

Maintaining Cognitive Demand Lesson Study

October 12, 2020

Research Question:

Implementing tasks that promote reasoning and problem-solving



The lesson study team hypothesized that the following actions would be important elements in implementing tasks that support reasoning and problem-solving. Each hypothesis is listed below followed by the team's reflection.

Hypothesis 1 and 2 – Questioning to maintain cognitive demand

Generally, the scaffolds to support high-levels of reasoning are in the form of teacher questions that press students for elaborations, explanations, and justifications.

Asking probing questions and prompting students to reflect on their work, rather than telling students what to do, may support reasonableness.

- Upon the launch of the task, many students tried to re-read the story without prompting from the teacher.
- There was a student who added $3 + 7 + 15$ (misrepresenting the situation) and the teacher prompted students to reflect on whether their model matches the context. This prompted students to make revisions to their models.
- The teacher spent a lot of effort in conferrals with students to make sense of the context and asking students what the number represent.
- The team felt that we had anticipated students' thinking fairly accurately in that the students did produce the same ways of thinking as anticipated.
- The teacher was able to celebrate that a particular student was making gestures/jumps on the desk, indicating a high level of professional noticing of students' thinking.

- It seemed that many students had a correct answer, but had difficulty justifying. Some students felt that since they were questioned about their answer/idea they thought it was wrong.
- The group believes that capitalizing on the social interaction in the room where students can hear from and reflect on each other's ideas.

Hypothesis 3 and 4 – Questions to cause cognitive reorganization

During the whole group discussion, having students explain other students' ideas in their own words, pushing students to make connections between strategies/models, using the teacher discourse moves (talk moves) supports the maintaining of cognitive demand.

The Teacher Discourse Moves are useful in positioning students to see themselves as contributors to the mathematical work and authors of their own ideas. (team to study the affect of the students identified as being elevated to a more prominent position)

- The teacher used several students' models during the whole group discussion, along with several of their ideas.
- Students were given opportunities to make sense of each other's thinking and each other's models.
- The teacher started the discussion by asking, "Who thinks they can tell us what she was thinking?" This may support students in seeing each other as authors of mathematical ideas. Over time, this may also support how students listen to each other.
- One student identified as benefitting from being elevated to a more prominent position contributed an idea, was re-voiced by the teacher and continued to add to the discussion, which is unusual for this student.

Individual team-member takeaways

- I'm looking forward to using contexts/story problems and try these ideas out.
- Using the talk moves is something we'd like to do more of and practice on a regular basis.
- Maintaining the high cognitive demand and using talk moves to do this without diluting the rigor is important.
- Using questions as described in the hypotheses is something we all need to work on over time. Our current materials allow for the opportunity to explain, elaborate and reflect if the teacher takes advantage of those opportunities.
- Many of the teaching practices to push for elaboration and explanation also connect to other content areas, which allows teachers more opportunities to practice the these actions.
- Turn and talks, like "compare and share", allow more students to contribute to the discussion while sometimes saving some time to have discussion on other topics.
- The document camera is useful for publicizing students' ideas by using what they produced as a topic of discussion.