Day 4 Teacher Journal

Planning

   In planning a lesson, it's, even after years of doing it, it's still very difficult for me to time the activity with the amount of time I have for the class. And again I got caught short today. I say that because I'm not comfortable with the amount of time I spent on assigning the homework problem. Had I had another few minutes, I would have liked to have read the context of the problem with the class and made sure they were extremely clear about what their assignment was. Instead, I asked them to quickly read it and if they didn't have any questions, it was OK for them to leave. As I looked around the room at the end of the period, some of the students were reading them. I think some of them just kind of glanced through it. So, I'm a little concerned about the quality of their responses. But I'll give them a chance to possibly to revisit that if it seems problematic.
   One of the things that I had done for today's lesson is I had prepared two separate homework assignments. In anticipation of this lesson, I wasn't really sure how the discussion about weighted rates or weighted ranks would go. And, the possibility existed that that wouldn't be something that the students would be able to understand or that the conversation wouldn't go forward. So, if that had happened, one of the homeworks simply dealt with developing systems. If I felt confident, that they were beginning to have some understanding about a weighted system, I had a separate version of the homework that asked them to create a weighted system. Now, in action, my judgment was that the students had some basic understanding of how you might weight a system. So, that's the homework assignment that I did give. So, it will be real interesting to see what their responses are in light of my initial judgments of their understanding of the discussion.

   Facilitating

   In formulating how I might get the students to start thinking about weighted ranks or weighted rates it was a real tension for me to create a situation in which they would see value in doing that. In other words, where that would naturally emerge for them, and I wouldn't just have to say, "OK, let's just multiply by two." So, I had considered in my thinking about it, it seemed that if they could look at what the city's value was, which was the final sum, and see what proportion of that sum was given by each of the two columns, then they might start to reason that basically the property crime is making the biggest contribution here. So, that was my reasoning in approaching the problem in that manner. When the students suggested that we double or that we count it twice, that was a real entree for me, because then I had some flexibility to then push them to think about larger magnitudes in numbers. As I said, it didn't occur to me to think about dividing the property crime, so I was really taken by that, but they were able to think about this as a sense of balance. In other words the contribution of the property crime rate was much more significant to that than the violent crime. So, they wanted to do two things, they wanted to pull that one down but increase this one. Whereas, from my perspective, I just wanted to think about how many times do I need to increase this one so that they balance. So, I thought that emerged very nicely from a prior teaching I had. And I wasn't sure how I was going to get to that point had they not made that offering to me.
   One of the things that was happening for me today was I was trying to keep multiple mathematical agenda items straight in my head. It was real interesting, because the students had differing agendas, and so they weren't necessarily on the same item that I was on. And at times, they were shifting quicker than I was. I remember at one point, I was still trying to clarify the difference between acting on the sums, such as finding the average, and acting on one of the addends, and one of the students raised the issue of well if you multiply by four and divide by four it equals it out. And, I remember taking, just pausing for a minute, to think about. It wasn't that I didn't understand her, it was do I want to shift gears one more time and pursue that right now or do I want to go back and get closure. And, I thought that was real interesting because when I paused and said I need to think about that, I was trying to sort out for myself

pedagogically how to proceed, and Gionni interpreted that as I was trying to sort it out mathematically, and offered me a calculator. So it was a tension for me to try to make sure that we got some kind of closure or at least we stayed with some of those issues until we reconciled those, instead of jumping around. Although, it wasn't as clean as I'd have liked for it to have been.

It was real interesting because, as usual I really try to keep an eye on the clock. And, I was watching today, and I was getting to a real pivotal point, I thought, in the lesson, when the students had come up with two very nice systems that did actually weight the different rates. And, so, one of the students posed the obvious question, "Does this really make a difference?" And, so, clearly we had to test that and make a comparison between weighted and unweighted systems. And, so, at that point I had the two different systems, and I'm trying to decide whether we want to test both of those systems against the original. I know that I'm going to get some change with either one of those systems. And, one of the students actually said, "Well, we know those two systems are going to be different, because one of them is times 4 and one of them is times two." And, so, that was kind of an opportunity for me to say, "OK, do we agree with that?" And there seemed to be some consensus, so at that point, I was able to just say "let's take one of these and quickly check it against one of the originals." So, I was trying to give them a sense of the change that would occur as a result of this, and it gave me an opportunity to do that within the time that I had left.

