**Supporting Academic Tenacity in Mathematics:   
Teacher Questioning and Feedback**

**Objectives**

The goals of this session are to:

* Look back on the full PD series – providing context to mathematical content: the how and why
* Have teachers reflect on how much opportunity they are currently providing to students to reflect on their learning and track their progress
* Expose teachers to mathematical tasks that support academic tenacity

**Guiding Questions**

Part 1: Looking Back on this PD Series

* How does placing course content in the context of a real-world scenario help make the mathematical content and processes enticing, meaningful, and memorable?
* How does applying mathematical learning to real-life situations *now* help students develop the skill of transferring such learning to the problem-solving, projects, and tests they will face *in their* *future*?
* Why move from “telling” to realistic problem-solving, sense-making, and discovery?

Part 2: Academic Tenacity

* What is academic tenacity?
* What types of tasks and questions promote academic tenacity?
* How do students’ responses to high-quality questions give us insight into their learning?
* What types of feedback should we be giving students?

**At a Glance**

Part 1:

* Ted McCain quote reflection
* Return to Jo Boaler’s six different ways of working with mathematics
* Review of teacher planning guide and student graphic organizer for working through tasks
* Present additional resource for rich mathematical tasks (Problem of the Month)

Part 2:

* What is academic tenacity?
* Review reflection and progress tracking handouts
* MARS task activity and discussion

**Materials**

Handout M6.1 (Authentic Problem Solving, 4 pages)

Handout M6.2 (Supporting Academic Tenacity, 11 pages)

Handout M6.3 (Problem of the Month example)

Handout M6.4 (*House Sales* MARS task, one per pair)

Handout M6.5 (MARS task descriptions)

**Procedure**

**Set-up:** Keep all handouts separate so as to not have too much material given to teachers at once. Have part 1 PD handouts available for teachers as they arrive. The remaining handouts will be distributed throughout the session.

**Before We Begin: Quote “tasks in the form of a problem” (2 minutes)** (page 1)

Facilitator welcomes teachers as they arrive

* Ask teachers to read and reflect on the quote on the first page of handout M6.1.

**Introducing the Session’s Dual Focus: Review Big Ideas from Entire PD Series; Supporting Academic Tenacity (15 minutes)**

Facilitator goes through each of Boaler’s six mathematical competencies explored in this series (page 2). Tasks given to students should, whenever possible, provide students with the opportunity to develop multiple competencies. **(4 minutes)**

Facilitator reviews two handouts provided at earlier sessions: the student handout for working through authentic tasks, and the teacher planning guide (pages 3-4). **(2 minutes)**

Facilitator passes out handout M6.3, the Problem of the Month handout from the Silicon Valley Mathematics Initiative (<http://www.svmimac.org/problemsofthemonth/problemsofthemonth.html>), as an additional resource available to teachers. **(2 minutes)**

Facilitator introduces/segues to concept of *academic tenacity*. Facilitator hands out handout M6.2 and allows teachers a moment to read definition of academic tenacity (page 1; from Dweck, Walton, & Cohen, 2014). Teachers take a couple of minutes discussing with a partner/in a small group their experiences/struggles with developing students’ academic tenacity. **(7 minutes)**

**Opportunities for Students to Reflect on Learning/Track Their Progress (10 minutes)**

Facilitator asks teachers to share with each other the ways in which their students reflect on their own learning and monitor their progress. Facilitator then has teachers review to the three included handouts on pages 3-6 (assessment corrections, tracking my progress in mathematics, and unit assessment feedback). Facilitator makes clear that these handouts are *examples* of ways in which students can reflect upon their own work and monitor their growth over time, and to think of if and how they may be useful to each individual teacher.

**House Prices and Payments MARS task (30 minutes)**

Facilitator passes out to teachers handout M6.4, the *House Prices and Payments* task from the Mathematics Assessment Resource Service (<http://www.scoe.org/mars>, one task per pair, two for a group of three), and asks them to work through the task. **(5 minutes)**

Facilitator prompts teachers to turn to page 7 of handout M6.2, and, with their partner/small group, to check off which competencies this task included. Facilitator has teachers share out. **(5 minutes)**

Facilitator prompts teachers to look at the student work and to discuss and answer the questions about the student (pages 7-9). Facilitator encourages teachers to share their thoughts as a whole group. **(10 minutes)**

Facilitator has teachers turn to page 10 and highlights the merits of MARS tasks in eliciting student thinking. Facilitator indicates that each task comes with a scoring guide (page 11). Facilitator then passes out handout M6.5, containing the MARS task descriptions for the 2014 Algebra 1 series. **(10 minutes)**