Collaborative Dynamics in Collective STEM Reform Initiatives

Lucas B. Hill, PhD
Associate Researcher
Wisconsin Center for Education Research
University of Wisconsin-Madison
Goals of the Session

- Explore the dimensions of collaboration
- Explore how the dimensions manifest in collaborative STEM reform initiatives
- Explore how the dimensions can affect STEM reform projects
My Background

● The Center for the Integration of Research, Teaching, and Learning (CIRTL)
  ○ CIRTL as an organization/community of practice
  ○ The impact of CIRTL
  ○ The role of boundary spanners

● Global Center for Food Systems Innovation (Michigan State, USAID)
  ○ Multi-sector collaboration

● CIRTL INCLUDES Pilot
  ○ Measuring CI

● The NSF Aspire Alliance
  ○ Measuring CI, 2.0
Contextual Framing

- Extensive national interest in STEM education reform
- Considerable effort in defining effective teaching
- Faculty slow to adopt evidence-based teaching practices
- Siloed and disconnected reform efforts ineffective

- Systems/collaborative approach needed
  - Multiple levers of change needed simultaneously
  - Multiple stakeholders needed to engage to make change happen
  - More can occur collectively than individually
Collaborative STEM Reform Initiatives

- **Individual-based membership**
  - PULSE, SENCER
  - BioQuest Consortium

- **Multi-institutional**
  - CIRTL
  - Bayview Alliance

- **Multi-sector**
  - [Insert state name] STEM Network

- **Networks of networks**
  - NSF INCLUDES Alliances

**Q1:** With what other networks or collaborative initiatives are you familiar?
Why are Collaborative Dynamics Important?

- The underlying premise of systems-based/collaborative reform efforts is that working together can produce more change than individual stakeholders can do alone.

- However, the focus is typically on change activities and outcomes/impact, often less on how the initiative functions as a collaborative entity.

- Main Point: The collaborative process is just as important as the activities and outcomes of an initiative.
A Central Hypothesis

How a collaborative STEM reform initiative functions….

Affects the change activities pursued….

Which affects the achievement of collective change goals.
An Example

How CIRTL functions as a community of practice...

Affects local teaching professional development programs...

Which affects future faculty participants.

Q2: Think of your own networks or initiatives, see if can you easily come up with a similar progression and post it in the chat.
Existing Collaborative Models and Frameworks Used in STEM Reform
Collective Impact

- Common Agenda
- Shared Measurement
- Mutually Reinforcing Activities
- Continuous Communication
- Backbone Organization

And....Principles of Practice, such as:
  - Include community members in the collaborative.
  - Build a culture that fosters relationships, trust, and respect across participants.
  - Cultivate leaders with unique system leadership skills.

https://www.collectiveimpactforum.org/what-collective-impact
NSF’s Collaborative Framework

- Vision
- Partnerships
- Goals and metrics
- Leadership and communication
- Expansion, Sustainability, and Scale

Networked Improvement Communities

What are we trying to accomplish?

How will we know that a change is an improvement?

What changes can we make that will result in improvement?

Plan

Act

Do

Study

Leading, organizing, and operating the network

Fostering the emergence of culture, norms, and identity consistent with network learning

Learning and using research methods

Developing a theory of practice improvement

Building a measurement and analytics infrastructure

Problem of Practice

https://www.carnegiefoundation.org/blog/five-essential-building-blocks-for-a-successful-networked-improvement-community/

https://www.air.org/resource/using-networked-improvement-communities-improve-educational-practice
Communities of Transformation*

Q3:

- In what ways have you used these existing frameworks in making sense of your collaborative work?

- What else have you used?
Literature on Collaboration: Building a Framework
Process

- **Key Questions**
  - What does existing literature say about collaboration in large, multi-institutional and multi-sector initiatives?
  - What helps or hinders the collaborative process?
  - In short, what should we consider in helping to build, evaluate, and study collaborative reform initiatives?

- **Literature review**
  - Focused on the identification of existing literature reviews, syntheses, frameworks, and models
  - Compared key elements across
  - Developed the Dimensions of Collaborative Dynamics Framework
Figure 4. Revised collaborative model for environmental planning.
Thompson & Perry, 2006 (Public Administration)

**Antecedents**
- High levels of interdependence (Logsdon 1991)
- Need for resources and risk sharing (Alter and Hage 1993)
- Resource scarcity (Levine and White 1961)
- Previous history of efforts to collaborate (Radin et al. 1996)
- Situation in which each partner has resources that other partners need (Chen and Graddy 2005; Gray 1989; Gray and Wood 1991; Pfeffer and Salancik 1978; Thomson 2001a)
- Complex issues (O’Toole 1997)

**Process**

**Outcomes**
- Achievement of goals (Bardach 1998; Gray 2000)
- Instrumental transactions among organizations become transformed into socially embedded relationships (Ring and Van de Ven 1994)
- The creation of "new value partnerships" produces capacity to leverage resources (Sagawa and Segal 2000)
- Self-governing collective action to solve problems of institutional supply, commitment, and monitoring (Ostrom 1990)

