DEVELOPING DIGITAL INSCRIPTIONAL RESOURCES: CONNECTING DESIGN, CLASSROOM ENACTMENT, AND STUDENT THINKING

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Project Overview

Building on prior research and development, this project explores two broad hypotheses about how use of digital inscriptional resources can improve middle school students' mathematical understanding:

- Development and communication of mathematical understanding is enhanced through the use of inscriptional resources for constructing meaningful records of student thinking

- Evidence for conceptual growth of mathematics becomes more sophisticated over time when students purposefully reflect on their inscriptional work at key points in the development of big mathematical ideas

Research Questions

- What features of the digital learning environment help students to produce and refine inscriptions of their learning as they explore mathematics problems?

- How does the use of inscriptions in the digital learning environment compare to conventional learning environments?

- Does evidence of student understanding of big ideas of mathematics become more sophisticated given sustained classroom-based engagement with inscriptions?

- How does evidence of student understanding of big ideas of mathematics compare to conventional learning environments?
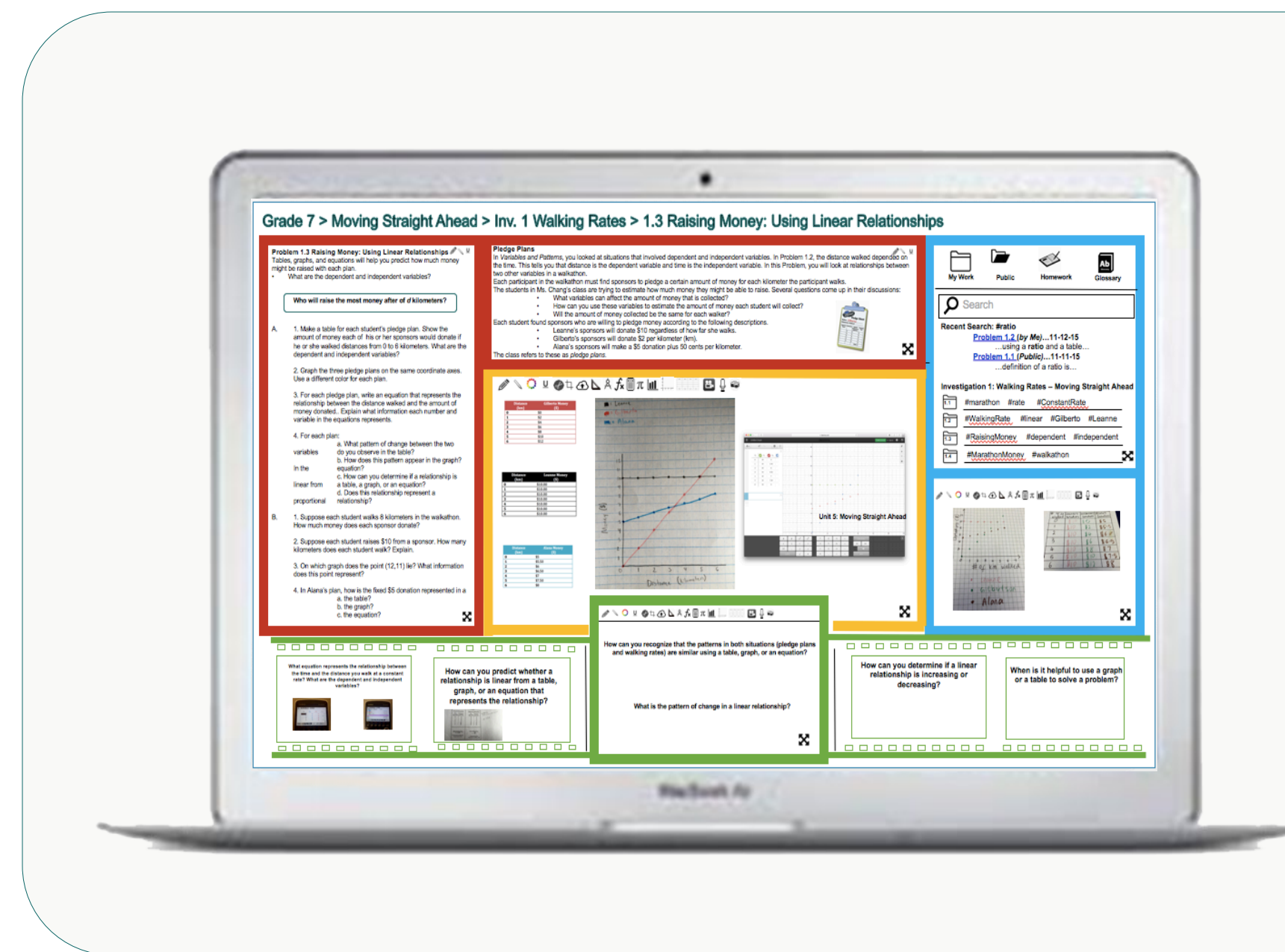
Research Frameworks

- Inscriptions: Mathematical representations existing in some "concrete" medium around which students develop shared social understanding.

- Productive Disciplinary Engagement: A way of describing classroom enactment, with a focus on students.

Data Sources

- Student surveys
- Teacher interviews
- Classroom observations
- Videos of class sessions
- Screencasts of student computers
- Analytics of student interaction with the software

Iterative Development Plan: Project Timeline

Year 1: Development and testing of prototype with a few problems

→ Feedback and modification →

Year 2: Test a connected sequence of problems

→ Feedback and modification →

Year 3: Pilot testing with connected units in limited classrooms

→ Feedback and modification →

Year 4: Field Testing multiple units in a variety of classrooms

## An Early Vision of the Collaborative Digital Space

The **problem presentation** shows contextual background of a problem and associated questions.

