



# NSF PI Meeting 2021

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# Poster Overview



# Project Purpose



- Pre-service teachers (PSTs) need more opportunities to learn
  - Grossman et al.'s (2009) approximations of practice
- Why discussion?
  - Engaging students in discussions is believed to support development of reasoning skills, support conceptual learning, and improve engagement
  - Leading a group discussion is considered a *high-leverage* teaching practice (TeachingWorks, 2015)
- Why argumentation?
  - Argumentation is characterized by an exchange of ideas where claims are stated and supported using forms of argument that are valued within the discipline
  - Supports students in developing their conceptual understanding
  - Engages students in content practices as a deliberate goal of instruction

# What is a simulation?

- Teaching Simulation
  - Set in a fifth-grade classroom
  - Five student avatars (and one “human-in-the-loop” who controls them)
  - Virtual whiteboard that PSTs and students can simultaneously write on using an iPad
  - PSTs begin mid-lesson, and have already seen written student work
  - Each PST individually plans and leads the short (up to 20 minute) discussion in the simulator
  - Discussion is in real-time with no pauses or restarts



# Research Focus

How can performance tasks delivered within a simulated classroom environment be used to develop pre-service elementary teachers' ability to facilitate discussions in science and mathematics?

Evidence of improvement on ability to facilitate discussions

Use and understanding of formative feedback

Perceptions of task authenticity, usefulness, and appropriateness

# Research Design



- Four-year, cross-disciplinary research and development grant
- Developed and piloted 8 performance tasks (4 math and 4 science) to support PST learning of how to facilitate small-group discussions focused on argumentation
- “Approximations of practice” model that provides opportunities for PSTs to:
  - 1) engage in rehearsals within a simulated classroom and receive video record of performance
  - 2) receive targeted, actionable feedback on teaching performance
  - 3) reflect and debrief within their methods class
- This study involves collaborating with 3 elementary teacher educators (1 science, 2 math) who integrated and used the performance tasks within their methods course across two semesters:
  - 1) baseline semester (pre and post only, business as usual for course instruction)
  - 2) formative semester (pre and post + use of 3 performance tasks during course instruction)

# Data Sources Across Baseline/Formative Semesters

Data Source	Time Point						
	Pre		Formative 1	Formative 2	Formative 3	Post	
	Baseline Semester	Formative Semester	Formative Semester	Formative Semester	Formative Semester	Baseline Semester	Formative Semester
Recorded Simulated Discussion Performance	✓	✓	✓	✓	✓	✓	✓
PST Discussion Performance Scores	✓	✓	✓	✓	✓	✓	✓
Background Information Questionnaire (BIQ)	✓	✓					
Content Knowledge for Teaching (CKT)	✓	✓				✓	✓
Post-Task Survey	✓	✓	✓	✓	✓	✓	✓
Teacher Educator Interview	✓	✓	✓	✓	✓		✓
Case Study Interview (6-7 PSTs per class)			✓	✓	✓		✓
Observational Notes from Class Sessions			✓	✓	✓		

# Analysis

Qualitative coding of interview results and observational notes to identify patterns/themes in participants' responses

Quantitative analysis of survey responses and performance scores

Analysis



# Selected Results

- Evidence that PSTs improved in their ability to facilitate argumentation-focused discussions
- PSTs' self-report of which supports contributed most to their learning
- PSTs' perceptions of the usefulness of the simulated teaching they experienced

