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.

INTRODUCTION

Research Question & 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 pretest 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:

<table>
<thead>
<tr>
<th>Task Set 1</th>
<th>Task Set 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Share multiple items among multiple people</td>
<td>- Sharing one item among increasing numbers of people</td>
</tr>
<tr>
<td>- Representation: open</td>
<td>- Representation: long tangible rectangle</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Task Set 3</th>
<th>Task Set 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Using a representation that stood for a unit fraction to produce another quantity.</td>
<td>- Using a representation that stood for a non unit fraction to produce another quantity.</td>
</tr>
<tr>
<td>- Representation: open + bars, rectangles</td>
<td>- Representation: bars, rectangles</td>
</tr>
</tbody>
</table>

INTERVENTION: 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/

ACKNOWLEDGEMENT

This project is funded by the National Science Foundation, grant #1708229 & #1949112. Any opinions, findings, and conclusions or recommendations expressed in these materials are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.