---

**Figure 1** The Antecedent-Process-Outcome Framework
Source: Adapted from Wood and Gray (1991).

---

Collaboration Processes 21
Ansell & Gash, 2008 (Public Administration)

Figure 1
A Model of Collaborative Governance
Figure 1. Process model of collaborative strategic management. \(^a\)Context describes the situational considerations and partnership formation is the initial partners, their initial form, and their initial communication, and decision-making processes. \(^b\)Collaborative strategic plan formulation is the strategic plan development by the partnership (for the partnership) and the plan’s content. \(^c\)Deliberate and emergent collaborative strategy implementation by the partnership is the actions taken by the partnership to further the collaborative strategic plan goals. \(^d\)Deliberate and emergent collaborative strategy implementation per organization is the actions taken by the individual partners within their own organizations to further the collaborative strategic plan goals. \(^e\)Realized collaborative strategy implementation outcomes are the results – plan, process, partner, person, outside stakeholder, and environment-centric outcomes. \(^f\)Changes in the domain refers to changes that occur in the social problem domain that are outside the actions taken by the individual partner organizations or the partnership, yet have an impact on the collaborative strategy implementation outcomes and/or other stages of the process model.
FIGURE 1
Communicative Constitution of XSPs As Authoritative Texts with the Capacity for Collective Agency

Trajectory
- Potential for collective agency
- Ability to influence subsequent efforts to attract capital and marshal consent (internally and externally)
- Capacity to create value

Authoritative text

Intertextuality

Texts

Conversations

Conversations

Texts
Austin & Seitanidi, 2012 (Nonprofit Sector)

<table>
<thead>
<tr>
<th>NATURE OF RELATIONSHIP</th>
<th>Stage I</th>
<th>Stage II</th>
<th>Stage III</th>
<th>Stage IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of Engagement</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Importance to Mission</td>
<td>Peripheral</td>
<td>Peripheral</td>
<td>Central</td>
<td></td>
</tr>
<tr>
<td>Magnitude of Resources</td>
<td>Small</td>
<td>Small</td>
<td>Small</td>
<td>Big</td>
</tr>
<tr>
<td>Type of resources</td>
<td>Money</td>
<td>Money</td>
<td>Core Competencies</td>
<td>Broad</td>
</tr>
<tr>
<td>Scope of Activities</td>
<td>Narrow</td>
<td>Narrow</td>
<td>Narrow</td>
<td>Broad</td>
</tr>
<tr>
<td>Interaction Level</td>
<td>Infrequent</td>
<td>Infrequent</td>
<td>Intensive</td>
<td></td>
</tr>
<tr>
<td>Trust</td>
<td>Modest</td>
<td>Modest</td>
<td>Modest</td>
<td>Deep</td>
</tr>
<tr>
<td>Internal change</td>
<td>Minimal</td>
<td>Minimal</td>
<td>Minimal</td>
<td>Great</td>
</tr>
<tr>
<td>Managerial Complexity</td>
<td>Simple</td>
<td>Simple</td>
<td>Complex</td>
<td></td>
</tr>
<tr>
<td>Strategic Value</td>
<td>Minor</td>
<td>Minor</td>
<td>Major</td>
<td></td>
</tr>
<tr>
<td>Co-creation of value</td>
<td>Sole</td>
<td>Sole</td>
<td>Conjoined</td>
<td></td>
</tr>
<tr>
<td>Synergistic value</td>
<td>Occasional</td>
<td>Occasional</td>
<td>Predominant</td>
<td></td>
</tr>
<tr>
<td>Innovation</td>
<td>Seldom</td>
<td>Seldom</td>
<td>Seldom</td>
<td>Frequent</td>
</tr>
<tr>
<td>External system change</td>
<td>Rare</td>
<td>Rare</td>
<td>Rare</td>
<td>Common</td>
</tr>
</tbody>
</table>

Austin et al.

<table>
<thead>
<tr>
<th>SOURCES OF VALUE</th>
<th>Sole-Creation</th>
<th>Co-Creation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource Complementarity</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Resource Nature</td>
<td>Generic</td>
<td>Distinctive Competency</td>
</tr>
<tr>
<td>Resource Directionality</td>
<td>Unilateral</td>
<td>Conjoined</td>
</tr>
<tr>
<td>Linked Interests</td>
<td>Weak/Narrow</td>
<td>Strong/Broad</td>
</tr>
</tbody>
</table>

TYPES OF VALUE

| Associational Value          | Modest        | High       |
| Transferred Resource Value   | Depreciable   | Renewable  |
| Interaction Value            | Minimal       | Maximal    |
| Synergistic Value            | Least         | Most       |
| Innovation                   | Seldom        | Frequent   |

STAGES

| Philanthropic | Transactional | Integrative | Transformational |

Figure 1. The collaboration continuum

Figure 2. Collaborative value creation spectrum
Emerson, Nabatchi & Balogh, 2012
(Public Administration)
Table 1
A Diagnostic or Logic Model Approach to Collaborative Governance

