Mathematics Persistence through Inquiry and Equity at a Two-Year HSI

Amelia Stone-Johnstone
Mary E. Pilgrim

This material is based upon work supported by the National Science Foundation under Grant No. 1953713, 1953753. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.
Outline of the Talk

- Introduction
- Description of the MPIE Project
- Context
- Data Sources
- Year 1 findings
- What we’ve learned about the process
- Discussion questions
Introduction: The problem

- Nationally, transfer students from two-year colleges earn 15% fewer bachelor degrees than their four-year counterparts, and only 33% of two-year college students transfer within six years (Davies, 2017).

- Less than 10% of students placed into developmental courses graduate from community college within three years, and 40% of them never complete their developmental courses (The Campaign for College Opportunity, 2018).

- To address these low pass rates, legislation in California (and other states) has been passed requiring students to be placed in a transfer-level course during their first year of study.
The Mathematics Persistence through Inquiry and Equity Project

• National Science Foundation supported project
• Partnership of 4-year institution and 2-year college
  • Many students transfer from the 2-year college to the 4-year college
Context

The Institution - SCHSI:
- Enrolls 20,000 students each term
- 85% of students from minoritized communities; 68% Latinx
- Gateway math courses have historically low pass rates.

The Legislation – AB705:
- Multiple Measures for placement
- Students take transfer-level math by the end of their first year.
- Student self-select enrollment
- Reduction in offerings in non-transfer level math
- Increased enrollment in transfer-level math (especially College Algebra)
Focus: Gateway Mathematics for STEM-intending students

- College Algebra (with and without support)
- Precalculus
- Trigonometry
MPIE Logic Model

Inputs
- Human resources of research team
- Material resources from Grant
- Relationship between the colleges

Activities
- Research Data Collection and Analysis
- Professional Development Design
- Professional Development Implementation

Short-term Outcomes
- Develop awareness of the institutional context that can support sustainable change.
- Understanding mathematics instruction at SCHSI.

Long-term Outcomes
- Shift in culture around teaching and learning.
- More inquiry and equity in student engagement.
- Building capacity at SCHSI to develop and implement PD.

AB705
Low pass rates in gateway courses
MPIE Project Phases:

**Phase 1:**
Collect and analyze institutional and classroom-level data to inform PD.

**Phase 2:**
Cycles of design research and compensated professional development to increase inquiry- and equity-oriented teaching practices in gateway mathematics courses.

**Phase 3:**
SDSU PD support is phased out; Study sustainability of changes.

Data Sources
- Interviews
- Surveys
- Institutional Data
- Classroom observations
- Student focus group(s)
Data Sources

- Interviews with students, instructors, department chairs, deans, PD developers
- Institutional data
- Classroom observations
- Surveys
Preliminary Analysis

1. Transcribed interviews & made descriptive accounts
2. Survey preliminary analysis
3. Transcribed and Analyzed Observations
   - Tasks
   - Patterns of Participation
Year 1: Initial Findings/Themes

**Tasks:** Procedures without connections

**Instructional Discourse:** Primarily IRE=Initial-Response-Evaluate

**Time Pressure:** Both instructors and students felt pressured to cover content / catch up

**Placement:** Multiple experiences and expectations, little consistency across

**Engagement:** Both instructors and students wanted more engagement. Like a broken marriage both parties saw there was a problem, and neither party saw a way to the solution.
How has data informed PD?

Mini-PD - with Phase 1 participants

Opening Day - Introducing a practical tool like Desmos was appreciated!

Current PD
• Fall 2021 - focus on inquiry

Tension looking ahead:
What does inquiry mean in college algebra?
How does inquiry work given the constraints of SCHSI’s current curriculum?

• Spring 2022 – focus on equity
How did we get here?

1. Partnered with local two-year college folks.
2. Started writing a year in advance.
3. Identified needs and determined a collaborative plan.
4. SCHSI had to understand how external funding worked at their institution.

NSF 19-540 (now replaced by NSF 20-599)

For Track 1 (Building Capacity), an eligible institution may submit only one proposal. The award limit and duration for Track 1 are up to $2,500,000 over a period of up to 5 years.

For Track 2 (HSIs New to NSF), there are no restrictions or limits on the number of proposals submitted. The award limit and duration for Track 2 are up to $300,000 over a period of up to 3 years.
What we’ve learned so far?

There is little to no infrastructure for external funding at SCHSI.

Understanding “assigned time” for grant work. What does that look like on the SCHSI side?

Silos of knowledge exist across SCHSI. (e.g., academic counseling vs. content departments)

Tensions around what classroom observations mean at SCHSI. (i.e., observations for research vs. observations for evaluations)
### What does the NSF offer for IUSE HSI?

