Sense-Making, Reasoning and Problem-Solving Lesson Study

December 4, 2020

Research Question:

Supporting sense-making, reasoning and problem-solving and facilitating meaningful whole group discussions

The lesson study team hypothesized that the following actions would be important elements in supporting sense-making and reasoning. Each hypothesis is listed below followed by the team's reflection.

Hypothesis 1 – From contexts to models as bridges to understanding

Strategic use of talk moves supports students' sense-making.

- *Revoicing*
- *Repeating*
- *Reasoning*
- *Adding on*
- *Waiting*

- Re-voicing of students' ideas was supportive in highlighting what students were already thinking.
- The questions the teacher asked were mostly open questions, followed by the teacher re-voicing what students are saying, inserting new information into the conversation, modeling students' thinking, then pushing those ideas back to the students was effective in moving students along in development.
- Throughout the conferrals, students were consistently pressed to articulate their noticings and to think about why they are working.
- During the congress, students were willing and able to articulate their strategy allowing the teacher to re-voice what students were saying and introducing slightly new ideas.
- Most, if not all of the congress was around the students' work, but this also allowed the teacher to use talk moves to draw their attention to certain features of another students' representation/model.
- The teacher was able to ask students to use other students' reasoning around the big idea of place value patterns when multiplying/dividing by ten.

Hypothesis 2 – Purpose in initiating new information

If the teacher inserts new information (initiating), the purpose should be to prompt coherence and sense-making or advancing the discussion and followed by eliciting to ascertain how students interpret the new information.

- Much of the re-voicing, followed by asking if the teacher was hearing the students correctly seemed to prompt student-student interaction.
- During the congress, the use of re-voicing paired with modeling students' thinking is a way to initiate new information to follow by eliciting students' ideas about the new information.

Hypothesis 3 – Key functions of the teacher

Three key functions of the teacher:

i. Eliciting student thinking
ii. Supporting student-to-student exchanges
iii. Guiding and extending the math

- During the congress, the teacher elicited students' thinking, re-voicing and then pushed towards big ideas.
- Once the idea of the value shifting to the left when multiplying by ten, the students were able to wrestle with the language of articulating what's happening.
- Asking students what happens when we multiply by ten in general, allowing students to speak more generally.
- Shifting students attention towards general relationships allows students to move out of the context to examine more generalizable procedures.

- Models will support in “guiding the math” - This means that the models will provide the students with a foothold during the process of vertical mathematization, without obstructing the path back to the source.

Hypothesis 4 – Sentence frames to support language

Sentence frames can support students to support student communication skills

- The students were given sentence frame cards and seemed to partially use them in conversation, but required teacher intervening in the discuss to use them fully.
- The team felt the students were able to use the “I noticed __” to drive their comments, but the “It made me think __” part of the frame did not really impact the comments students gave in the gallery walk.
- Possible practice to consider in the future are sharing the sentence frame for the gallery walk during postering, sharing posters as “mentor texts” for understanding the group’s big idea that they discovered, and using the congress to ask what others think the group’s big aha was.
- The gallery walk seems to serve the purpose of preparing for a stronger congress, so remembering that the quality of the feedback is not the goal but rather the process of examining other mathematician’s work is an important part of what we are trying to achieve through it.
- In one pair, students were arguing about different ways to come up with more combinations by flipping their 3-D array, prompting reflection on whether they are different than other arrangements.
- During the congress, students shared the strategies they used but were selected strategically to make sure doubling and halving, the idea that numbers can be created from multiple factors, and the connection between the 2-d and 3-d array.
- After students discussed their ideas in the congress, they seemed to have more ideas on finding various combinations that they were willing to try and represent with expressions.
- The teacher used several turn and talks during the congress that allowed the dialogue ball to keep moving between the kids.