



Lasting STEM Reform: Sustaining Non-Organizationally Located Communities of Practice Focused on STEM Reform

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CONTEXT

Calls for reform in undergraduate STEM education are increasing (e.g., PCAST, 2011)

Reform communities and networks being touted as vehicles for creating change (Austin, 2011; Fairweather, 2009; Kezar, 2011)

Little is known about how STEM reform communities of transformation are designed, how they form, and how they are sustained over time



PURPOSE OF THIS STUDY

Part of larger study examining four faculty STEM reform communities of transformation that have sustained themselves over time and reached thousands of faculty in reform efforts

Broader study focused on formation, sustaining, design, and outcomes of these communities

This paper focuses specifically on strategies for these communities to sustain themselves in order to make an impact on STEM reform efforts



COMMUNITIES OF PRACTICE (CoP)

Groups of people who share a concern or a passion for something they do and learn how to do it as they interact regularly (Allee, 2000; Lave, 1988; Wenger, 1998, 2007)

Key aspect is that CoPs tend to be organizationally situated

Literature focuses more on design principles as opposed to sustaining. Some principles include:

- Design for evolution
- Dialogue between inside and outside perspectives
- Different levels of participation
- Public and private community spaces
- Focus on value (Wenger et al., 2002)



COMMUNITIES OF PRACTICE (CoP)

Stages of Development and Key Tensions/Challenges
(Wenger et al., 2002)

STAGE	TENSION/CHALLENGE
Potential	Discover/Imagine
Coalescing	Incubate/Deliver Immediate Value
Maturing	Focus/Expand
Stewardship	Ownership/Openness
Transformation	Let Go/Live On



METHODOLOGY

Exploratory mixed methods design

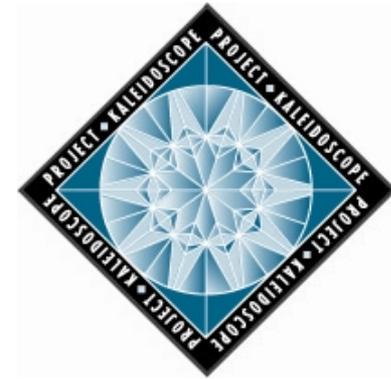
- Site visits/archival research (year 1)
- Interviews (year 1)
- Observations/field notes (years 1 & 2)
- Survey of community members (year 2)

Sample selection

- STEM education and reform focus
- Large networks, leading to dissemination
- Focused on postsecondary sector reform
- Long history to study formation, sustaining, outcomes
- Ability to survey community members



STEM REFORM COMMUNITIES OF TRANSFORMATION





METHODS

This paper is informed by:

- **Document analyses/observations**
- **Interviews:** 112 individuals (26-30 from each community); staff, leaders, involved faculty, some not as involved or newer

Interview sample:

- **Primary Activity:** 34% Administration, 42% Teaching, 4% Research, 20% Other
- **75% Current Faculty Members:** 61% Professors, 30% Associate Professors, 9% Other
- **Demographics:** 57% Female, 92% White



