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Gathering Preservice Teachers Around the Data Roundtable

My Vexation

My vexation occurs in an elementary science methods course taken by undergraduate seniors, all of whom have had 6 science courses prior to this methods course. Their preparation includes courses taught on an inquiry model, though some take alternative (traditionally taught) classes. The education courses they take are in a program that values constructivism, classroom inquiry, and reflective practice. These themes weave through our core courses, though we struggle with consistency of representation across courses and sections (we are a very large program).

This vexation can be stated this way: our teacher candidates seem to understand inquiry from the standpoint of simple comparisons with other science instruction they've encountered. They see it as being different in that the instructor is posing interesting questions, and students have responsibility for developing their own ideas. However, in hundreds of micro-teaching episodes I have observed, once data is gathered in an investigation, our teacher candidates do not understand that working with and evaluating data should be the next step. Most often, they see this as the point where the teacher starts "telling." However, from a constructivist viewpoint this is the place where teachers should be structuring occasions for students to look at larger data sets (perhaps group or class data, or data from pre-existing data sets) to find patterns and make decisions about what comes next.

For me, working with the data (at least some of the time) and helping students to evaluate it and interpret it, is critical for maintaining the flow of classroom inquiry. It brings an authenticity to the process that ensures that the inquiry belongs to the students and to the teacher, as co-investigators and co-learners. Essentially, it is the point of meaning-making that has the most potential for representing the nature of science AND for building conceptual connections.

When teacher candidates look at students' data, they are likely to think about themselves as teachers, and the students as students. They think that incomplete or muddled data means they've done something wrong. They see it as "bad". Yet, in real science situations, data that is muddled or not specific is often the initial result. Scientists examine this data carefully for emergent patterns, developing hunches that can serve as starting points for possible redesigning and retesting. Data that are mostly consistent can be accepted, and more work done on a targeted set of variables or conditions, to work out inconsistencies and to validate existing data. Data that are more consistent can be examined for clear patterns and for divergences from those patterns.

To be able to ask students about the data, quite often teachers need to work out the specifics of how to gather and display data from a larger set of students. This is because it is often more productive for pattern-seeking to occur in a larger group setting, which makes the ideas of each student more generative and more subject to addition, modification, and validation. This is the essence of the problem; teachers often don't see the need for, and often don't plan the time for, data work. In addition, in seeing the data as "bad", they are likely to want to throw it out or diminish its role in the instructional process.

My Venture

At the root, this vexation has to do with elementary education teacher candidates' visions of 1) what constitutes inquiry in classrooms, 2) how science is done in the real world, and 3) what a typical sequence for science investigations in the classroom looks like. It is also closely related to candidates' level of understanding of how to support and require their students to understand concepts, not just collections of facts.

I firmly believe that several avenues of effort will be required to resolve or diminish this vexation, but I'd like to focus on one here. It involves my work with teacher candidates within the methods class. I recently split one micro-teaching assignment into two. In the first, candidates 1) set the context for the investigation, 2) introduce and model the investigation, and describe data collection and recording, 3) investigate, and monitor student progress, and 4) clean up and collect student data sheets to use in designing their second micro-teaching episode.

In the second episode, they are charged with gathering class data and displaying it, and then scaffolding students in finding patterns in the data. It is the preparation sequence for this second episode that is so difficult.

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Essentially, I am meeting one-on-one with teacher candidates to do this, but this Fall I will have 80 candidates (rather than the 50 I have had for the last year). I have figured out that our meetings go better if I require them to examine the class data before we meet, and to sort it based on the various attributes they see. They bring the sorted data sheets and their analysis to our meeting.

I am now toying with the idea of “data roundtable” sessions, where groups of students could meet and work on “what comes next” with my help. These sessions could involve smaller clusters of students working on each others’ data, generating ideas and developing plans.

So, working on the idea of “data roundtable” sessions:

- 4 or 5 teacher candidates bring their student-generated data sheets. Sessions are scheduled to last an hour or more, depending on 4 or 5.
- Prior to the data roundtable, each prepares by sorting student data sheets by attributes they see in the data, developing a hunch of what they’d like to do next, and proposing how they will display data and how they will lead students through evaluating and pattern-seeking.
- Each candidate shows group members their data and the way they’ve sorted it, with others questioning in order to understand the data-gathering activity, range and kind of data, the patterns, and what problems might exist with the process or the data. The candidate then proposes next steps for data display and evaluation.
- The group provides a setting for looking critically at the data collection process, the resulting data, and thinking mostly about maintaining the inquiry process. It is intended to be a critical look, but also generative of suggestions & alternatives.
- I’m coaching during this process, but I’m afraid of taking center stage. More guidance or structure will be needed to make these data sessions work, especially given the candidates’ lack of understanding of inquiry and the way science is done.
 - I’m still puzzling over guiding questions or points to facilitate this process, so that the candidates can play more central roles in helping each other think about this phase of instruction, rather than relying heavily on me.
 - What kinds of artifacts of the process should the candidates be creating so that they learn from it, and have something to look back to when they’re in their own classrooms?

Note that, doing the math for 80 teacher candidates per term, doing these individually would mean 20 hrs of meetings outside the classroom. So I am thinking about doing several of these concurrently during class, which means I would not be sitting with each group all the time. How can I see that each group gets the attention they need?

I am also writing an elementary science methods text to support learning in this class, and want to include writing on this kind of activity (evaluating student data as an important step leading to class data sessions). I see connections here to the learning cycle, to constructivism, and to classroom inquiry. These connections are easy to draw given our National Science Education Standards, the literature behind the Benchmarks for Science Literacy, and even our Michigan Curriculum Frameworks Science Benchmarks.

I need to work out connections to existing literatures in science education, especially to look for ideas related to evaluating data. I am aware that I should explore the scientific argumentation literature, but could use ideas about connections that others see that may provide insight or background for me as I write, and for my teacher candidates as they learn.

I am also interested in collaborations, discussions, and sharing resources with others who are trying to accomplish the same things, teaching our future teachers to think, act, and teach in ways that support students’ engagement in meaningful classroom inquiry.