The Nature of Student Thinking Available in a Secondary Mathematics Classroom

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References


Methodology

• Data: Video of a 90-minute, junior-level, geometry lesson taught by a beginning teacher in an urban high school where 99% of the students received free lunch.

• The lesson was about finding the surface area and volume of a sphere.

• The rate of instances of student thinking per minute and MOSTs per minute of the 45-minutes of whole-class instruction in this lesson were at the medians of the larger data set (Van Zoest et al., 2014).

• 180 instances of student thinking—observable student action or small collections of connected action—were identified from the 45-minutes of whole-class instruction.

• The instances were categorized using the MOST Analytic Framework in Figure 1.

• Instances that were non-mathematical as well as instances of repetitive student thinking were exempted from further analysis leaving 168 instances that were analyzed.

• Instances were categorized by their Building Potential into four categories: high, own, own and counter infr (CNI).

• Building Potential refers to the potential for learning to occur if the student thinking of the instance is made the object of consideration during whole-class discussion.

• High Building Potential (MOSTs)
  - A student shows their work for finding the surface area of a sphere on the whiteboard (Fig. 2).
  - Instance of student thinking: The teacher asks the class what dimension they are looking at when talking about surface area and a student replies, “Two-dimensional.”

• Some Building Potential
  - Instance of student thinking: “Two-dimensional.”

• No Building Potential
  - Instance of student thinking: “That came from the radius.”

Implications

• It is important that teachers consider the potential that student thinking has when they attend to, and make decisions about how to respond to, that thinking.

• Teachers may need support to develop the ability to identify the potential in student thinking and respond to the thinking in ways that support students’ learning of mathematical ideas and optimize instructional time.

References

Available on a handout.

Contains Data from the Building Potential (CNI)

On the backs of students counting the area of the face of the cone covered by the hemispheres (Fig. 3) is a student shown out, “Subtract π.”

Instance of student thinking: “Subtract π.”

CNI: Cannot Infer.

High Building Potential (MOSTs)

A student shows their work for finding the surface area of a sphere on the whiteboard (Fig. 2).

Instance of student thinking: The teacher asks the class what dimension they are looking at when talking about surface area and a student replies, “Two-dimensional.”

MP: The equal sign is not a command for an answer, but represents the equality of the expression on each side of the equal sign.

• High potential instances are MOSTs. Making these instances of student thinking an object of consideration for the class would capitalize on an opportunity to further the class’s learning.

• In this example, the teacher could help the class understand why it is important to consider the radius when finding the surface area of a sphere.

• Another subcategory of examples would be instances of student thinking that contain mathematical ideas that the class is not ready to engage with at that time. For such instances the teacher could acknowledge the student thinking, and indicate that it will be revisited later.

•Instances of student thinking that are CNI have unknown potential, and need to be classified to determine the potential.

• In this example, the teacher would need to first ask the student to clarify what would be subtracted from what.