1st Grade Fluency with Flexibility Lesson Study

November 18, 2020

Research Question:

Supporting students to reflect on and communicate their own reasoning

The lesson study team hypothesized that the following actions would be important elements in supporting students to reflect on their own thinking. Each hypothesis is listed below followed by the team's reflection.

Hypothesis 1 – Contexts are a source for learning

The starting point is the exploration of a context problem which — and this is very essential — can be solved on several levels of understanding.

- Starting with the context of the bus moving fast was made clear, and was mathematically significant to move kids along from counting and moving progressively up the landscape.
- Many students were referencing the bus moving fast throughout the investigation (horizontal mathematizing).
- Because we have a context, every student was able to start and every student had room to grow.
- The range of starting points for this task was counting by ones to starting to use and notice compensation.
- Students were able to mathematize vertically both within the task and in the congress by noticing patterns, using compensation, noticing part-whole relations, generalizing beyond moving just 1 from an addend to another.

- Starting with the context, students were articulating relationships and given moments to think about what they're noticing in terms of relationship between the symbols.

Hypothesis 2 – Mathematics as a social activity

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.

- After talking with partners, we noticed students who were counting by ones were able to move further in development towards prioritizing 5 and 10.
- Additionally, students were able to build on each other's thinking.
- The teacher asking students to think about other students' thinking and then asking them to reflect on what "just happened" supported students in having opportunities to reach higher levels of understanding.
- Because students were given time to talk to each other about their ideas, many students were able to link to other students' use of the context.

Hypothesis 3 – Progression of models

For models to serve the bridging function between informal and formal ideas, they need to go through 3 stages.

1. Models of a situation
2. Modeling of students' thinking
3. Models as tools for thinking

- Many students were referencing what was happening in the story with the bus moving fast, the weather changing, the arrangement of passengers on the bus all connected to how students thought about how they were using the rack.
- During the congress, the teacher did less modeling of students' thinking than the students purposely to elevate students' position as mathematicians in front of their peers. This also raises the level of investment in future modeling and problem-solving by students.
- During the string and some conferrals, the teacher modeled students' thinking on the rack. Having a culture of reasoning and problem-solving frees up space for the teacher to model students' thinking without it feeling like an implied thing for the kids to use.
- It is critical for students to recognize that it is their thinking that is being modeled, not the teachers.
- Some students were imagining compensation (and moving the beads in groups) because they have used the rack many times previously.
- In congress, students were predicting whether compensation would continue working using different numbers.

Hypothesis 4 – Teaching developmentally using the landscapes

With the use of the landscapes, teachers can interpret students' thinking from a developmental perspective and use questions and modeling of their thinking to promote individualized progressive development.

- The team noticed that some students were moving between on and off task, but were able to stay into the problem-solving.
- Having students working on rich contexts in pairs is a critical first step in order to support students from where they are.
- We have to hear what students are thinking before we can decide what to push on.
- Modeling students' thinking is helpful in supporting development along the landscape.

Hypothesis 5 – Talk moves

Use of talk moves of waiting, turn and talk, what did your partner say, re-voicing, engaging with another student's reasoning supports students to discuss their ideas with each other.

- These practices seem powerful and should be used regularly.
- These moves were used in the string, congress and within pairs in the investigation.
- The teacher kept asking students what they thought about what other students were thinking.
- Wait time of 3 seconds or more, asking students to envision what another student's thinking.
- Developing procedures for productive turn and talks should include physically turning, looking at each other, having an assigned math partner increase the quality of the discussion.