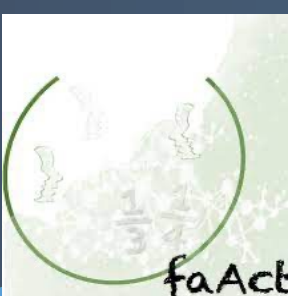


Fraction Activities and Assessments for Conceptual Teaching/Model Mathematics Education (Model ME)



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INTRODUCTION

This poster describes the outcomes, dissemination, and scaling of project work from "Fraction Activities and Assessment for Conceptual Teaching (FAACT)."

We describe the results of a pilot study for FAACT, free curriculum materials, and how the work has been translated to a new game-based project, Model Mathematics Education (ModelME). A link to an intro video for ModelME's game-based curriculum will be shared.

RESEARCH QUESTIONS & ANALYSIS

Research Question 1: Is there a statistically significant difference pre and post-intervention in students score on a measure of fraction concepts?

Research Question 2: To what extent does an intervention based in learning trajectories demonstrate evidence of increased student concepts of fractions, defined as conceptual advance and performance differences?

Analysis for Question 1:

Paired sample t-test to evaluate significant change in score on test comprised of district end of course exam fraction items.

Analysis for Question 2:

3 stage analysis of video data, transcripts, and field notes for evidence of units coordination and generation of heat map.

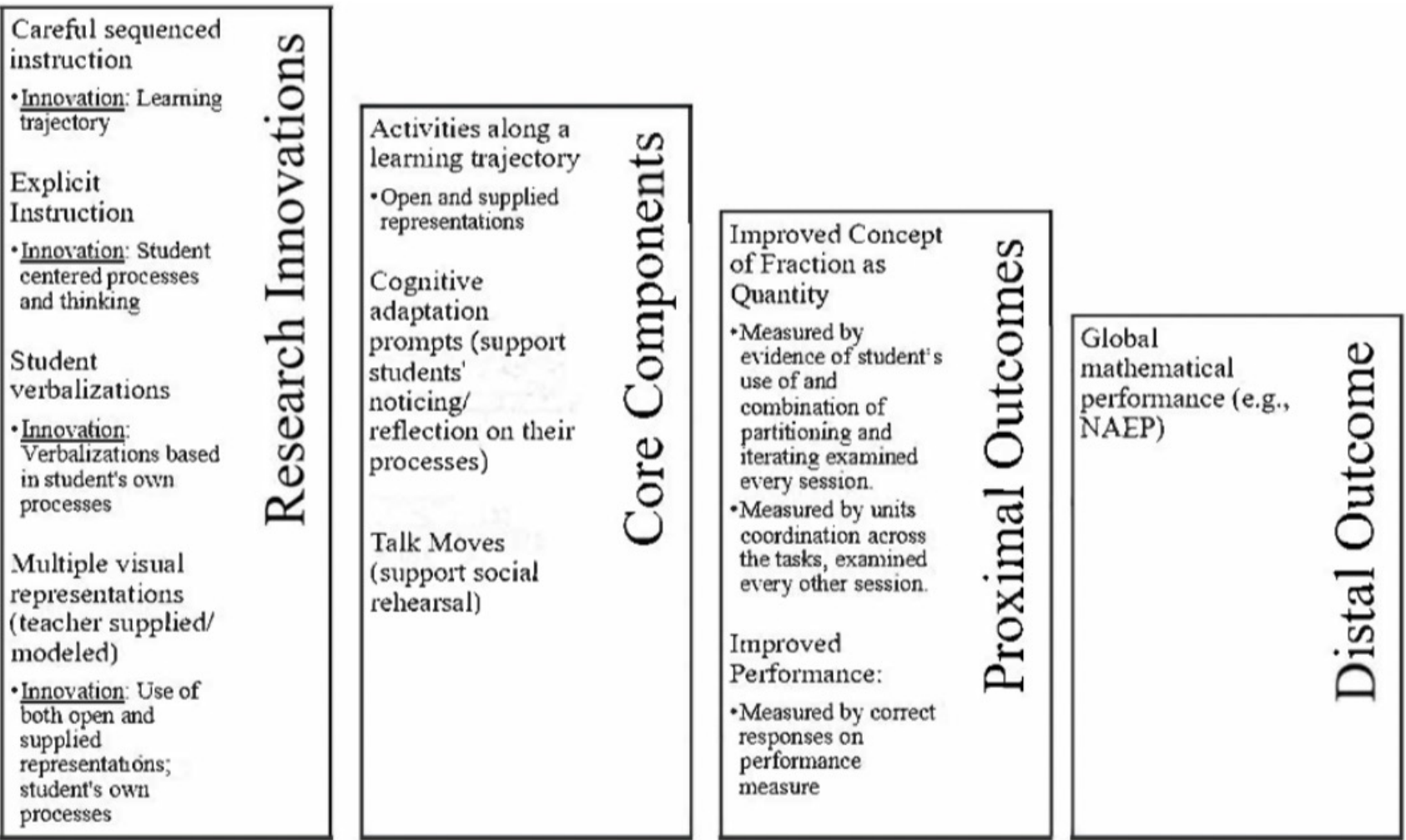
- Constant comparison of each students' partitioning and iterating processes in each task.
- Emergent coding of units coordination across tasks.
- Content analysis to determine percentages of each process and units coordination across the study.