In talking about the set up of the two crime problems, I had mentioned that I was extremely pleased with how they seemed to engage in the problem. But one of my concerns had been, did they get too engaged so that the context wrapped around the problem too much so that they weren't able to do the mathematics. I saw a little bit of a problem today in that when we were talking about violent crime being more important, students started recounting personal preferences or personal events. I was able to just pass over those and move forward so it really didn't bog us down too much. But I think overall the context was very supportive in this particular activity.

One of the things that I was again trying to be cognizant of, but I probably didn't attend to it as much as I should, was the participation by all of the students and then my wait time. At many times today, there was an incredible volley going on between the students. They were engaged, and I do believe I could argue today that the majority of the students were engaged in the activity or in the discussion whether or not they were verbally participating in the discussion. There were more students who seemed to be raising their hands, and while I still had some of the students who answered a majority of the questions, more of the students seemed to be more interested in participating. I saw that as an excellent sign, because their questions were really powerful and the suggestions they were making were really strong. So it gave me a sense of where they were in the sequence. In other words, even though I hadn't heard from them prior, I had a sense of where they were mathematically by just the questions and the contributions that they were making today.

One of the tensions in trying to promote student participation in whole class discussions is when you have a situation that you have posed a question and the responses are really pivotal as far as you advancing your mathematical agenda. And, you have a pretty clear understanding of what the response might be from one student, and you're pretty confident that person will give you what you need. Sometimes you take that student's response so that you can move forward instead of allowing other students into the conversation. I go back and forth on when that's appropriate and when it is not. So in those situations when I think I might be able to move the agenda forward with a certain response, I then try to make opportunities for other students to get back in the conversation. So, you might think of widening the scope at times to engage everybody; then it becomes narrow because we have to continue down this learning route. And so the person that I call on might have, I have a more specific intent instead of just participation. So that kind of has to be balanced against the student's desire to stay engaged in the conversation and their interest, plus they're learning.

Understanding Student Thinking

At the end of class today, I was really left with a sense of being unsure if I had a real handle on all of the mathematics that emerged in the conversations today. There were several issues that I had on my own agenda that I wanted to get talked about that I do think came up. But the students were so engaged in the conversations they kept raising other issues. In particular, we went back and revisited the notion of average and sum. But we did that in the context of the problem that occurred for the students when we started talking about weighting the different columns or the different addends within the systems. And the students I had anticipated that this would be a problem, because they had spent a great deal of time talking about that fact that if you take the sum column and then you divide them all by the same number it doesn't change the ranks. And, now, we're saying that if you act on say the total violent column in the same way, it does change the ranks. And, I wanted to clarify with the students how one change did have an impact, and the other one didn't. So I had kind of anticipated that that would come up, which it did. Simultaneously, I think, the students were also bringing up other issues that I wasn't sure that I was clear in responding to. In particular, when you look at the weighted rated ranks issue, for me the notion of division had not occurred. And I, in fact, was really surprised that came up because prior to Rob's suggesting that I had even said, "We don't want to act on this column", which was the total property crime column. So, I was really encouraged that he made that offer in spite of my previous statement. So, when the students were looking at developing the weighted systems the notion of how much of an impact we wanted those coefficients to have to try to equalize the contribution of each of those aspects really became a nice topic of mathematical conversation for the students.

In thinking back over this lesson sequence, if I reflect back on my initial goals for this sequence, and I put and I look at those in comparison where we ended up, I'm pretty pleased with the progress that we made. In particular, if you look at the notion of symbolizing, I think that we made great strides there. I was extremely pleased with the students' ability to talk about these systems in terms of symbols. And in fact, at one point, Sherika today referred to one of the columns through the symbol notation. But, when I asked them yesterday to develop their systems and then to write the equations for them, I was torn between whether or not they were really capable of doing that or they were just copying what they had done the day before. So, in monitoring the groups, I had specifically asked them to explain those symbols systems to me as if I didn't understand them. And, they were extremely clear on what they stood for. In fact, I was looking at Nina's group, and they just had RK plus RK over 2, which I thought was extremely cryptic in one sense, but in another sense I was extremely pleased because it was not what I had written on their first system. I had written the rank of plus the rank of in brackets divided by two. So they were able to extract from their activity a symbolization that represented that. So, I think that's a nice shift.