The **work space** is the digital environment where inscriptions are created. It is comprised of individual, group, and class spaces, and it comes equipped with a flexible variety of representational tools.

Hashtags may be used for archiving, organization, and later retrieval of inscriptions or reflections.

The **learning log** is the home of students' individual reflections, capturing key elements of their learning.

What We Have: Problem Presentation, Individual Workspace, and Collaborative Workspace
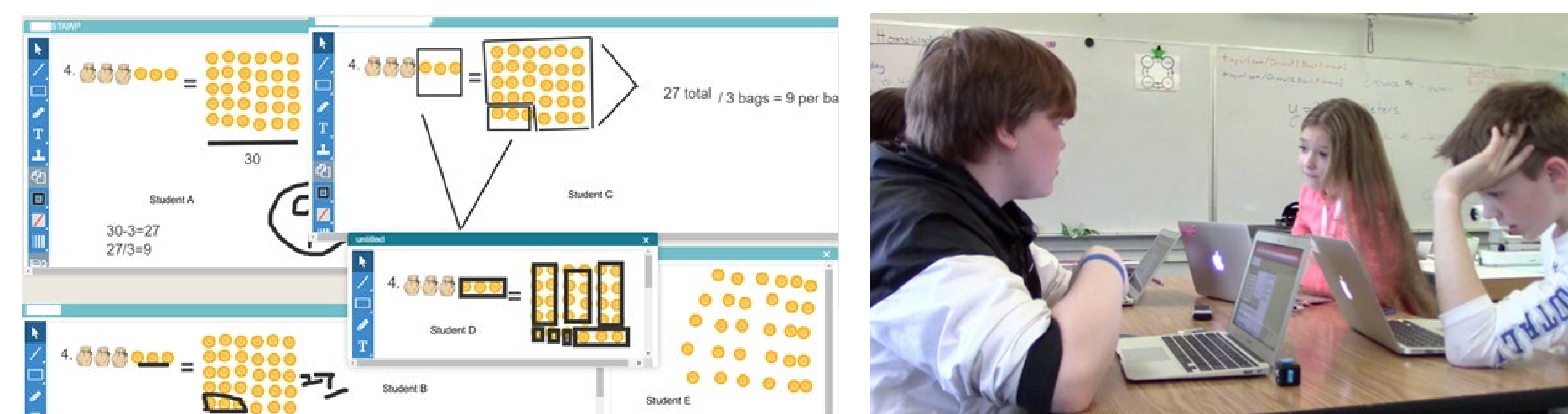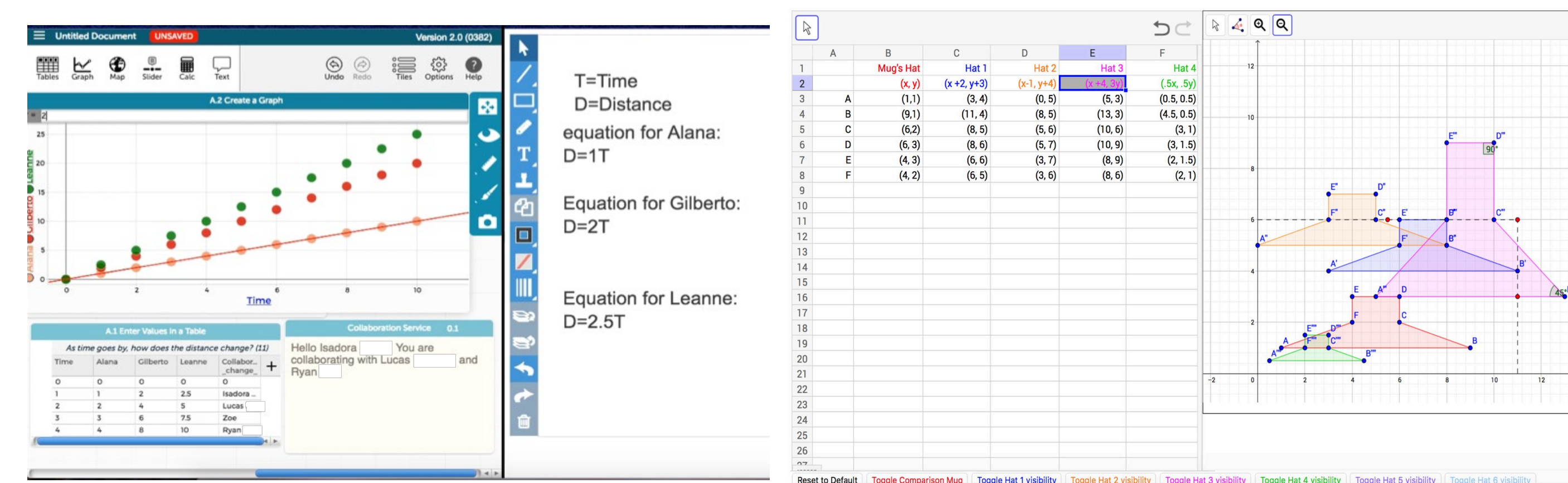
Questions We Are Thinking About

- Problem Presentation: How can the problem presentation be effectively displayed without interfering with workspace?

- Learning Log: How will students determine what inscriptions to save? How will that help them develop their mathematical understanding over time?

- Hashtags: How do students create and curate hashtags? How and when will they use hashtags to retrieve prior work?

- Authority and Inscriptions: How and when will students capture and annotate the work of others?

- Teacher Resources: How will real-time access to student workspaces support the teacher's role in the classroom? How can technology support the teacher's ability to examine student growth over time?

- Analytics: What are useful software-generated analytics for examining student learning and productive disciplinary engagement?

Acknowledgements