Activities (tasks, representations, questions) set along a learning trajectory:

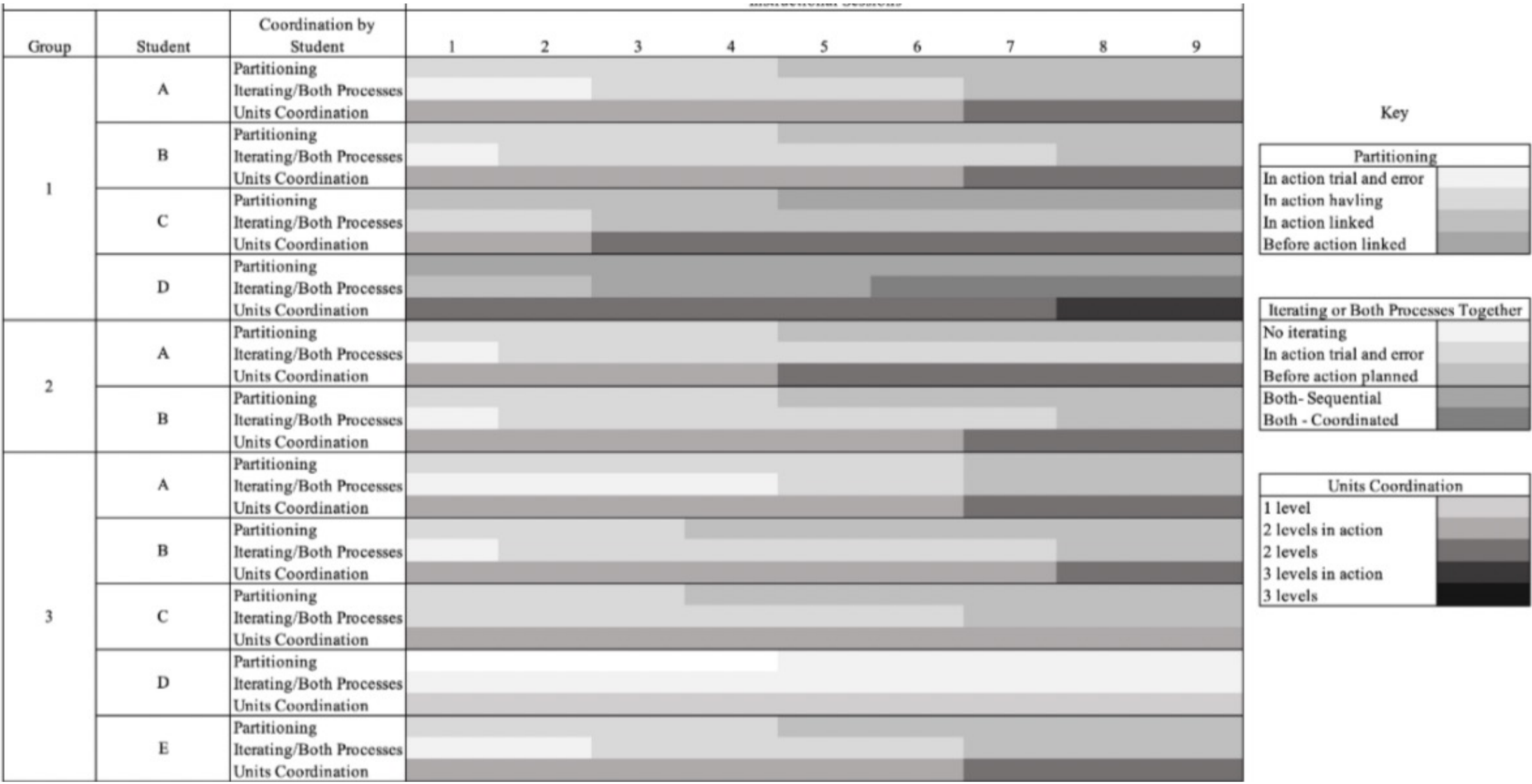
| Task Set 1 | Task Set 2 |
|--|---|
| <ul style="list-style-type: none">- Share multiple items among multiple people- Representation: open | <ul style="list-style-type: none">- Sharing one item among increasing numbers of people- Representation: long tangible rectangle |
| Task Set 3 | Task Set 4 |
| <ul style="list-style-type: none">- Using a representation that stood for a unit fraction to produce another quantity.- Representation: open → bars, rectangles | <ul style="list-style-type: none">- Using a representation that stood for a non unit fraction to produce another quantity.- Representation: bars, rectangles |

INTERVENTION

Learning goal: Fractions are numbers that have magnitudes determined by the coordination of the numerator with the denominator"



RESULTS



- Increased conceptions of fractions evidenced by changes in units coordination over the course of the intervention.
- The changes in score from the pretest ($m = 1.77$, $sd = 1.43$) to the posttest ($m = 5.64$, $sd = 3.264$) were statistically significant ($t = 4.81$, $p < 0.01$).

TRANSLATION TO MODEL ME

We used the encouraging results from FAACT to build a universally designed video game in our ModelME project.

The game contains:

- Six game worlds
 - Set along the learning trajectory documented in FAACT.
 - Each world set in the context of a STEM/ICT career
 - World contain game challenges based upon FAACT activities (tasks, representations)
- Universally designed game interface, tasks, and tools
- Action adaptive prompts to aid self-regulation
- Player selected hints and "show me" features matched to each game world

The curriculum contains:

- A unit of **32 lessons** with teacher and student materials
- Each lesson contains
 - **Launch of gameplay** (5 minutes)
 - **Gameplay** (15 minutes)
 - **After-game concept/skill connections** (20 min)
 - Worked examples & Number Strings
 - Language routines for discourse

PLAY THE IN PROCESS GAME BUILD HERE:

<https://modelmemath.org/game/>

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