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ABSTRACT

This study is one of a set designed to investigate how preservice teachers' understanding of mathematics and views of teaching are affected by working with children. In the study, two preservice secondary school teachers tutored an eleventh grade student over a period of two sessions. The student teachers were surprised that the student was not considering fractions as involving equal areas, and they spent 45 minutes unsuccessfully attempting to induce disequilibrium in the student. The author viewed the videotape with the student teachers, during which time it became clear that the student teachers were struggling with the notion that teaching means not telling students anything. Implications of this view are discussed. (Author)

Two Prospective Teachers Struggle with the Teaching-Is-Not-Telling Dilemma

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Paper presented at the Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education

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TWO PROSPECTIVE TEACHERS STRUGGLE WITH THE TEACHING-IS-NOT-TELLING DILEMMA

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This study is one of a set designed to investigate how preservice teachers' understanding of mathematics and views of teaching are affected by working with children. In the study, two preservice secondary school teachers tutored an eleventh grade student over a period of two sessions. The student teachers were surprised that the student was not considering fractions as involving equal areas, and they spent 45 minutes unsuccessfully attempting to induce disequilibrium in the student. The author viewed the videotape with the student teachers, during which time it became clear that the student teachers were struggling with the notion that teaching means not telling students anything. Implications of this view are discussed.

Lampert (1985) proposed a provocative view of teaching when she suggested that the teacher manages dilemmas. These dilemmas differ from problems because they do not lend themselves to solutions, and therefore, rather than being viewed as obstacles to be eliminated, dilemmas instead should be viewed as endemic conflicts that teachers learn to work with and even find useful (Lampert, 1985). Four examples of dilemmas faced by teachers attempting to transform the way they teach mathematics include *"telling" students vs. students constructing knowledge; fostering unconventional and meaningful strategies vs. being socialized into the broader mathematical community; achieving immediate success vs. long term development of ideas; and fostering diversity vs. having convergence of ideas as a goal* (Harel et al., 1995). This paper will address the first dilemma listed above, which Romagnano (1994) referred to as the *ask them or tell them* dilemma. Romagnano (1994) described an incident whereby a lesson he taught to a ninth grade general mathematics class did not go as well as the same lesson taught by a first-year teacher using a more direct teaching approach. Romagnano wondered where one could draw the line with respect to the *ask them or tell them* dilemma:

> Perhaps the most subtle and important aspect of this black-and-white dilemma is the apparent absence of any shades of gray. Can you tell the students some things so you can move on to the more important goals of the lesson? Is it possible to wean students away from being told what to do all the time by telling them less and less and asking more and more as the school year progresses? Or does any telling to students of this age reinforce their expectation that they will be told what to do? (Romagnano, 1994, p. 101)

This paper will highlight this dilemma by sharing the difficulty experienced by two student teachers who had adopted the view that teaching means not telling.

Method

Louis and Ethan were two prospective secondary school mathematics teachers who undertook an assignment that called for them to meet with a student at

least two times and work with the student on a mathematical topic of their choosing. They were to assess the student and then, based on the assessment, plan a follow-up lesson that they might teach to the student. The sessions were videotaped. Louis and Ethan worked with an 11th grade student named Donald, an average student in Ethan's geometry class. Louis and Ethan chose to assess Donald's understanding of division of fractions, because it was only in the previous semester's methods course that they themselves had come to conceptually understand this idea.

Following the sessions with Donald, Louis and Ethan entered a student-teaching seminar excited and eager to share with their peers what they had learned. During their interview with Donald on the first day, Louis and Ethan planned on developing the idea of fraction division by working up to asking how this picture  could be used to show why $1 \div 3/5 = 5/3$. To develop this idea, Louis and Ethan first asked Donald to draw a picture of fifths, which Donald drew: . Donald explained that he could draw fifths, but not equal fifths. Louis and Ethan were quite surprised by Donald's response, and they began their second session by again asking Donald to draw fifths, which Donald drew the same way he had the previous day. Louis and Ethan had expected that, and they had altered their plan so that they might work with thirds, which they expected Donald to be able to construct. When asked to draw one-third, Donald drew: . The student teachers spent the duration of the tutoring session, over 45 minutes, trying to induce disequilibrium in the student so that he would come to recognize that the thirds must be equal. At one point they asked the student to draw one-fourth, and he drew: . When they asked Donald how was it that the shaded region in the first circle was one-third whereas the same sized shaded region in the second circle was one-fourth, he responded that in the first case the region was one out of three whereas in the second case it was one out of four. Ethan and Louis expressed surprise that an average eleventh grade student would think in this manner. They also explained that they found the experience to be difficult because they did not want to "tell" Donald. Intrigued by what Louis and Ethan seemed to have learned from their experience, I invited them to view their videotape with me. Prior to the meeting, I arranged to have the videotape transcribed and I sent Louis and Ethan each one copy of the transcription. I then met with Louis and Ethan to discuss the videotape. This session was also videotaped, and the videotape was transcribed and served as the primary source of data for this report.