METHODS

Anaylses

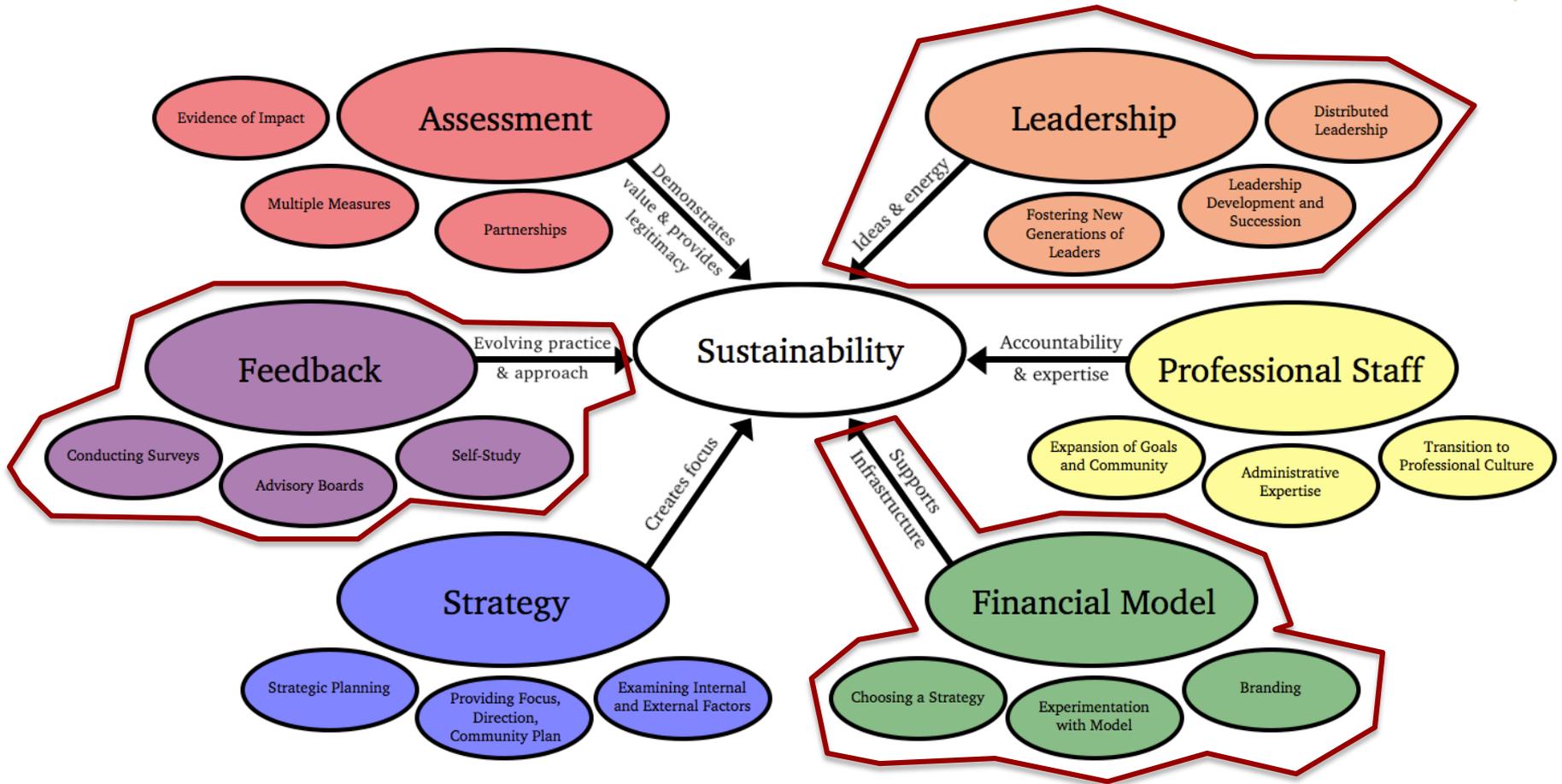
- **Boyatzis' (1998) Thematic Coding – Inductive and deductive coding**

Trustworthiness:

- **Advisory Boards:** Internal and External
- **Triangulation:** Documents, observations, and interviews
- **Multiple Researchers:** Three people coding and comparing themes



FINDINGS





Leadership Development, Distribution, and Succession Planning

Key Themes

1. An ongoing cycle of bringing in a new generation of individuals to potentially move into leadership positions
2. The development of individuals that are part of the community to play leadership roles
3. Retiring leaders to bring in fresh ideas
4. Distribution of leadership among members
5. Succession planning

Importance of Leadership for Sustainability

- Leaders provide the enthusiasm, passion, vision, ideas, and human face to the community



Leadership Development, Distribution, and Succession Planning

- 1. An ongoing cycle of bringing in a new generation of individuals to potentially move into leadership positions**

“We have a philosophy of bringing in one third new people, one third who have been to a few events and one third that are veterans. This way we ensure we are developing new leaders over time as well as the health of the community.”



Leadership Development, Distribution, and Succession Planning

3. Retiring leaders to bring in fresh ideas

“I think they have to get rid of people like me on the board. You know, they need new blood and they need new enthusiastic leaders. I worry sometimes there is not enough turnover to keep things moving.”



