spread innovations among community members and, ultimately, on their campuses
Research Partners

Dr. Adrianna Kezar, PI

Dr. Sean Gehrke
Three Guiding Research Questions

1. How do members and leaders of STEM reform communities perceive community design shapes the ability to achieve goals?

2. What are the perceived benefits of participation in a STEM reform community for the individual participants and for their campuses?

3. How do communities form, and how are they sustained in ways that help them achieve their goals?
Exploratory Mixed-Methods Study Design

First Phase (2012-2013)

Second Phase (2013-2014)
Our Participants

First Phase (2012-2013)

Interview Participants (n = 112)

Primary Professional Roles
- Teaching (42%)
- Administration (34%)
- Research (4%)
- Other (20%)

84 Current Faculty Members
- 61% Full Professors
- 30% Associate Professors
- 9% Other

Demographics
- 57% Female
- 92% White

Events Attended – Summer 2013
- BioQUEST Summer Workshop (Atlanta, GA)
- PKAL Summer Leadership Institute (Crestone, CO)
- POGIL National Meeting (St. Louis, MO)
- SENCER Summer Institute (Santa Clara, CA)
Exploratory Mixed-Methods Study Design

**Survey Participants**

- **Sample**
  - 3,927 responses (22%), 2,503 in final sample

- **Academic Rank**
  - 37% Full Professor
  - 28% Associate Professor
  - 9% Assistant Professor
  - 12% NTTF; 8% Non-Tenure Institution
  - 6% No Rank

- **Years in the Classroom**
  - 16.8 years on average (SD=8.67)

- **Disciplines**
  - 35% Physical Sciences
  - 34% Biological Sciences
  - 12% Math/Comp/Engineering
  - 8% Social Sciences; 11% Other

- **Demographics**
  - 55% Female; 82% White; Average Age 49.9 (SD=10.5)

**Second Phase (2013-2014)**
Exploratory Mixed-Methods Study Design

**SENCER’s Sample Trends**

Fewer full professors – more responses from:
- Associate professors
- Institutions without tenure
- No academic ranks

Fewer department chairs – more responses from those who are or have been:
- Program directors
- Deans
- Provosts

Interdisciplinarity shines through:
- Larger representation from social scientists and faculty from other non-STEM disciplines

Institutional differences:
- Baccalaureate colleges underrepresented; trend toward Master’s and Associates;
- Higher proportion of public institutions
Four Faculty Initiatives: Communities of Practice or Networks?

vs.

Diagram of interconnected people.
Commonalities with Communities of Practice

• All four communities have a clear domain of focus (e.g., innovative teaching, leadership development)
• Communities are well-formed and nurtured
• Community development is essential as the community supports the outcomes
• All are focused on improving practice
• Common formation and lifecycle stories

• However, these also differed from traditional CoPs…
Communities of Transformation

Communities that create and foster innovative spaces that envision a new future.

What world do YOU want to live in?
Communities of Transformation

Communities that create and foster innovative spaces that envision a new future.

*Three defining characteristics*

1. A compelling philosophy
2. A lived philosophy that creates a new world of practice
3. A network of peers to break isolation and brainstorm new ways of practice
A compelling philosophy

THE SENCER IDEALS
A compelling philosophy
THE SENCER IDEALS

SENCER robustly connects science and civic engagement by teaching “through” complex, contested, capacious, current, and unresolved public issues “to” basic science.

SENCER invites students to put scientific knowledge and the scientific method to immediate use on matters of immediate interest to students.

SENCER helps reveal the limits of science by identifying the elements of public issues where science does not offer a clear solution.

SENCER shows the power of science by identifying the dimensions of a public issue that can be better understood with certain mathematical and scientific ways of knowing.

SENCER conceives the intellectual project as practical and engaged from the start, as opposed to science education models that view the mind as a kind of “storage shed” where abstract knowledge may be secreted for vague potential uses.

SENCER seeks to extract from the immediate issues the larger, common lessons about scientific processes and methods.

SENCER locates the responsibilities (the burdens and the pleasures) of discovery as the work of the student.

SENCER, by focusing on contested issues, encourages student engagement with “multidisciplinary trouble” and with civic questions that require attention now. By doing so, SENCER hopes to help students overcome both unfounded fears and unquestioning awe of science.
“So the thing about SENCER, what definitely attracted me to this, was knowing smart, thoughtful people who understand the human need to do something principled with meaning. That’s important. And SENCER I think tapped into that idealism, too, because the capacious question, being interdisciplinary, and attention to civic engagement, which I think attracted a lot of faculty saying I don’t just teach biology.”
A lived philosophy that creates a new world of practice
A lived philosophy that creates a new world of practice

SENCER Ideals deeply embedded in signature events, such as the SENCER Summer Institute.

