

Using and Connecting Representations Lesson Study

September 11, 2020

Research Question:

Supporting students to use and connect mathematical representations



The lesson study team hypothesized that the following actions would be important elements in supporting students in using and connecting mathematical representations. Each hypothesis is listed below followed by the team's reflection.

Hypothesis 1 – Representational flexibility

Students should often engage in explicit dialogue on connections among representations, be asked to alternate directionality between representations, and make decisions on which representations to use in solving problems.

- The slow-reveal of the graph seemed to allow multiple entry points into key mathematical ideas, relating the various categories to each other and analyzing the data. It seemed that removing the quantities and need for procedures allowed for strong reasoning about the graph (connecting contextual and visual representations).
- During the warm-up of How many do you see? many students were making connections between various representations.

- In the first task, because we did not prescribe or imply a certain strategy or model to use, we saw a variety of strategies and models being used by students that included number lines, the graph to add and subtract, addition/subtraction equations and expressions, skip-counting, making jumps of 10 forward and backward.
- Shifting students' attention towards the audience of the other students may help to affirm the importance of the students making decisions on which representations to use.
- Through questioning, the teacher can continue to push students to articulate connections between equations and other representations (graphs).

Hypothesis 2 – Modeling students' thinking

When students see their teachers and other students using models to represent their own thinking over and over students will begin to transition to using models for thinking.

- Modeling students thinking during the Number Talk seemed to give access to students to articulate their thinking, as well as find some fallacy in their reasoning.
- Modeling students' thinking during the Number Talk also seemed to allow students to move bidirectionally across representations.
- Some students were trying to use models of other students that were discussed in the whole group discussion that was connected to their initial way of thinking.
- Other students' models helped some students to make sense of their own thinking.
- During the first task, one student referred to the model used in the warm-up and chose to try using it during the task.

Hypothesis 3 – Assessing through multiple representations

Asking students to produce multiple representation types sheds light on students' understanding of the mathematics within the situation.

- Asking students to produce a number line from their equations, showed how the student was thinking more about a closed number line than an open number line to think with.
- Students who were able to refer to various parts of their models and how they connect seemed to have a deeper understanding of the content.

Hypothesis 4 – Revising models in interative cycles

Representations should be developed in iterative cycles where students are given opportunities to revise their models.

- Without prompting revising their models or ways of thinking because they were given time to work on the task, and during the whole-group discussion when other students were sharing their reasoning and models.

Individual team-member take-aways (teaching practices to work on

- The slow-reveal of the graph is something to consider in engaging in more reasoning in future lessons.
- Deciding which models to use and emphasize to model students' thinking during the warm-ups.
- Promoting a particular model in the warm-ups throughout the unit.
- Having students share more and being intentional about who is sharing more, and using the students' work to help lead their discussions.
- Using turn and talks during the whole-group discussions
- Modeling students' thinking during the conferrals
- We need to continue to work on building a mathematical community where representations matter.
- Making sure the students are aware that the other students are their audience (not the teacher).