Mathematically Accountable Talk

Accountable Talk: Teaching Students to be Mathematically Smart

adapted from Phil Daro and Lauren Resnick

Further background on Accountable Talk:
[excerpt from article by Lauren Resnick](#)
[excerpt from Institute for Learning website](#)

Students can be taught how to be smart in mathematics. We have seen it done on a large scale in literacy and on a small scale in mathematics. The key strategy is to create social norms for `talk' that model cognitive norms of smart people; that is, to translate mental habits of smart people into social habits for all students. These habits of talk get internalized and all the students start talking and thinking like smart students. Lauren Resnick and others have named these habits of talk "Accountable Talk". Accountable talk is based on the idea that people can "learn to be smart": that social, concrete experiences help us internalize methods "smart people" use automatically.

Accountable talk sharpens students' thinking by reinforcing their ability to use and create knowledge. Teachers create the norms and skills of accountable talk in their classrooms by modeling appropriate forms of discussion and by questioning, probing, and leading conversations. For example, teachers may press for clarification and explanation, require justifications of proposals and challenges, recognize and challenge misconceptions, demand evidence for claims and arguments, or interpret and "revoice" students' statements. Over time, students can be expected to carry out each of these conversational "moves" themselves in peer discussions.

Accountable to the conversation.

Just because it's your turn to talk, you don't get to change the topic. The speaker is accountable to the group to cite the ideas of others, explain how her ideas relate to what has previously been said. Is the relationsip logical? An analogy? An example or application of what someone else said? A request to explain? A disagreement? An alternative?

This habit of connecting my talk to the talk of others models the mental habit of connecting the idea on my mind right now to ideas previously thought. In other words, this habit of talk teaches me how to link my own ideas into longer chains linked by logic and analogy. I can make complicated ideas in mathematics just like the ones smart people make.

Mathematically Accountable talk.

1. Generalization of mathematical statements
    o Is it ever true?
    o Is it always true?
    o When is it true? Under what conditions?
    o Good strategies for seeing and showing when a mathematical statement is true:
        ▪ How is [term] defined?

          Often, the definition contains the key ingredient for showing a statement is true -- it follows from the definition.

        ▪ What happens in simple cases?
        ▪ What happens in special cases?
            ▪ very large numbers
            ▪ near zero
            ▪ near one (both more and less than 1)
            ▪ empty set
            ▪ very tall or very flat triangles
        ▪ Have we looked at all cases?
            ▪ Is it possible to look at all cases?
            ▪ "Every case" vs. "any case": Often every case is impossible to check, but it is easy to show how it works for any case.
        ▪ Counterexamples
        ▪ How does it relate to other mathematical statements we have talked about? Does it logically follow? Do other statements follow logically from it? Are there interesting analogies that might be true for analogous reasons?
2. Seeing through multiple approaches to problems
    o *Every student understands every approach*
    o Approaches that didn't work: Why didn't they work?
    o Approaches that worked:
        ▪ How are different approaches alike?
        ▪ How are they different?
        ▪ How do the mathematical ideas in each approach make the problem easier or harder?
    o Multiple representations: What do different representations show?
3. Confusion
    o Ask when you are confused (assume you are the canary in the mineshaft). Sometimes it is valuable for everyone to understand what can be confusing about the concept, procedure, representations or problem. Many times it is the language.
        ▪ "What does [term] mean?"
        ▪ "What does [representation] mean?"
        ▪ "Is there a useful analogy? A better analogy?"
        ▪ "Is the book confused?"
        ▪ "Is the teacher confused?"