Reflecting on deeper meaning and questioning are built into sessions.

Multiple disciplines engaged through events and materials.

Key leaders model the SENCER ideals in how they approach science and events – role models for living out the SENCER Ideals.

SENCER Ideals ever-present in communication and other materials, including assessment.
A lived philosophy that creates a new world of practice

“They bring a fundamental epistemology that's very different to all their events and communication than a lot of groups of people that I know. They really have this much more phenomenological approach to teaching, which is kind of an awareness of the methods they're using in teaching and just a willingness to think about values, and mission, and care, and love, and the things that actually make us more and more human. And you can feel this different ethic in every aspect of the community. They can talk about things like truth, beauty, and goodness without it being seen as something polar to the very materialistic approaches of Western science.”
A lived philosophy that creates a new world of practice

“It so hard to break from the ways we traditionally do our work. But these leaders really show you that teaching can be different, learning can be meaningful. It is just not something possible that you can talk about at a professional development or disciplinary meeting. Here we have a special environment in which this kind of learning can occur through seeing others do it.”
A network of peers to break isolation and brainstorm new ways of practice
A network of peers to break isolation and brainstorm new ways of practice

Community has been present since the beginning and is intentionally planned for.

Events involve teams and balance seasoned and new SENCER community members.

Seed grant programs with continual support and connection to others implementing SENCER ideals.

Continued support and mentoring after SENCER Summer Institute.

Variety of events to broaden community, including students, such as Capitol Hill Symposium.

SENCER Leadership Fellows, Co-PI’s, and Staff
A network of peers to break isolation and brainstorm new ways of practice

“Without this community, I could not have altered my own practice, let alone made the curricular changes I have made on campus. People here made me not only deeply rooted in the ideas, but also provided the practical models and advice. It is the people who help you live these new ideas.”
We learned a lot about Communities of Transformation

- Outcomes and Perceived Benefits of Participation
- Engagement and Design associated with Benefits
- Formation and Lifecycles of CoT
- Expansions Strategies for CoT
- Sustainability Model for CoT
- Common Challenges
Individual Outcomes and Perceived Benefits of Participation in SENCER

- Learning/Innovation: 75%
- Networking: 53%
- Leadership/Change: 50%
Individual Outcomes and Perceived Benefits of Participation in SENCER

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<tr>
<th>Outcome</th>
<th>Percentage</th>
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<tr>
<td>Recharged/Energized</td>
<td>80%</td>
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<tr>
<td>Collaboration Opportunities</td>
<td>74%</td>
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<td>Teaching Credibility</td>
<td>73%</td>
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<tr>
<td>Professional Credibility</td>
<td>67%</td>
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Organizational Outcomes and Perceived Benefits of Participation in SENCER

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<tr>
<th></th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Departmental Change</td>
<td>43%</td>
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<td>Institutional Change</td>
<td>33%</td>
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Additional Broader Impacts

• Creating other communities and networks
• Working across and between communities
• A cadre of leaders
• Service as conveners across groups
• National reports and activities
## Designing for Engagement and Outcomes

### Design/Involvement

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<th>Design/Involvement</th>
<th>Learning</th>
<th>Change</th>
<th>Networking</th>
<th>Department</th>
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<td>Continuity of Involvement</td>
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<td>Community Leaders</td>
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<td>Community Culture</td>
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<td>Community Philosophy</td>
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<td>Signature Events</td>
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<td>Peers Involved</td>
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<td>Years Involved</td>
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<td>Innovative/New Ideas</td>
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<td>Connection to STEM Leaders</td>
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<td>Presenting at Professional Meetings</td>
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* = Significant Relationship
Sustainability Model for Communities of Transformation

**Assessment**
- Evidence of impact
- Multiple measures
- Partnerships

**Leadership**
- Fostering new generations of leaders
- Leadership development & succession
- Distributed leadership

**Feedback**
- Conducting surveys
- Advisory boards
- Self-study

**Professional Staff**
- Expansion of goals and community
- Transition to professional culture
- Administrative expertise

**Strategy**
- Providing focus, direction, community plan
- Examining internal and external factors
- Strategic planning

**Financial Model**
- Choosing a strategy
- Experimentation with model
- Branding
Considerations for SSI and Beyond

If you are new, engage the community; there is much to learn.

Make connections and stay in touch with the SSI participants and SENCER leaders/staff; ongoing connection is vital to success.

If you are seasoned, mentor others and pursue more involvement with the leadership.

This community also fosters networks of innovation and support, capitalize on those connections.

Utilize lessons we learned about CoT and bring them back to your campus.

Looking to start a new community or learn how to make the most of your experience? Our report has a wealth of information.
Thank you!

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