Mathematical Content and Context

In addition to all of these issues, there was the notion that or the understanding by some of the students that, if we multiplied one of the factors by four, or one of the addends by four, and then we divided the other by four that that would equalize or cancel each other out. In fact, when Aleyna said that, she related it to what they were learning in pre-algebra. And so, this goes back for me, to the notion of the difference between acting on the terms, acting on the addends, and acting on the sums. Because what they were thinking about is trying to balance an equation as opposed to acting the same way or acting in off setting ways on different addends in an equation. So, while I was trying to sort that out, I was also trying to move the students forward to get them to think more globally about how you could develop a system that would take into consideration the importance of violent crime when trying to rate the different cities.

One of the things that came up today, that I had hoped would arise, was the notion of doing data analysis and how to represent the results of your analyses. Nadira raised this point when we had agreed that we might want to multiply the violent crime rate by two, and then someone suggested that we needed an even larger number, and she questioned this whether this was fair or misleading or even accurate. And so it gave me a nice opportunity to talk about the role of data analysts and how you can take the data and do different things with it as long as you clarify what your system or what your intent was. So in thinking back over this, I think possibly I should have emphasized this point earlier in talking about when you're

trying to do analysis clarifying your goal against your activity. In other words, if your goal is to come up with a way to rank the cities so that violent crime is represented just as equally as property crime, then you would have to do something to alter the statistics or work with the numbers. If you do that, as long as you clarify your system, I don't think that you can say it is incorrect or wrong. It was really nice that the article in the Money magazine had done a similar thing and actually clarified their system so that I could tie that back to Tina's comment the previous day when she said, "How do the magazines do this?"

   Another issue that came up today, that I need to spend more time thinking about, was Gionni's notion of wanting to take the ranks of the cities across the systems and then find their average. I thought that was a really valid suggestion, especially in light of the activity we had done the first day with the Sneakers problem. Because what he was saying was if you look at what all these different systems yield, and you take an average of that, that should be a pretty good indicator of where the city ranks in crime. That wasn't my goal, my goal was to try to get them to develop a system that would give them the result that they wanted as opposed to having to operate on four different systems. So, my sense was that he might have felt that I didn't really acknowledge the importance or the value of his contribution, but it wasn't just fitting with where I wanted the lesson to go. So there was a real tension there for me in actually following up on his suggestion. Had I done so the problem for me in thinking ahead was how do we then begin to symbolize this. So, what I would have liked to have teased out from what he offered was, if we think that aspects of these different systems are important in coming up with this final rank, how can we tease those out and come up with one system that reflects those important aspects?

   In having taught these problems before, I have often, personally, had a problem interchanging the words rate and rank. That's incredibly problematic for the students. And, so I had worked very had to try to be clear about that and to try to support students' understandings about the notion of rate. I was very pleased today to hear the students talking about these correctly. I think there was only one instance when I corrected someone that said rate when it should have been rank. But they seem to have a pretty good understanding of these different measures. In particular, when I had given them the Gotham City, Metropolis, and Pleasantville data, and Meagan had said, "They're violent crime rate is 1,000. That means you have pretty good probability of being killed because that is 1,000 out of 100,000." So, she was able to take that number and relate it back to what it meant as a rate, which I thought was a very powerful understanding.

   When I was planning for today, I was really struggling with a way to create a problem situation for the students so that they would see the value in multiplying the total crime rate by a factor that would then increase it's impact on the value for that city. In thinking about this, the idea that emerged for me was to use extreme values. That is how the problem that I posed of Metropolis, Gotham City, and Pleasantville arose. By showing them the extreme values of 0 and 1000, the students were able to see that clearly Gotham City was a safer city, because there were no murders. Also in describing those rates, I talked in terms of death or murder and stealing candy bars, so I was even pushing it further to try to get at the notion of the extremes to see that this is much more important, the violent crime than the property crime. So when they saw the need for giving that more weight, then that offered me a transition into the original problems we had done. However, if you look at the data in those problems, it's not as clear or as clean what the factors should be when you multiply. So that offered me the opportunity to then talk about the sum or the value that we generate for the system and look at the proportion of that value that's attributed to the crime rate and the proportion that's attributed to the property rate.