



Enhancing the Teacher-Curriculum Relationship in Problem-Based Mathematics Classrooms by Connecting Teacher and Student Digital Collaborative Environments

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Research Overview

❑ **Overarching Research Question:** How do teachers in networks access, generate, use, and share teaching resources (including classroom artifacts) to support mathematics teaching (planning, enactment, and reflection of student thinking)?

❑ Project Objectives

- Iteratively design and develop the digital collaborative platform so networks of teachers can create, use, and share teaching resources.
- Co-design the digital resources and teacher learning opportunities with networks of teachers as instructional designers of classrooms.
- Conduct field-testing of the system of digital resources to answer the research questions.
- Disseminate the research findings and products widely.

Focus Research Question: To what extent do teachers and students use the platform as a resource during the summary phase?

Identifying Whole-Class Summary Discussions

CMP Instructional Model



During Summarize: Whole-Class Discussion

- ❑ **Students** present and discuss their solutions and strategies, discuss the embedded or encoded mathematics of the problem, and connect learning to prior and future knowledge.
- ❑ **The teacher** facilitates discussion to reach the problem's mathematical goals and connect their new understandings to prior mathematical goals. The teacher uses evidence from the *Explore* phase that can be used to support student understanding.

Summary discussion includes three key elements:

- 1) Attending to student strategies/solutions
- 2) Unpacks embedded mathematics
- 3) Connects to past/future mathematical ideas

Whole-class summary starts when teachers and students transition to a whole-class activity that incorporates evidence of student thinking (student work) from small-group student explorations of the mathematics problem.

Whole-class summary ends when students begin working on individual or small group work that exceeds 2 minutes in length.



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Data Sources and Analysis

- ❑ Our data consists of video recordings of four teachers implementing problem lessons in the digital collaborative platform with their students, with teacher screen recordings and audio recordings to confirm analysis.
- ❑ Videos span 6 problems across three units focused on proportional reasoning with two classes recorded for each teacher (33 videos).
- ❑ Classroom summary discussions were identified by two coders to establish start and end times, resulting in 29 total summary discussions.
- ❑ Each summary discussion is reviewed by two coders to identify the tools and features of the digital platform used to support summary discussion and their potential purpose.
- ❑ Features are defined by kind of document in the digital platform and its use during summary discussion.