Leadership Development, Distribution, and Succession Planning

4. Distribution of leadership among members

“Our leadership is really diffused now. When I look at the people that are there when we have our annual meeting to do all the kinds of things that POGIL has to do all the administrative things, well we have over 20 people who can step up, just at that one meeting alone. And we could say that for workshops, presentations any of our activities, we have a large set of people.”



Viabile Financial Model

Key Themes

- 1. Various Strategies/Models to Consider**
- 2. Experimentation to Find Right Balance**
- 3. Importance of Branding**

Importance of Financial Model for Sustainability

- Key to support infrastructure of community**
- Put simply, communities cannot survive without funds to support operations**



Viabale Financial Model

Various Models to Consider:

- **Becoming a membership organization**
- **Selling materials or resources**
- **Charging for events**
- **Creating a partnership with another organization**
- **Becoming a nonprofit organization (which can encompass some or all of the above)**



Viable Financial Model

Difficult choice because materials, events, and resources were largely provided to participants at no cost early on

Important to find the right model given the culture and philosophy and to constantly make adjustments

“And so each year we’ve upped the cost of attending. So now it’s sort of a breakeven deal. And they still fill up. So it’s been sort of exploring what is the real model for what people will pay for, what people expect for it.”



Viability Financial Model

Importance of branding to establish their niche and develop reform efforts authentic to their philosophy

Two examples:

- **“SENCERized Courses”**
- **POGIL Endorsement**

“So we came up with an assessment document for writing POGIL materials. If you're an author and you wanted to publish your book and you wanted to put POGIL, the name on it, your activities had to be reviewed by a series of peers who had been trained to review POGIL materials that it needed to contain certain things. So that's how we controlled publications.”



Formal Feedback and Advice Mechanism

Key Themes

1. **Self-study/being self-critical important significant in sustainability**
2. **Importance of formal advisory boards and committees**
3. **Feedback from members (e.g., surveys) important to evolve**

Importance of Feedback for Sustainability

- **Ability to evolve and adapt practice**



Formal Feedback and Advice Mechanism

A community leader described the importance of “being self-critical and questioning our ways of operating” as one of the most significant parts of sustainability.

“And that’s really the way PKAL functioned, it was to keep reflecting on testing, challenging its conception of what worked in undergraduate STEM education and then to use that vision to shape a response to whatever it was pressing.”



Formal Feedback and Advice Mechanism

Formal advisory boards evolved out of early steering committees and informal advisory boards. Challenges stemmed from early boards:

“There were advisory boards but we might not meet for several years, there wasn’t necessarily a sense that we have a clear agenda, and I’m not sure a lot of our advice was used. Now as the board is more formalized we have set meetings, everything is in writing, and there is a sense of accountability for responding to the advisory board. And the people on it have changed a more diverse set of expertise now.”



Formal Feedback and Advice Mechanism

Also important to get feedback from community members

“So we do take and think about all comments that are given to us, both plus and minus. There are some people over the years who really didn’t like our type of workshops, who found them not helpful at all. And because of some of the things they said we made some changes in how we do our workshops. One of the things just a very simple thing is that we used to most of our workshops used to about five days in length, four days in length or so. And it was quickly realized that faculty can’t take that much time off. It’s hard to arrange that. So we adjusted and created a workshop style that can be done in two and a half days.”

