Designing for Success in STEM Communities of Practice: Philosophy and Personal Interactions

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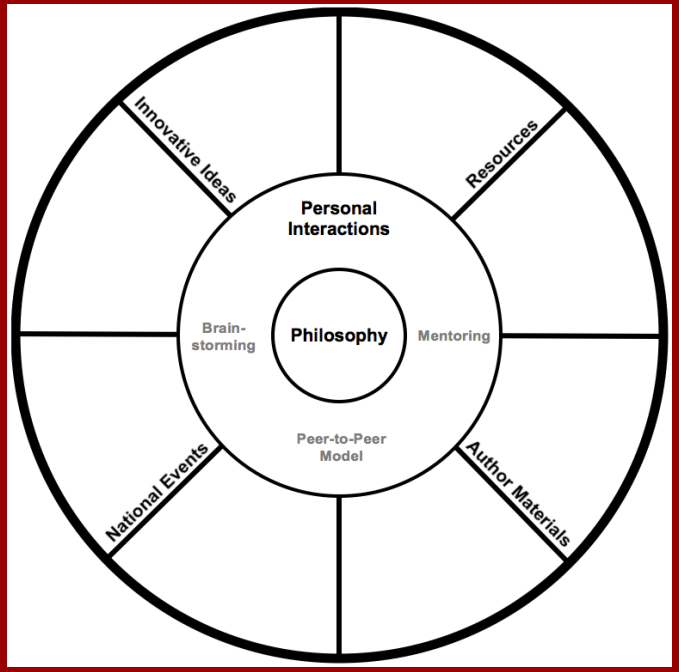

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USC Rossier

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 practice 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 how these communities can be best designed to engage faculty in STEM reform work

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)

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
- Combine familiarity with excitement
- Nurture regular rhythm for the community (Wenger et al., 2002)

Little research connecting design to outcomes

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

SENCER
SCIENCE EDUCATION FOR NEW CIVIC ENGAGEMENTS AND RESPONSIBILITIES

PROJECT KALEIDOSCOPE

POGIL
Process Oriented Guided Inquiry Learning

BioQUEST
Curriculum Consortium

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
- **Survey**: 2,503 participants, faculty members belonging to all four communities

METHODS

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

Survey sample:

- **Institutional**: 54% public, 22% Doctoral, 34% Master's, 29% Baccalaureate, 14% Associates
- **Individual**: 55% female, 84% White
- **Professional**: 37% full, 28% associate, 9% assistant, 12% NTTF; 34% biology, 35% physical science, 12% math

METHODS

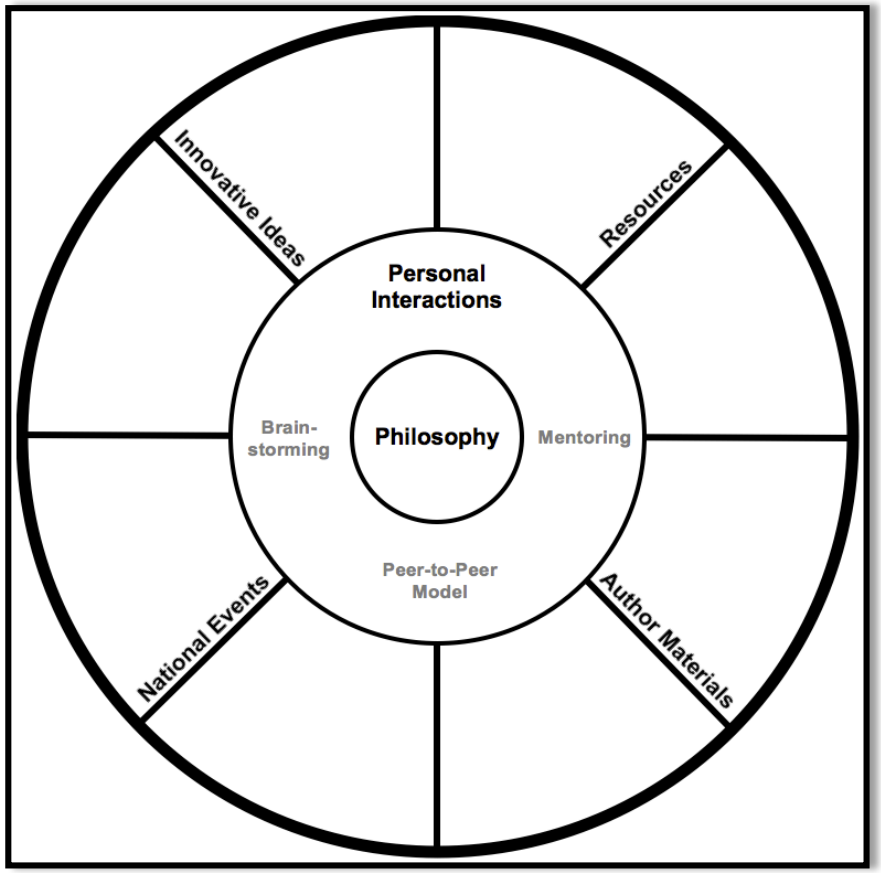
Anaylses

- **Boyatzis' (1998) Thematic Coding –** Inductive and deductive coding
- **Descriptive Statistics** – Participants' perceptions of importance of design characteristics for their effectiveness in STEM reform