<table>
<thead>
<tr>
<th>Project Tracks</th>
<th>Multiple Organizations</th>
<th>Maximum Budget and Project Duration</th>
<th>Maximum Number of Awards per PI/Institution</th>
</tr>
</thead>
</table>
| **Track 1: Planning or Pilot Projects (PPP)** | Optional; Collaborative Projects and/or subaward            | • $200,000 – single institution  
• $300,000 – collaborative  
• +$100,000 incentive to partner with one or more community colleges  
• Two years | 2 active awards per institution, including awards from previous solicitations (see full solicitation for details) |
| **Track 2: Implementation and Evaluation Projects (IEP)** | Optional; Collaborative Projects and/or subaward            | • $500,000 – single institution  
• $800,000 – collaborative  
• +$200,000 incentive to partner with one or more community colleges  
• Three - five years | 2 active awards per institution, including awards from previous solicitations (see full solicitation for details) |
| **Track 3: Institutional Transformation Projects (ITP)** | Optional; Only through subawards (if expertise not available in submitting HSI) | • $3,000,000  
• Five years | 1 submission per institution; previous ITP track awardees are not eligible to apply |
Discussion Questions

1. What resistance do you forecast that two-year college instructors will have for PD focused on inquiry and equity? What advice do you have for navigating this context?

2. What transformations of gateway mathematics that were necessitated by remote learning will /should persist after COVID restrictions are lifted?

3. What systemic changes should accompany AB705 and the use of multiple measures to place students in credit bearing gateway mathematics courses?

4. What types of data do you recommend we collect to inform the development of PD?

5. What are ways to bridge between the siloed campus units to better support students?
References


- Davies, R. I. (2017). The impact of transfer assistance program on STEM students’ transfer from the community college to the California State University. Dissertation, (October).
Thank you for attending, and thank you to the organizers!

Feel free to contact us if you have lingering questions/suggestions:

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- National Science Foundation supported project
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- You should think about developing similar projects--there is money to support such work!
Logic Model

Inputs
- Human resources of research team
- Material Resources from Grant
- Relationship of Colleges

Activities
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- Professional Development Design
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Short-term Outcomes

Long-term Outcomes

AB705
Previous low pass rates
MPIE Project Phases:

**Phase 1:**
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Gateway Mathematics In the Time of AB705 (and COVID): Student and Instructor Voices

Brinley Stringer
William Zahner
Ernesto Calleros

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First Pass Analysis

- Transcribed interviews
- Made descriptive accounts
- Discussed as a team and identified themes (e.g., placement)
  - Commonalities within roles (student, instructor)
  - Commonalities across roles
    (e.g., What do students and instructors say about placement?)
Year 1: Initial Findings/Themes

Students and Instructor Perspectives: Changes in Gateway Math Induced by AB705

- Timing and Pacing
- Engagement & Feedback
- Placement
Theme 1: Timing & Pacing

- Instructors expressed feeling tension between the volume of curriculum content and time allotted to teach that curriculum.
- Students also noted time and pace concerns, but usually in the context of a single class period.

Instructor: “Students are [now] coming into [the course] less prepared” and “then suddenly we're spending more time on this prerequisite material, and then we can't get into or as far as we need to get to for the other content for students to move on to the next course.”

Student: “I feel like the professor does a good job of covering the material when she does but I don’t, you know obviously if we’re covering you know 6, 7 sections a week but we’re only meeting one hour for class, it doesn’t really give us a lot of instructor time”
Theme 2: Engagement & Feedback

Both instructors and students expressed difficulty adapting class routines to Zoom or for asynchronous classes.

- In general, both students and instructors wanted more student engagement, but were disheartened by black screens.

**Instructor:** “there's a lot less interaction on the remote. It's just a bunch of black screens. Some of my colleagues, they're trying to force students to turn their cameras and I've shied away from that because I've heard that, you know, sometimes they Just so many issues.”

**Student:** “When you uh have to ask questions, you like really stand out. And it's like, it's more intimidating since you have to disrupt the entire class, since most of the time, like no students are talking, it's just the teacher talking.”
Theme 3: Placement

- Most instructors expressed students were underprepared for their classes, whereas most students felt their peers were placed in the right class.
- Wide variation in students’ experience:
  - varying types of counseling, interactions,
  - a placement test,
  - comparing their previous transcripts to classes offered at the college, or using a website.

Student: “Uh, not sure. I-I just filled out the form and they gave me the class I should be in.”

Instructor: “They’re not coming in with the skills they need to pass.” and some feel students are not being appropriately advised.
How has data informed PD? (And what tensions are coming up?)

Mini-PD
Opening Day < Introducing a practical tool like Desmos was appreciated!

Current PD
Tension looking ahead: What does inquiry mean in college algebra? (How to do inquiry work given the constraints of SCHSI’s current course)
Discussion Questions

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