# PST Learning Was Evaluated via a Five Dimension Rubric

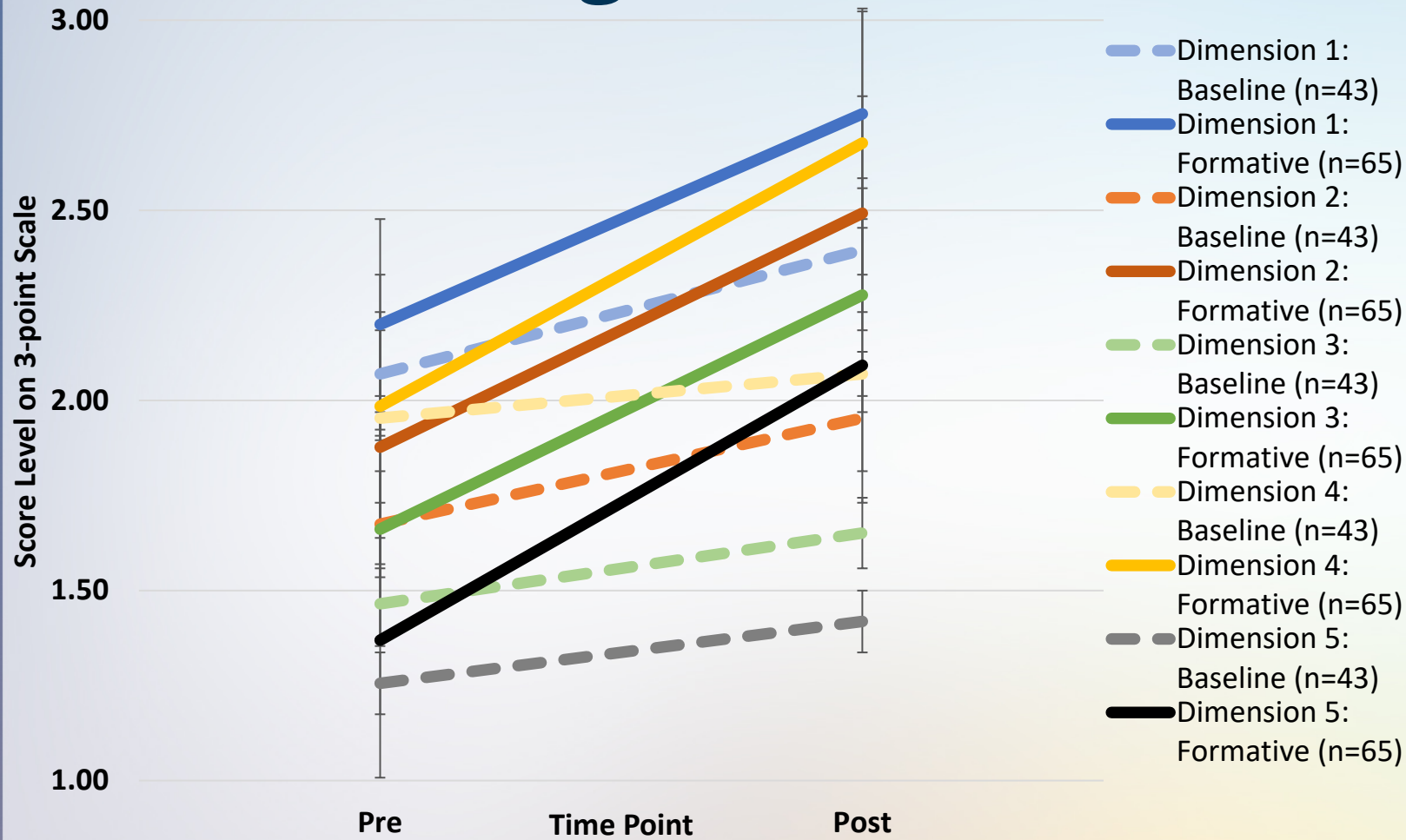
## Five Dimensions

- **Attending to Student Ideas** focuses on ensuring all student voices are heard and ideas are valued.
- **Facilitating a Coherent and Connected Discussion** emphasizes the structure and clarity of what transpires in the discussion.
- **Encouraging Peer Interactions** focuses on the nature and extent of teacher mediation of student contributions.
- **Developing Students' Conceptual Understanding** focuses on the accuracy of content and students' opportunities to evaluate content accuracy.
- **Engaging Students in Argumentation** focuses on the extent to which argument construction and critique are a focus of instruction.

