Examining A Network of Communities Focused on Transforming Mathematics Instruction

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Communities of practice (CoPs) offer a structure for individuals with common goals to engage in collective learning (Wenger-Trayner & Wenger-Trayner, 2015). The CoMMIT Network was developed to support regional Math CoPs of undergraduate mathematics faculty interested in using active learning and inquiry teaching approaches in their courses. This study utilized the value framework (Wenger et al., (2011) to interrogate the value participating in the CoPs and COMMIT Network provides participants.

Key Words: communities of practice, active learning, inquiry teaching

Mathematics courses at institutions of higher education often act as "gatekeeper courses," leaving many students with minimal access to or interest in pursuing STEM careers. One strategy for increasing success is to use evidence-based teaching methods, like active learning (Freeman et al, 2014; Theobald et al, 2020). Despite research that supports this approach, traditional lecture-style teaching is still the predominant method of instruction in many college mathematics courses (Jaworski & Gellert, 2011; Laursen et al., 2019). Using networks and communities of practices (CoPs) to initiate, promote, and sustain change is one method shown to overcome these barriers to instructional change (Austin, 2011; Gehrke & Kezar, 2017). The COMMIT Network provides a flexible structure to support regional CoPs of undergraduate mathematics faculty in their mission to influence instructional change and improve student learning outcomes.

Methods

This study focused on two research questions: 1) To what extent does the COMMIT Network create value for the regional CoPs? 2) What aspects of the COMMIT Network model are most valuable to individual faculty participants, CoP leaders, and the Network? We utilized the value creation framework (Wenger et al., 2011) and descriptive analysis to qualitatively examine the layers of value identified by both faculty participants and CoP leaders to understand how the COMMIT Network can best support the sustained, systemic implementation of evidence-based teaching practices in institutions of higher education.

Results and Implications

Faculty participants shared finding immediate value in the ability to network with like-minded peers and share resources and ideas across their CoPs. CoP leaders expressed the importance of the COMMIT Network in providing a structure that supports: 1) regularly scheduled activities, 2) opportunities for networking, 3) structured channels of communication, 4) distribution of leadership, and 5) mentoring, which helps the CoPs within the Network to develop a sense of collective identity and legitimacy.

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The Value of COMMIT-ing to Teaching with Inquiry: Examining a Network of Communities Focused on Transforming Mathematics Education

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Introduction

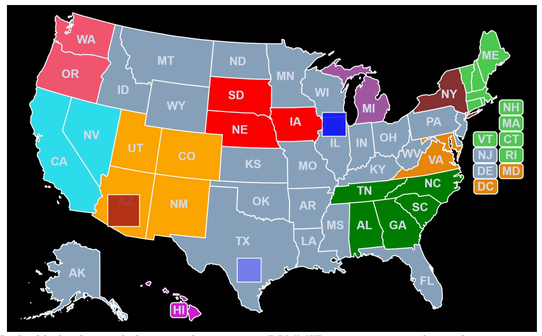
The 21st century workforce needs highly qualified STEM professionals. It is projected that STEM jobs will grow 8% over the next ten years (Seitz, 2021). Mathematics courses at institutions of higher education (IHEs) often act as "gatekeepers," leaving many students with minimal access to or interest in pursuing STEM careers. One strategy for increasing success, including for students from historically under-represented groups, is to use evidence-based teaching methods, such as active learning (Freeman et al, 2014; Theobald et al, 2020). Despite research supporting this approach, traditional lecture-style teaching is still the predominant method of instruction in many college mathematics courses (Jaworski & Gellert, 2011; Laursen et al., 2019; Nolan, 2006, 2010). Using networks and communities of practices to initiate, promote, and sustain change is one method shown to overcome these barriers to instructional change (Austin, 2011; Gehrke & Kezar, 2017) and is the focus and exploration of this project. Communities of practice (CoP) are groups of people with common interests who engage in shared learning via ongoing, regular interactions and collaborate toward a common goal(Lave & Wenger, 1991; Wenger-Trayner & Wenger-Trayner, 2015).

Context

The **COMMIT (COMmunities for Mathematics Inquiry in Teaching) Network** provides a common infrastructure and flexible structure to support regional communities of practice in their mission to influence instructional change, address faculty isolation, and ultimately, improve student learning outcomes. The COMMIT Network collectively spans over half of the United States, with over 800 educators actively involved. Each regional COMMIT brings high quality professional development to their local members, focused on infusing active learning, equity, and inquiry into college mathematics classrooms.

A regional **COMmunity for Mathematics Inquiry in Teaching (COMMIT)** is a local group of college mathematics educators interested in practicing and disseminating teaching and learning techniques centered on student inquiry.