Results

During the session it became clear that not only had the student teachers read the 26-page transcript of their sessions with Donald, but they talked to each other on the telephone about it. Their session with me began with me asking the student teachers to comment on the transcript. They explained their surprise that Donald

did not draw equal fifths or thirds. They said that although they knew where they wanted to go with Donald, they were not sure how to get him there. Louis said, "There was still this mystical magic land we wanted him to get to — you know, the equal parts."

After Louis and Ethan shared their thoughts about the transcript, I asked them whether there were portions of the tape they wanted to watch. Louis responded, "No, not really, (but) there are portions I'd rather skip." He and Ethan described how they were disappointed with how much they thought they had led Donald. As Ethan and Louis reflected upon the "telling" they did with Ethan, they wondered how much telling they did in their own classrooms:

E: I just wonder how much I do that in my own class.

L: And I do it in my class, too. Now since doing this...

R: Is this bad to do?

E: I think sometimes it is. And sometimes...

R: What are the implications for doing it, and what are the implications for not doing it?

E: The implications for doing it is that you're telling the student maybe what to think. And you're perhaps telling them, maybe not literally, but figuratively telling them that their thinking should be the same as yours.

L: I think maybe you're also telling them they don't have to think.

E: Yeah. You're also telling them, "Well, you're going to give us the answer anyway."

Ethan and Louis spent 40 minutes trying to induce disequilibrium in Donald. Following is a portion of their attempt, transcribed from their interview with Donald. It begins with them asking Donald to draw one-third.

Donald draws: .

E: That's 1/3? Are all those pieces equal?

D: No.

E: So is that a third?

D: I guess. (Inaudible)

L: You guess? ... Don't be nervous; we're trying to figure out how you're thinking. So you're saying a third because it's one of three pieces? (Donald agrees) This third right there—if I take a third of something, it doesn't matter what it is, whether it's a pie or something else, it's just one piece out of three?

D: Yeah.

L: Do the pieces have to be equal sizes?

D: Yes. No.

L: What happens if we have three 3rds?

D: All three of them make 1.

L: Okay so, they don't actually have to be exactly the same size as long as three of them add up to the whole.

(Pause)

E: When you were dividing it (the circle) into half, did you have two equal halves?

D: When I divided it in half?

E: Yeah. When you divided it in half the first time—those two pieces. So each of those pieces represented what?

D: One half of the whole.

E: So both of them were equal?

D: Yeah.

E: Okay. What about here (Donald's representation of 1/3)? You divided it into 3 parts. Are the 3 parts equal?

D: No.

E: So is that one-third of the whole?

D: I guess not.

L: Can you show me one-fourth?

Donald adds a line to his previous drawing: 

L: **So now the same thing you called a third is a fourth now.** Does that make sense to you?

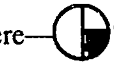
D: I added another piece.

L: You added another piece.

Even though Ethan and Louis understood that Donald was seeing one-third as one-out-of-three, they continued to struggle with why their attempts at inducing disequilibrium failed. I finally suggested we role play, with one of them playing the role of Donald:

R: Okay, let's do it again. "So both of them were equal; they were halves." Okay? "You divided the two pieces in a whole. Were they both equal?"

E: (as Donald) Yes.

R: What about here—? You divided into three parts. Are the three parts equal? How much is this?"

E: (as Donald) One third.

R: Why did you answer one third? Now we're popping out [of the roll playing]. Why do you think that he would have answered that that's one third?

E: Because it's one out of three pieces. I see what you're talking about.

L: I see what you're saying now. Yeah. To us there is a connection between three equal parts and a third, but **not to Donald!**

E: To him... We have to get inside his brain, so to speak, and try to question it so that we don't give away that maybe he's wrong or he's right....

L: That's interesting. Even talking as much as we did, we didn't even come close to seeing that one.

Ethan and Louis talked about how they felt they had been going around in circles. I suggested that at times the best thing to do is to back off:

R: Sometimes the best thing to do is just to back up ten yards and punt when you're in a position like this, because you're really sort of stuck. You don't really know where to go with it.

E: And I really didn't know where I was going with this.

L: We're not very adept at punting yet.

R: I realize that.

L: Punting is a hard thing to do...

E: We go for it on fourth down still.

L: Fourth and ten, we're running—up the middle!

E: Up the middle (laughing).

R: That's good. That's funny.

L: No, it's not.

E: No, it's not funny.

R: Well, look. You know, one of the points of being here is to sit back and reflect upon stuff that you probably don't often have a chance to reflect upon.

E: And this is only five minutes into the tape. And our frustration level.... If you could have been in that room—and you know Louis and I and our mannerisms—you could tell just by looking at us that we were frustrated.

I asked them to describe the source of their frustration. Ethan responded, "The frustration was because we didn't know what to do next. We didn't know what to do with his responses. Later during the discussion they again came back to the difficulty they had helping Donald see that thirds were supposed to be equal.