## Three Score Levels

- **Level 1: Beginning Novice** – performance is typical of a novice with little to no preparation or teaching experience
- **Level 2: Developing Novice** – performance represents a teacher who has some experience or preparation but is not yet ready to begin teaching children
- **Level 3: Well-Prepared Novice** – performance represents a teacher who is ready to begin teaching children (but not yet expert)

# Evidence that PSTs Improved in Their Ability to Facilitate Argumentation-focused Discussions



- Growth between pre- and post- time points by dimensions is shown here for the full group of PSTs across baseline and formative semesters.
- Baseline semesters are shown by dotted lines; formative semesters by solid lines.
- There was a statistically significant difference in post discussion scores between the baseline and formative groups, while adjusting for pre discussion scores.

# PSTs' Report of Important Factors Supporting Their Learning

Factor Supporting Learning	Very Important n (%)	Important n (%)	Not Important n (%)	Did Not Occur n (%)
Familiarity with the simulated environment	45 (68%)	19 (29%)	2 (3%)	0 (0%)
Familiarity with the task and expectations	48 (73%)	18 (27%)	0 (0%)	0 (0%)
Opportunities to reflect on performance	37 (56%)	23 (35%)	4 (6%)	2 (3%)
Formative feedback reports	49 (74%)	16 (24%)	0 (0%)	1 (2%)
Other feedback	30 (45%)	26 (39%)	5 (8%)	5 (8%)
Class activities	38 (58%)	21 (32%)	3 (5%)	4 (6%)
Outside activities not involving students (e.g., readings)	18 (28%)	17 (26%)	3 (5%)	27 (42%)
Other related activities involving students (formal or informal experience in the classroom or with children)	26 (41%)	26 (41%)	0 (0%)	12 (19%)

*N=67 PSTs; some PSTs did not respond for all rows*

# PST's Report of Factors Contributing Most to Learning (Case Study Participants Only)

Factor Supporting Learning Most	Total n (%) N = 20
Formative feedback report	12 (60.0)
Opportunity to practice teaching	7 (35.0)
Opportunity to reflect on practice	6 (30.0)
Opportunity to review video record of simulated discussion	4 (20.0)
Class activities	4 (20.0)
The focus on the five dimensions of argumentation-focused discussion	2 (10.0)
Simplified nature of the task allowing for sustained focus on argumentation-focused discussion	1 (5.0)
Other	1 (5.0)

# PSTs' Perceptions of Usefulness

- 84% of PSTs would recommend including simulated classroom discussions for a future section of the methods course.
- Why? (% of total codes applied)
  - Opportunity to practice leading discussion (78%)
  - Tasks allowed PSTs to transfer skills to real classroom teaching (36%)
  - Safe environment in which to learn/make mistakes (33%)
  - Useful to focus on discussion (31%)
  - Supported reflecting on PST's own teaching or that of others (14%)
  - Feedback reports were useful (13%)
  - Tasks simplified some aspects of classroom practice (12%)
  - Allowed PSTs to apply techniques learned in coursework (10%)
  - Allowed PSTs to better know and understand student thinking (5%)
  - Helped with understanding core content (2%)

# Implications/Impact

- Proof of concept: First of their kind extended, content-focused performance tasks can be delivered via simulation with adequate levels of standardization to support their intended purpose.
- Results suggest simulations may have value as approximations of practice in teacher education.
  - Strong evidence of PST learning (direct and self-report evidence)
- The cycle of activities (preparation / engagement / feedback & debrief) drives PST learning, not the simulation alone.
  - Evidence that familiarity with the environment, task, expectations, and the formative feedback were especially important
  - But so was reflection, and support provided by the TEs

