

An Introduction to the TRU Math Document Suite

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An Introduction to the TRU Math Document Suite (Teaching for Robust Understanding in Mathematics)

The *TRU Math Document Suite* provides research-based tools for studying and improving mathematics teaching, with a specific emphasis on helping students understand and solve contextually rich algebra problems. Our research reveals that there are five general dimensions to mathematically powerful classrooms, as identified in the first part of Table 1 (See Schoenfeld, 2013). These general properties can be supplemented with specifics for addressing significant mathematical types of content, for example understanding rational numbers, contextual algebraic tasks, or proof and proving. As an example, specifics for robust understandings of contextual algebraic problems – the focus of the Algebra Teaching Study – are elaborated in Table 2.

The Five Dimensions of Mathematically Powerful Classrooms:				
The Mathematics	Cognitive Demand	Access to Mathematical Content	Agency, Authority, and Identity	Uses of Assessment
<i>The extent to which the mathematics discussed is focused and coherent, and to which connections between procedures, concepts and contexts (where appropriate) are addressed and explained. Students should have opportunities to learn important mathematical content and practices, and to develop productive mathematical habits of mind.</i>	<i>The extent to which classroom interactions create and maintain an environment of productive intellectual challenge that is conducive to students' mathematical development. There is a happy medium between spoon-feeding mathematics in bite-sized pieces and having the challenges so large that students are lost at sea.</i>	<i>The extent to which classroom activity structures invite and support the active engagement of all of the students in the classroom with the core mathematics being addressed by the class. No matter how rich the mathematics being discussed, a classroom in which a small number of students get most of the "air time" is not equitable.</i>	<i>The extent to which students have opportunities to conjecture, explain, make mathematical arguments, and build on one another's ideas, in ways that contribute to their development of agency (the capacity and willingness to engage mathematically) and authority (recognition for being mathematically solid), resulting in positive identities as doers of mathematics.</i>	<i>The extent to which the teacher solicits student thinking and subsequent instruction responds to those ideas, by building on productive beginnings or addressing emerging misunderstandings. Powerful instruction "meets students where they are" and gives them opportunities to move forward.</i>

Table 1. The Five Dimensions of Mathematically Powerful Classrooms

Mathematical Content Elaboration:

Contextual Algebraic Tasks

The extent to which students are supported in dealing with complex modeling and applications problems, which typically call for understanding complex problem contexts (most frequently described in text), identifying relevant variables and the relationships between them, representing those variables and relationships symbolically, operating on the symbols, and interpreting the results.

Table 2. Content elaboration for contextual algebraic tasks.

This *Introduction to the TRU Math Document Suite* presents the dimensions of TRU Math (**T**eaching for **R**obust **U**nderstanding of **M**athematics) and describes the appropriate use of documents in the TRU Math Document Suite.

Each of the documents in the *TRU Math Document Suite* addresses a different aspect of research and professional development.

An Introduction to the TRU Math Dimensions provides a summary of the literature undergirding the five dimensions of the TRU Math scheme. It provides descriptions of increasing proficiency along each dimension, a progression that is distilled in the TRU Math Rubric itself (see below). It also provides a summary of the literature undergirding the mathematical content elaboration for one content area: Contextual Algebraic Tasks. This document will be of use to those who engage in research related to productive mathematics classrooms. It will be of particular use for research focused on helping students learn to work with contextual algebraic tasks; future work will begin to offer parallel guidance for other content areas.

The TRU Math Professional Development Tools have been designed to support teacher engagement with the content summarized in Tables 1 and 2. The *TRU Math Conversation Guide* offers five collections of reflection questions, with each collection focused on a key dimension described in Table 1. The purpose of these questions is to guide discussions between teachers and supportive others, with the goal of enhancing understanding and capacity along each dimension. Our intention is that the questions will support teachers in developing, articulating, and progressing on their own learning agendas, through ongoing dialogue with coaches, administrators, colleagues, and others (including internal dialogue with themselves), as they plan, enact, and reflect on instruction. The *TRU Math Conversation Guide, Module A: Contextual Algebraic Tasks* supports reflections on the teaching of algebraic ideas, along the lines of the content elaboration in Table 2. The *Algebra Module* is the first of a series of planned content modules.

The TRU Math Rubric is a research tool developed for the investigation and validation of the TRU Math Dimensions. Although the literature documents the importance of the five dimensions, the ultimate goal is to provide clear evidence that classrooms that “score well” on those dimensions produce students who are powerful mathematical thinkers and problem solvers. To do this, one needs an empirical tool to code what takes place in classrooms. The TRU Math scheme does this, for research purposes; we are producing a *scoring guide* (to be posted) to help researchers use it in the proper ways. The scheme includes a content-focused tool for content elaboration on contextual algebraic tasks. Researchers interesting in using the rubric should contact Alan Schoenfeld at alans@berkeley.edu. The TRU Math Rubric is not appropriate as an administrative tool for evaluating teachers. Assignment of scores and validation of the rubric are being established through ongoing research.

Details regarding the development of the TRU Math framework and rubric can be found in Schoenfeld (2013), which can be downloaded from the Algebra Teaching Study (<http://ats.berkeley.edu/>) and Mathematics Assessment Project (<http://map.mathshell.org/>) web sites.

Reference

Schoenfeld, A. H. (2013) Classroom observations in theory and practice. *ZDM, the International Journal of Mathematics Education*, 45: 6-7-621. DOI 10.1007/s11858-012-0483-1.