<table>
<thead>
<tr>
<th>Dimension and Components</th>
<th>System Context</th>
<th>Drivers</th>
<th>The Collaborative Governance Regime</th>
<th>Outputs Collaborative Actions</th>
<th>Collaborative Outcomes</th>
<th>Impacts</th>
<th>Adaptation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elements within Component</td>
<td>- Resource</td>
<td>- Leadership</td>
<td>- Discovery</td>
<td>- Procedural/Institutional Arrangements</td>
<td>Will depend on context and charge, but might include:</td>
<td>- Change in System Context</td>
<td>- Change in System Context</td>
</tr>
<tr>
<td></td>
<td>- Conditions</td>
<td>- Consequential</td>
<td>- Definition</td>
<td>- Leadership</td>
<td>- Securing Endorsements</td>
<td>- Change in the CGR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Policy</td>
<td>- Incentives</td>
<td>- Deliberation</td>
<td>- Trust</td>
<td>- Enacting Policy, Law, or Rule</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Legal</td>
<td>- Interdependence</td>
<td>- Determination</td>
<td>- Mutual</td>
<td>- Marshalling Resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Frameworks</td>
<td>- Uncertainty</td>
<td></td>
<td>- Understanding</td>
<td>- Deploying Staff</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Prior Failure to Address Issues</td>
<td></td>
<td></td>
<td>- Internal Legitimacy</td>
<td>- Siting/Permitting</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Political Dynamics/Power Relations Network Connectedness</td>
<td></td>
<td></td>
<td>- Shared Commitment</td>
<td>- Building/Cleaning Up</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Levels of Conflict/Trust Socio-economic/Cultural Health &amp; Diversity</td>
<td></td>
<td></td>
<td></td>
<td>- Enacting New Management Practice</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
- CGR: Collaborative Governance Regime
- System Context: Resource, Consequential, Incentives, Interdependence, Uncertainty
- Drivers: Leadership, Discovery, Definition, Deliberation, Determination, Understanding, Mutual, Trust, Internal Legitimacy, Shared Commitment, Knowledge, Resources
- Outputs: Procedural/Institutional Arrangements, Leadership, Knowledge, Resources
- Impacts: Securing Endorsements, Enacting Policy, Law, or Rule, Marshalling Resources, Deploying Staff, Siting/Permitting, Building/Cleaning Up, Enacting New Management Practice, Monitoring Implementation, Enforcing Compliance

Source: Emerson, Nabatchi & Balogh, 2012
Bedwell et al., 2012 (Human Resources)
Bryson, Crosby, & Stone, 2015
(Public Administration)
Dimensions of Collaborative Dynamics

- Motivation
- Support Resources
- Group Norms & Processes
- Leadership
Motivation

● History
  ○ The contextual precursors of the change initiative, including the systemic context of the problem being addressed, prior reform activities employed to address the problem, and prior partner/stakeholder interaction.

● Value
  ○ The perceived value of forming and continuing to engage in a collaborative initiative for participating individuals and organizations.

● Commitment
  ○ Individual and organizational commitment to the mission, group norms and processes, and activities of the change initiative.
Group Norms and Processes

- Congruity
  - The extent of congruence across and among partners and stakeholders in the change initiative, which includes factors of commonality, autonomy, interdependence, and coordination.

- Interaction
  - The nature of the mediums and mechanisms used in the change initiative to communicate, exchange knowledge, build connections and relationships, and resolve conflict.
Group Norms and Processes Con’t

● Trust and Respect
  ○ The extent that individuals believe in the reliability and character of fellow partners and stakeholders in the change initiative and respect diverse perspectives and ideas.

● Accountability
  ○ The articulation, distribution, and execution of project roles and responsibilities in the change initiative in alignment with clear, mutual expectations for project members.
● **Equity, Diversity, and Inclusion**
  ○ The wide representation and substantive involvement of stakeholders and partners affected by the problem of interest and equitable distribution of power to the benefit of diverse groups.

● **Governance**
  ○ The decision-making process to develop and implement rules, policies, and strategic directions of the change initiative.

● **Improvement**
  ○ The development and implementation of shared metrics (and other data collection) related to group dynamics, project activities, and project outcomes in service to organizational learning and continuous improvement in the change initiative.
Support Resources

- Availability
  - The availability of key resources in support of the change initiative, such as funding, staffing, technology, time, expertise, and a backbone organization.

- Allocation
  - The balanced or imbalanced distribution of key resources within the change initiative to support project functioning and the implementation of change activities.
Leadership

● Structure
  ○ The leadership structure of the change initiative including varying combinations of distributive, hierarchical, formal, and informal components.

● Attributes
  ○ The qualities of formal and informal leaders in the change initiative that help convene diverse individuals and organizations, empower stakeholders and partners, build legitimacy for the project, and create enthusiasm for collective change.
Concluding Thoughts

- Motivation, group norms & processes, support resources, and leadership are all VITAL in....
  - Developing a collaborative initiative
  - Convening stakeholders
  - Seeking support
  - Establishing leadership structures & processes
  - Evaluating the initiative over time
  - Diagnosing strategic areas of investment & improvement
  - Maintaining drive & passion for the cause of the initiative
Questions?

Email: lhill6@wisc.edu
References