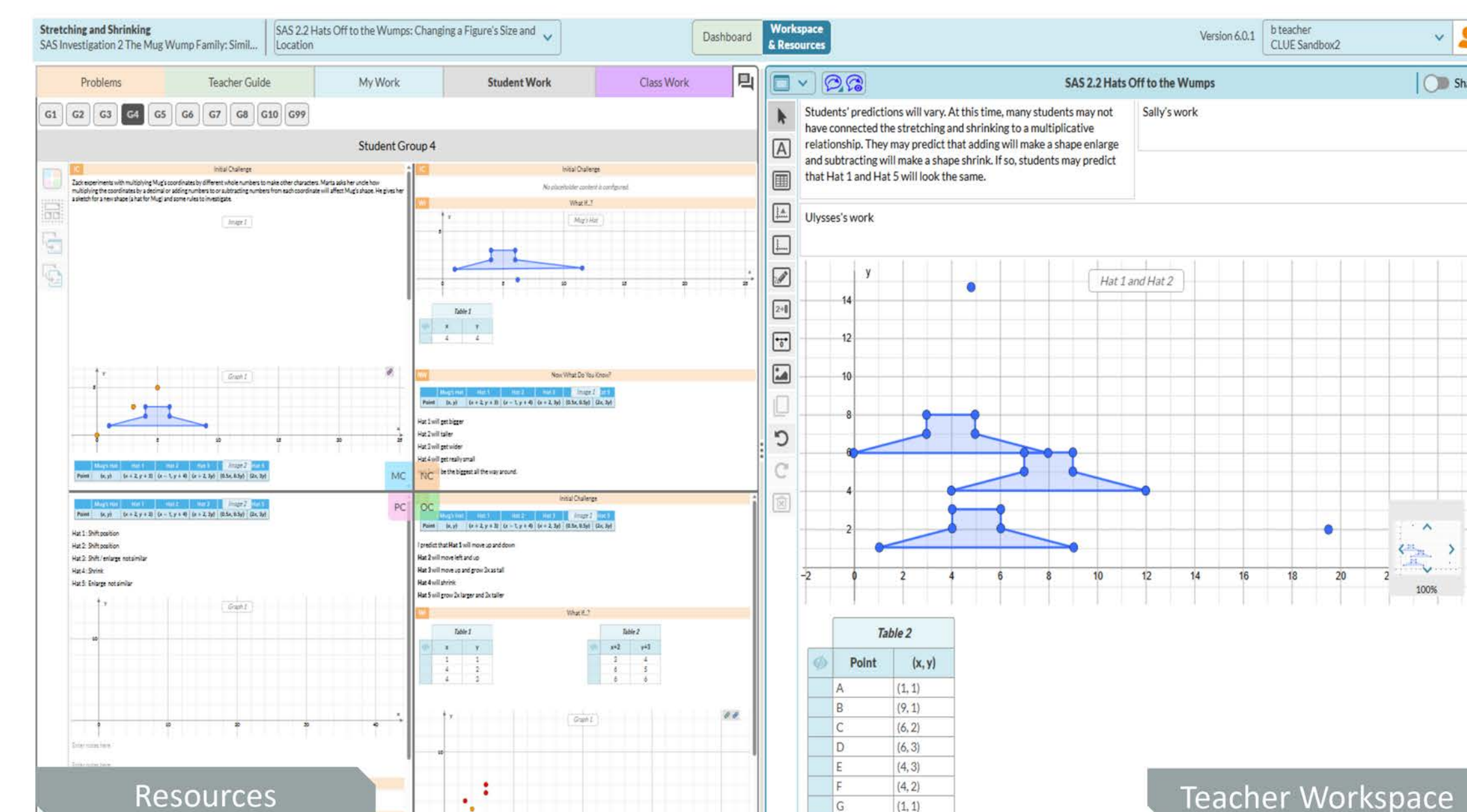
Coding Scheme	
Type of Document	Use/Action
Student Document	Access Student Work Whiteboard Annotation
Teacher Document	Access Student Work Access Pre-created Teacher Work Access Curriculum Create Work Edit Student Work Edit Teacher Work Edit Curriculum Work Whiteboard Annotation Share or Publish
Curriculum Document	Student Edition Teacher Edition Whiteboard Annotation

Open Coding: Exploring the Purpose of Feature Use

<ul style="list-style-type: none">• Display student work• Display work as student talks• Display to discuss student work• Share student work• Discuss multiple students' work	<ul style="list-style-type: none">• Build off student's verbal work• Compare student responses• To discuss differences between two strategies• To collectively assess student work as a whole group• To see if students have the same numbers in the tables	<ul style="list-style-type: none">• Point out important mathematical point• Emphasizing key aspects of what has been learned so far• Highlight scale factor on shape• Point out special case
<ul style="list-style-type: none">• Recreate strategy seen by students• Recreate student exploration• Recreate student work from digital platform	<ul style="list-style-type: none">• Display problem• To show problem contexts as the student explains the differences• Return to given information in the problem	<ul style="list-style-type: none">• Address student question• Address student interpretation of problem• To discuss one group's misunderstanding

Overview of Digital Features During Summary

- ❑ Teacher have access to resources they can utilize during summary
 - Teacher Guide Resources
 - Answer Keys
 - Student Work Overview
 - Student Work Group View
 - Student Work History View
 - Sorting Student Work
 - Sending Students Messages
 - Creating Documents Using Embedded Tools
 - Sharing Documents and Comments with Colleagues
- ❑ A key part of summary discussions is discussing student work. The digital platform allows teachers to display students' work from the lesson while facilitating a discussion.
- ❑ Below are two common ways that teachers display student work.



Resources Side:
Teachers can view a group of 4 students' documents. They can also zoom in on one student's work.

Teacher Workspace Side:
Teachers can create their own document and copy student work from the left into this document.

Codes:
Student Document >
Access Student Work

Codes:
Teacher Document >
Access Student Work

Next Steps & Implications

- ❑ Complete ongoing data analysis, synthesize results, and disseminate findings.
- ❑ Findings will unveil knowledge of ways students and teachers utilize features of the digital collaborative environments during whole-class summary discussions.
- ❑ Findings allow us to better support teachers in their use of the digital platform and continue developing digital platform features applicable to teachers' immediate needs.