

Maintaining Cognitive Demand Lesson Study

November 4, 2020

Research Question:

Supporting students to reason and problem-solve flexibly and adaptively



The lesson study team hypothesized that the following actions would be important elements in maintaining high levels of cognitive demand. Each hypothesis is listed below followed by the team's reflection.

Hypothesis 1 – Questions that press for elaboration and justification

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

- Beyond the questions, the structure of the whole discussion involves sequencing students' thinking or strategies that promote opportunities for elaboration, explanation and justification of students' ideas.
- Pressing students to elaborate on what they've produced or what they knew moves students' attention back to the model to try to make sense of it themselves or add to their own understanding.
- Asking students if that will always work was an opportunity for to start justifying an idea.

- Asking students what their idea would look like on a model or how they're interpreting another student's thinking were helpful in pressing for elaboration.

Hypothesis 2 – Focusing on understanding versus procedures

Teacher's questions should focus on mathematical understanding versus producing the correct answer. (proceduralizing the task)

- Having the model visible allowed the teacher to focus on justifications of why their strategies were or were not working.
- The teacher frequently asked students to explain what they think another student was thinking (when they provided non-algorithmic reasoning) kept the focus on understanding.

Hypothesis 3 – Student-student discourse

"Turn and talk" opportunities force students to slow down their thinking and engage a bit deeper with the mathematical ideas. (talk moves)

- Throughout this lesson students were pressed to explain each other's thinking.
- When teachers ask students what they think about what another student said or if they agree or disagree supports them to think on their own.
- Keeping mathematical processes as most important may be a way for teacher's to avoid answer-getting questions and patterns of questions.
- Prompting students to discuss their thinking and listening to their thinking more than listening for an answer.
- It's very useful for the teacher to keep pushing back the student's conversation or big ideas to the kids or the model being discussed. Allowing for pointing of fingers back to the model, let the model do the talking. This allows for more discussion about reasoning relative to the model.
- Pushing student discussion back to the kid increases students' agency and identity.

Hypothesis 4 – Student discourse that evokes reflection

By listening to what others find out and discussing these findings, the students can get ideas for improving their strategies. Moreover, the interaction can evoke reflection, which is necessary to reach a higher level of understanding.

- Allowing students to interpret each other's models, discuss them and share their ideas about relationships they notice in each other's models.
- It was clear that students were seeing equivalence during the whole-group discussion in ways that they hadn't before that discussion by listening to each other's ideas.
- When the second student was sharing his thinking, students began talking about the advantages and disadvantages of a table compared to double number line.

- The whole group discussion allowed students to find and share relationships about constant of proportionality and others.

Individual team-member take-aways

- I need to press myself in thinking more about what constitutes a real justification.
- I need to celebrate more of students' thinking.
- I want to keep focusing on using questions that focus on students' understanding versus producing the right answer. (moving the understanding along more than the correctness)
- We saw a nice amount of wait time that allowed more opportunities for kids to discuss and develop deeper understanding and ideas.
- I want to try hard to set up the activities to be more open-ended so that kids have the freedom to try to make sense of the ideas themselves and if possible keep the modeling of student's thinking in the strings as a representation of their own ideas.