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Using the Video "Teacher Questions."

The "Teacher Questions" video, 14 minutes, has a collection of 8 clips. These clips show the teacher questioning students in different situations, 1 – 1, small group, and large group. The questions have different purposes and consequences.

How Does the Teacher Know What to Ask?

I have noticed that teachers are not ready to listen hard to student and teacher voices the first time they view the videos *Developing A Multiplication Algorithm for Fractions (Bits and Pieces II, 3.1 – 3.3).* But one of the comments I hear a lot is that Teri asks great questions. Teachers new to this way of teaching often find this intimidating. In fact if you study Teri's questions on these videos you notice that they are not "difficult" questions at all. Teri's genius lies in her ability to really listen to her students so that her questions are not the result of her *waiting* to ask what she has already planned to ask, but are instead the result of her genuine interest in how her students are thinking. Of course, she does plan ahead by thinking hard about what she expects students to do and say, and about the mathematics she wants to draw out; and she has a lot of experience to guide her. But what she often does in her questions is ask what students are thinking, and then she reflects their thoughts back to them in a way that forces them to think again, think harder, or think at a higher level. Her questions open up rather than close down student thinking.

Learning to Listen

I think that the collection of clips could be used, with a transcript, to help participants practice really listening to students. This would be better done as a "homework" assignment, with teachers working in pairs, re-viewing as often as necessary.

Some Helpful Articles (see Appendix)

It may help to have some common vocabulary for analyzing what Teri does. There are two articles that offer ways to think about discourse, specifically about the actions a teacher takes in her part of the discourse: "Questioning our Patterns of Questioning" (Herbel-Eisenmann et al, 2005) and "Making the Right Discourse Moves" (Springer et al, 2006). Participants could use one or more of the bullet points below to analyze an interchange. Italicized words and phrases relate to the vocabulary used in the two articles. These same questions could be asked in relation to the longer video "Developing a Multiplication Algorithm for Fractions" (or any video).

Questions on the next page.

Questions to Investigate

- Find 2 examples of Teri *re-voicing* what students said as a direct or implied question. What was the question? What form does the *re-voicing* take (repeating, rephrasing, summarizing, re-casting)? What was the result of *re-voicing* (cognitive or attitudinal)? Compare the two examples. Was the purpose of the *revoicing* the same each time? Was the result the same each time? [Ω]
- Find 2 examples of Teri asking questions and measure *wait time*. What was the question? What seems to be the purpose of each question you identified (review, assessing understanding, connecting, probing, extending)? What was the result (cognitive or attitudinal) of waiting? Compare the two examples. Was the purpose/result of the question the same each time?
- What does the teacher do when students have a misperception? Does she always do the same thing? Give an example.
- When Teri viewed this selection of clips she commented that none showed her differentiating among students by asking any questions that pushed higher order thinking skills. Do you agree with her?

[Ω] One of my favorite interchanges is when Teri asks Caleb if he is stuck on *Bits and Pieces* II, Problem 3.1 part B. (Chapter 2 on the "Teacher Questions" video.) He has figured out that ¾ of a ½ of the brownie pan is 3/8, but he says he can't find the cost for a 1/8 piece of the pan (total cost $12). Teri asks him how he figured out that the cost of 1/6 of a pan would be $2. This makes Caleb look at the process he used successfully in a previous problem. Reflecting on prior knowledge is a useful strategy, and Teri's questions nudge Caleb in that direction. Then Teri goes further and writes down what she hears him saying, which makes his thinking explicit. With her questions and actions she acts like an extension of Caleb, *re- voicing* what he knows already, and re-casting it in explicit symbolic language. Caleb says he is stuck because "you can't divide 12 by 8." He is not saying *he* cannot do this, but that it is impossible. Teri asks him "Why not?" She does not imply he has made an error, but her question implies that he should have a reason for such a statement. Her question f*ocuses* on the mathematics of division, not just on what the answer for the division should be. He answers, "You get a negative." "Do you?" says Teri, apparently taking the information as good information. Again Teri *re-voices* what Caleb said. "Why can't I divide 12 by 8?" she asks, which pushes Caleb to confront his thinking on the process and come up with a reason. "Because 8 does not go into 12," says Caleb. "Hmm. It doesn't?" says Teri, again just asking in a way that does not disagree, but requires Caleb to make explicit his thinking. "It would be 1 and a half," replies Caleb, moving away from his first statement that this cannot be done. "Why couldn't we use that? Is it exactly 1 and a half?" asks Teri, again making Caleb explicate his thinking. "Yes," says Caleb. (Teri seems to accept this without question but then she goes back and asks "How did you decide this was 1 and a half?") "What does this tell me?" asks Teri, checking on whether Caleb has understood what his answer means. Her questions all *focus* on the mathematics of division and on proof of Caleb's mathematical statements. None of Teri's questions *funnel* Caleb towards the answer *1.5*.

Questions to Investigate

- Find 2 examples of Teri asking questions, and identify the mathematical idea in play. What does the student understand at the beginning? Place the student on a continuum from "Understands nothing" to "Understands completely." What is the purpose of the teacher question (review, assessing understanding, connecting, probing, extending etc)? Place the question on a "*Funneling*" to "*Focusing*" continuum. What happens after the teacher asks a question? Does the question push the student to think harder? Does it help them clarify or correct their thinking? Does it move the students on the "Understanding" continuum you created? Compare the 2 questions.
- Does the teacher ever just "tell?" When and why?
- When should the teacher stop questioning and leave students to continue without further intervention?
- How would you characterize the dynamic of each of these student-teacher interactions? Specifically, where is the responsibility for asking questions and making sense: solely/ mostly/ partly with the teacher?[Ω]

Large Group Discussion?

A large group discussion may be needed after this assignment, but I should ask participants if they would like a large group discussion; they can learn from this "homework" assignment without me "checking" on it.

To extend this investigation into future practice, I might ask teachers to reflect on the questions they ask in class. (Again, better done with a peer.) Can they recall examples of *focusing* questions they asked? Can they recall an example of *re-voicing*? What was its effect? By making some questioning strategies explicit we can all improve our questioning techniques.

[Ω] Teri's questions are all focused on mathematical explanations and all originate with Caleb's ideas. The *dynamic* between the two of them is calm, decisive, deliberative and respectful. So when Caleb says "Sweet" near the end of the interchange it seems as if he has taken ownership of the process; Teri's presence during his change of mind is essential but not intrusive. She adds almost nothing of herself, just persists in asking Caleb to explain his ideas. She is so respectful of Caleb's thinking process that Caleb seems to think he arrived at this answer by himself, as indeed he has.

The operating principle behind this and other classroom interchanges is that mathematics has to be explicable, and that the moves that the teacher and student make comprise a drama in which reasons will become clearer and in which students assume more and more independence in requiring and giving reasons.