**Visual Access to Mathematics (VAM): Professional Development for Teachers of English Learners**

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**ABSTRACT**

This project is designing and studying a sustained, blended online and face-to-face course for grades 6-8 mathematics teachers and EL specialists focused on visual representations (VRs) in the context of rational number & ratio and proportion content and supports for ELs’ language access & communication.

**RESEARCH OVERVIEW**

1. What supports allow teachers to develop mathematical knowledge for teaching & knowledge about instructional planning to support ELs?
2. What is the effect of VAM PD on that knowledge for teachers?

**Year 1**: PD development in consultation with critical friends group

**Year 2**: Formative field test of PD

**Years 3-4**: Cluster randomized control trial of PD

**DATA COLLECTION**

- **Participants (across phases)**: ~120 New England middle grades math or EL teachers, coaches, and specialists
- **Formative Data**: PD observations; facilitator reflections; and teacher surveys, interviews, & focus groups
- **Pilot Study Data**: MC assessments of MKT, video analysis, and open-response exercise

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**VAM PROFESSIONAL DEVELOPMENT**

**Goal:**
Increase teachers’ knowledge and abilities to use VRs, plan lessons to support ELs, and analyze student work, all in the context of ratio & proportion (R&P) content.

**Key PD Activities:**
- Solve and discuss mathematics tasks using VRs
- Plan lessons to integrate supports for language access & communication
- Analyze student, including screencast recordings from EL students
- Explore applets that make connections between VRs and R&P content
- Reflect in online notebooks & participate in group videoconferences

**Course structure:**

<table>
<thead>
<tr>
<th>Institute August face-to-face</th>
<th>Online Sessions September to December online</th>
<th>Workshop January 1 day</th>
<th>Online Sessions January to April online</th>
<th>Workshop April 1 day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 day</td>
<td>2 weeks</td>
<td>1 day</td>
<td>2 weeks</td>
<td>½ day</td>
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</tbody>
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**THEORY OF CHANGE**

**Teacher Outcomes**

1. Knowledge of how to create & use VRs to solve ratio/proportional reasoning tasks
2. Mathematical knowledge for teaching ratio/proportional reasoning content
3. Ability to analyze student work for all students, including ELs
4. Ability to provide rationale for instructional planning with VRs & for ELs

**Classroom Outcomes**

- Teachers support students' use of VRs for mathematical problem solving & communication

**Student Outcomes**

- Improved skill in using VRs for mathematical problem solving

**PARTICIPANT REFLECTIONS**

“I had always used and thought of VRs as presentation tools to show final work. After taking this course, I have emphasized the use of VRs as thinking tools to make sense of word problems.”

“Throughout this course, my own use of VRs when solving problems has led to a deeper understanding of how to teach the key ideas involving fractions, ratios, and proportional relationships to my students.”

“The most important take away so far for me is that by allowing students to ‘show’ what they know you gain insight into their mathematical thinking. Students may be able to show more than you think they know. [...] [VRs] allow students a way into the problem that they may not have had.”

“My knowledge of language strategies to support ELs has increased. I am more comfortable identifying effective modifications to support students’ language access and production. [...] Some supports we have used have been Three Reads, Questioning, Sentence Frames, and Think, Pair, Share.”

**BLENDED PD FINDINGS**

Blended PD is a powerful vehicle for rigorous and interactive professional learning. Blended PD components that emerged as important in VAM’s design:

- Customizable online platform
- Asynchronous structures that provide flexibility but offer guidelines, accountability, & supports
- Building relationships early in course and through synchronous sessions
- Goals, activities, & instructions that are quick to navigate online