Trustworthiness:

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

Model of Core Design Characteristics for Engagement in STEM Communities of Practice



Philosophy as Design

Philosophy cited by participants as best and/or most meaningful aspect of the communities

- **Symbolized and realized through their signature events**
- **Enacted through communications and other activities**
- **Often articulated in seminal documents and located on website/other materials**
- **Best evidence comes through understanding how each community enacts their philosophy**

Philosophy as Design

The POGIL Project

- **Philosophy guided by pedagogy – Process Oriented Guided Inquiry Learning**
- **Meetings utilize principles of their pedagogy – active, learner-centered sessions; guided by assessment**

"I think one of the things that really makes it work is the workshops. You don't go and hear talks all day. You are doing this stuff, and you're seeing how it works on yourself. So it's much easier to understand how it helps your students. And that's intentional all the way through. Very rarely are there talks. I think that's huge in engagement."

Philosophy as Design

SENCER

- **SENCER Ideals – Capacious questions, connecting science to civic issues and problems, interdisciplinary – value meaning-making, democratic openness**
- **Events reflect these ideals – constant questioning, reflection, making meaning of purpose of science education.**

  "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."

- **Democratic ideals come through**

  Participants are "asked for input and [get] a sense that contributing to the discussion was the duty of participants."

Philosophy as Design

Project Kaleidoscope

- **Philosophy of "What Works" in science education – active, experiential learning and acknowledging needs of diverse learners**
- **What works is enacted through leadership development initiatives, aimed at fostering leadership for STEM reform**

  "The sessions are always interactive…learning from diverse perspectives is always emphasized, we role-play and utilize our own experiences."

- **Formal mentoring and relationship building is a central component of the PKAL philosophy and these events**

Philosophy as Design

BioQUEST

- **Philosophy based on the 3 P's - problem posing, problem-solving and peer persuasion**
- **3 P's enacted through their annual summer workshops**
  - Problem solving to create new teaching materials
  - Problem posing to understand key issues for biology education
  - Peer persuasion through convincing others about their approaches and methods
- **Interactive workshop settings, computers and other tools available – participants leave with tools to engage in 3 P's to design future classes and activities**

Personal Interactions

Personal connections and interactions cited most frequently as engaging aspect of these communities

- **Peer-to-peer learning**
- **Brainstorming**
- **Mentoring**

Personal Interactions

Peer-to-peer model

- **Development and knowledge generation comes through interactions with one's peers for all four of these communities**

  "The peer-to-peer sharing I think is really vital. A lot of [professional development] models have a person who is kind of like the presenter and goes around and does trainings. I think the idea of active users, meaning people who are teaching, who are professors, who are using this, sharing, is a key."

- **Signature events provide opportunities for interactions in small and large group settings**

Personal Interactions

Brainstorming

- **These communities provide spaces to brainstorm and gain advice from others.**
- **People met at events develop into a supportive community**

> "A sounding board, advisors, mentors. Always a place to go with questions. Okay, it was a safe place to go when sometimes it wasn't safe to be in my department with certain opinions."

Personal Interactions

Mentoring

- **Formal mentoring is a crucial aspect of these communities**

  "Really having recruited and picked good people as mentors, and having them be available as resources or sounding boards was helpful, faculty always mention that. The mentoring was vital to my success."

- **Meaningful experience for mentees and mentors**

  "I'm now mentoring probably eight or nine young people, and I keep in contact with them when they've got things going on, they brainstorm with me. And I find that reciprocal mentoring as just wonderful."

Quantitative Findings Reinforce Qualitative Findings

Survey findings from 2,503 participants reinforce interviews of over 112 community leaders

- Community philosophy and innovative/new ideas rated as most important aspects of community from among 23 design characteristics
- Opportunities to connect with other faculty and STEM leaders, safe community space, inclusive practices, and opportunities to be mentored all rated highly
- These aspects predictive of individual and organizational outcomes (Gehrke & Kezar, 2015a; 2015b)

DISCUSSION

Typical design principles (e.g., rhythm of events, different levels of participation) from the literature less important than philosophy and personal interactions for ensuring engagement

Importance of these aspects likely stems from these not being organizationally-situated, as well as being distance communities

Current context of STEM reform seems to favor virtual communities and initiatives, but these findings point to importance of engaging philosophies in personal settings

THANK YOU

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