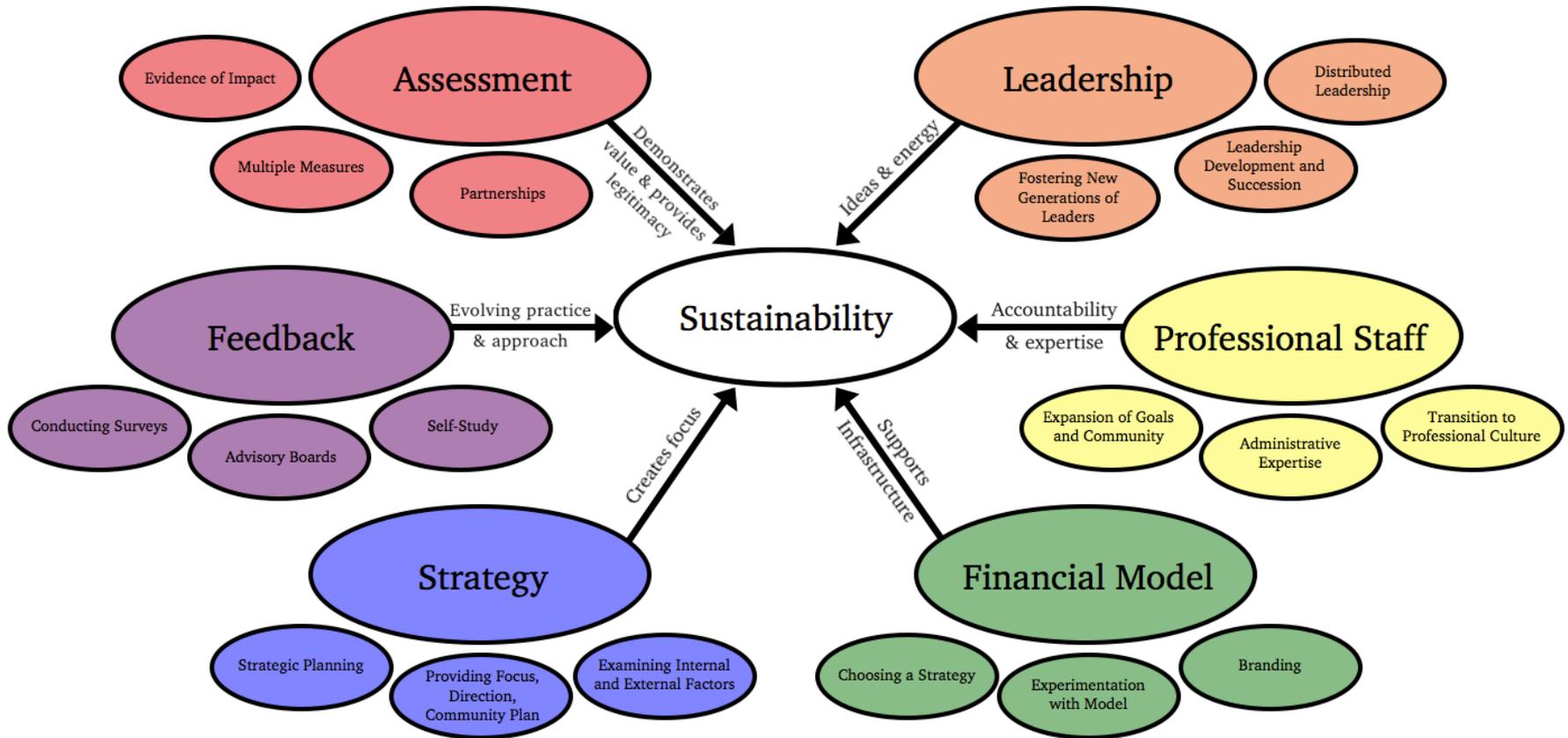


Formal Feedback and Advice Mechanism

Openness to critical feedback is tied to ability to evolve

“It's the willingness to be able to ask itself the question, ‘Have we been successful in this work that we've been trying to do? Let's look at our mission. Have we been successful in the mission? If we aren't, then we need to change what we're doing. And let's look at what and why we are doing it. Is it because we're doing it wrong? Did the environment change? Are our assumptions off? What's going on here?’ ’ Right? Okay. And then it's then it's being able to ask ourselves the question, ‘Is it time to pack up, declare victory and ride off into the sunset? Or is there another challenge beyond this that's...is there another linear challenge? Okay. We have accomplished this. But in order for this to truly be successful, we're gonna have to do this and then do this.’ So it's the ability to evolve.”

FINDINGS





DISCUSSION

- **Sustainability issues largely related to the fact that these communities are not organizationally situated**
- **Key tensions identified in CoP literature not as relevant to sustaining these communities**
- **Sustainability issues focused much more beyond general design principles and more on people and ideas**
- **All aspects of sustainability were not able to be addressed until at least 10 or 12 years into their existence – calls into question current funding models**
- **Sustainability is much more of a process than outcome – and sustainability is not always the desired state**



THANK YOU

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