L: Uggh! It's frustrating because *I* see this, and I want *him* to see it.

R: What would you like to tell him right now?

L: I don't know.

R: Forget about all this constructivist stuff, and my methods class. Forget about all the stuff that's in your head. What would you like to tell him right now?

L: **Damn you, child. Thirds are equal!**

R: So what would happen if you told him that?

L: I don't know.

E: I don't think he would necessarily take that to heart.

L: I don't know.

R: Pat and I talked about this quite a bit. And he suggested that what you're trying to do is have him discover a convention.

L: **Ouch!** I didn't think of that.

E: That's exactly what it is. Ahh, man. That's exactly what it is.

L: Do you want to slap me now or later?

E: Slap *me*, man! I said they had to be equal. That's the convention, right there. His thirds don't have to be equal.

L: Ohhhh, man! But *why* are thirds equal? Why did we decide that they *should* be equal? Aah. Okay. Excuse me for a moment.

E: Can we hide our faces?

Note how fragile Louis and Ethan's understanding was. They were grasping for straws, ready to jump on any suggestions I made. They were stuck, with no idea how to proceed. Albert Einstein once said, "The world we have made as a result of the level of thinking we have done thus far creates problems we can not solve at the same level as that which they were created at." Ethan and Louis chose not to tell Donald, but in so choosing, they were left with a problem they could not solve. How could they facilitate Donald seeing what they wanted him to see?

Discussion

Was the previous situation an artificial result of not wanting to "tell" in order to be "constructivists"? Is the condition of equal area a convention, in the sense of

an arbitrarily socially-agreed-upon condition? Should Louis and Ethan have simply told Donald that the fractional parts must have the same area?

My answer to all these questions is yes and no. On the one hand, yes, Louis and Ethan felt that telling Donald how to split the circle into equal areas would be inconsistent with a constructivist approach, a thesis that can arguably be considered naive and impractical; but, on the other hand, by restraining themselves from explaining how-to-do-it they created an opportunity to be surprised by how Donald conceptualized the idea of "thirds." This was not only a source of insights for Donald's view of fractional splits, but also for Louis' and Ethan's own questioning of the nature of fractional quantities.

It was important to the student teachers that they not tell Donald the "solution," and yet, at certain points, it might have been useful to talk with Donald about the "convention." Donald's ideas could have provided a background of relevance to the "convention." That is, by noticing how the convention is different from what he had done, the whole conversation might have made the issue more salient for Donald.

Is the condition of equal area a convention, in the sense of an arbitrarily socially-agreed-upon condition? Yes and no. Taken in isolation it can be thought of as a convention, but from a broader perspective it is not just a convention. For example, 1/2+1/2 would not necessarily be equal to one if each 1/2 could be a "different" half. So, should we tell the student that this is a convention? Well, sometimes. Telling Donald the condition of equal areas might have been useful to start him on a shared-upon activity. But there is something shallow in just thinking of it as an arbitrary norm.

Whether something is a convention or not is context dependent. For someone viewing fractions as ratios, equal areas may appear to be a convention. However, for Louis and Ethan, the condition that equal fractions must involve equal areas was an unquestioned principle of mathematics. Which raises another dilemma: Just when and how do conventions become principles, and for whom? At what point should teachers tell students conventions? There are no general rules for this. Furthermore, if Louis and Ethan decide when it would have been appropriate to tell Donald, that does not prescribe when "to tell" another student.

The current reform movement calls for teachers to move from the role of the "sage on the stage" to the "guide on the side." Romagnano (1994) suggests that the dilemma introduced here is black-or-white, with no shades of gray. For some, this black-or-white view is reflected in the notion that "constructivism means never having to tell anyone anything." The study reported in this paper suggests that there are shades of gray.

In order to help teachers work with these shades of gray, we must provide them ways to think about such questions as: Are there some things teachers can tell students? Are there some things teachers must tell students? What are the implications for either telling or not telling in each of these cases? What is the difference between the roles played by convention and principle in mathematics, and how do each of these play out in a classroom committed to constructivist principles? If it is true that there is some knowledge students can not be expected

to construct (Williams & Baxter, 1994), then which knowledge is constructible by whom, and how do teachers provide supportive learning environments?

References

Harel, G., Kaput, J., Lesh, D., Nemirovsky, R., Philipp, R., & Thompson, P. (1995). *Mathematics Curricula based in Conceptval Experience* [Unpublished manuscript].

Lampert, M. (1985). How do teachers manage to teach? Perspectives on problems in practice. *Harvard Educational Review, 55*(2), 178-194.

Romagnano, L. (1994). *Wrestling with change: The dilemmas of teaching real mathematics*. Portsmouth, NH: Heinemann.

Williams, S. R., & Baxter, J. A. (1994). *Reconstructing constructivism: The dilemmas of discourse oriented teaching*. Manuscript submitted for publication.