COMMIT Members center their classrooms on the Four Pillars of inquiry that include: **(1)** ability for instructors to foster equity in their design and facilitation choices , **(2)** deep student engagement with coherent and meaningful mathematical tasks, **(3)** opportunities for students to collaboratively process mathematical ideas with peers, and **(4)** opportunities for instructors to inquire into student thinking (Laursen & Rasmussen, 2019).



The highlighted areas below are where current COMMIT communities are located.

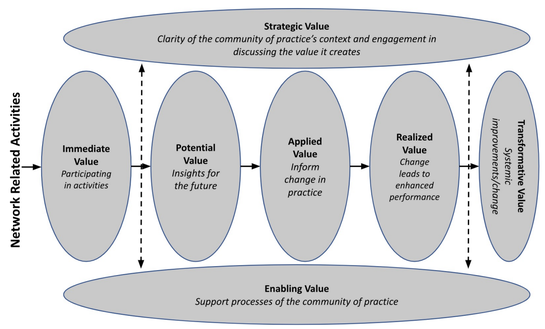
Research Questions

1) To what extent does the COMMIT Network create value for the regional COMMITS?

2) What aspects of the COMMIT model are most valuable to individual faculty participants, COMMIT leaders, and the broader network?

Theoretical Framing

Utilizing Wenger et al.'s value framework (Wenger et al., 2011), we examine the multiple layers of value identified by both faculty members and leaders as we seek to understand how the COMMIT Network can best support the sustained and systemic implementation of evidence-based teaching practices in IHEs. The framework incorporates five cycles of value creation - immediate (in the moment resources, information, connections), potential (for the future), applied (tested implementation), realized (actualized implementation), and transformative (broader dissemination to others). In addition to the cycles, value at the CoP level is also supported by strategic value (clarity of the context and vision, ability to engage in strategic conversations) and enabling value (support processes that make network life possible).



Findings

The Value the COMMIT Network Creates for Regional COMMITs

Interviews of COMMIT regional leaders in Year 2 of the project indicate that the ability to share resources and ideas and to develop interpersonal connections as the most prominent "in the moment" Immediate Value aspects of engaging in COMMITs. One CoP leader explained,

"We have been trying to learn from others and what they are doing…it has been inspiring for us." The opportunities to connect with like minded peer groups also surfaced as important to CoPs."

Leaders shared that it was important to "...have access to the leadership teams and a shared voice" as they developed processes and events for their region and having access to other faculty and CoPs allowed them to build strong interpersonal relationships with colleagues, not only within their own COMMIT but also from across the network.

Findings (Continued)

Regional COMMIT leaders identified the role that the Network plays in fostering a sense of collective identity around utilizing teaching with inquiry practices. Leaders noted the importance of this in developing a sense of purpose and support to "change the way we think about effective teaching" in their CoPs and at their individual institutions. "Having the general CoP Network in the background helps us generate some legitimacy," explained a leader. "It is not something we are making up because it is fashionable...that support from the back is helpful. We have a more defined structure to what we were trying to do more organically."

Finding Value in the COMMIT Network Model

CoPs are often ephemeral—they develop organically out of shared need, but often dissolve, particularly when they do not exist within a formal organization. One of the goals of the COMMIT Network project has been to examine the structures and supports that individual CoPs need to sustain over time in order to facilitate long term, systemic change in mathematics education. As such, it is important to understand the aspects of the Network model itself that leaders and participants view as being integral to the health of their COMMIT.

- **Regularly scheduled, ongoing events**
- **Formal and informal opportunities for faculty to network and share ideas/resources**
- **Structured channels of communication within CoPs and across the Network**
- **Distributing leadership by recruiting and training new and upcoming leaders in each CoP**
- **Mentoring support for individual participants, workshop and activity facilitators, and COMMIT leaders provided by COMMIT members and the Network**

These forward-looking insights aligned with our consistent evidence of the value both individuals and regions find in the strong community connections within the network. When looking at the future goals of each region, it is often about engaging within the network in addition to continuing to expand the reach of the network and its regions.

"It's nice… our community has been around for awhile. We have a history of things we have done and tried, we could give that experience and share that history with new CoPs to help out."

"There is something powerful about the regional anchoring of things but there is enough connection that regions can inform each other. There are many similarities to having a network where we can learn together what works well."

Quick Facts About the Network

13 current regional COMMITs (8 included in the study), which expanded from the original 4 regions funded in 2019.

438 documented participants engaged in one or more COMMIT Network activities over the past 3 years (e.g. book clubs, teas, workshops, classroom observations).

213 mini-grants awarded to faculty to support their participation in activities such as peer classroom observations, course collaborations, and workshop planning/facilitation.

78.5% of surveyed participants indicated expanding their COMMIT Network with math faculty peers by engaging in at least one inquiry teaching activity

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