# Products

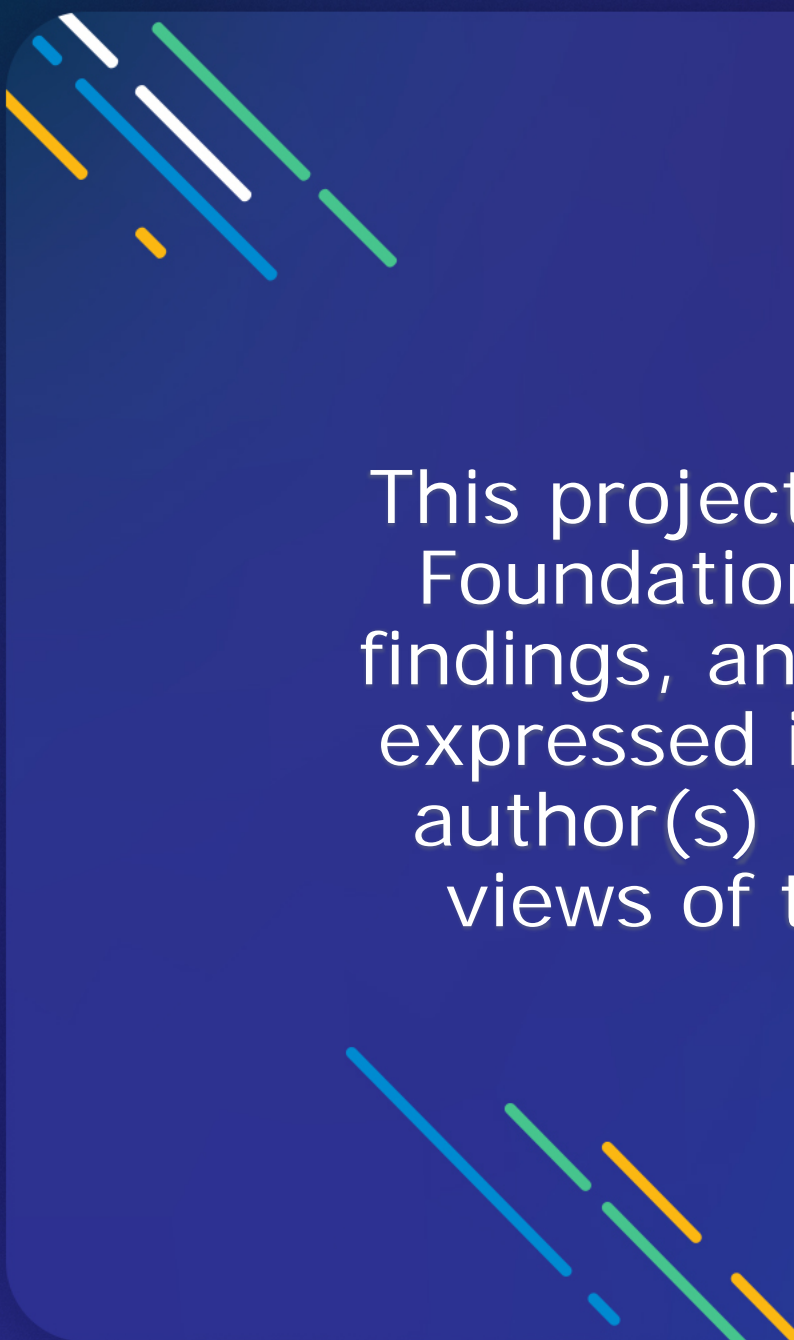
**ALL** performance task files associated with this project work are publicly available for use and adaptation via the Qualitative Data Repository (QDR) including ...

- Teacher-facing materials for all eight mathematics and science tasks
- Back-end (interactor) training materials to support the person controlling the avatars
- Scoring materials including rubrics and training files that would allow you to score performances

To access:

- Create a free account at QDR (search qualitative data repository or go to <https://qdr.syr.edu/user/register>)
- Search for “Go Discuss” to access the project collection
- Narrow by content or file type or download them all!





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