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Using Writing To Connect With Our Mathematics Students

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For the last two semesters, I have been experimenting with short writing assignments that are intended to keep a line of communication open between me and my students. I call these short papers “minute papers.” Minute papers are written, short responses to one or more questions given to the students at the end of class. These papers are not a new idea, but I have found them very effective in developmental math classes.

EXAMPLE OF QUESTIONS AND TWO STUDENT RESPONSES

In a short paper, (1) explain what the main point of today’s class was, (2) describe at least one thing you found interesting and (3) ask at least one question about today’s lecture or activities.

EXAMPLE 1

1. Conversions
2. I guess it’s not really interesting, but when you gave us the answer to #3 on the quiz, I should have known that the vertical intercept was 4 and the x was 5. I didn’t even come close to that answer...oh well, maybe next time.

(The student did know the procedure; she made only a small computational error on the quiz.)

3. No question for now except one I don’t know if you can answer. Why do I have the feeling that I don’t know what I am doing, but I really do?

(I responded to this question. I think it is a common feeling among hard-working beginning algebra students. I wrote, “I often ask my students thought-provoking questions about the material we are covering. I believe that if we have a deep understanding of the concepts, the mechanics are easier--and make sense! The ‘whole picture’ takes longer to grasp, but even before you have the whole picture, the understanding that you are developing is helping.”)

EXAMPLE 2

1. The main point of today’s class was about radicals and squares.
2. I found some factoring ideas semi-interesting.
3. How do we know that 2^2 really equals 4?

(How could I not respond to this? I wrote, “There are certain mathematical statements that cannot be proven; they are just accepted as true. If you tweak the assumptions, you can get a mathematics that looks completely different but is in itself logically consistent. It’s questions like this (what’s true?) that makes mathematics interesting!”)

WHY MINUTE PAPERS?

I started using minute papers in my classes after a discussion with other math instructors about how to make our mathematics classes more “humane.” I was about to embark on a six-week, four day per week Intermediate Algebra class. My previous experience teaching such short courses was that within two weeks the students usually had a look of horror on their faces whenever I introduced a new topic, since they had not yet assimilated the previous material. I always felt a bit sadistic trying to teach so many topics in so little time. I wanted to do something different. The original intention of the minute papers was to create a forum for discussion. I believed that if the students took a few minutes to reflect on the material we had covered, they would be able to see the material as a whole and to see how it connected to material that we had studied previously. I didn’t want the students to feel as if the material in the course was a torrent of abstract, useless and disjointed ideas passing them by. If a student felt completely overwhelmed he could say so. I also used their responses to assess when I needed to spend more time on a topic and when I could go on. This was particularly effective in a course that met daily. The students’ questions also provided material for the next class.

HOW ARE THEY DONE?

I usually asked the same three questions: 1. What was the main point of today's class? 2. Describe at least one thing you found interesting, and 3. Ask at least one question about today's lecture or activities.

During a 16-week semester I also included periodic self-assessments. Again, I asked three questions: 1. Discuss your strengths as an algebra student, 2. Describe one topic that gave you difficulty at first but you have now mastered, and 3. Describe how you mastered this topic. I intentionally phrased these questions in the positive, although some students would write, "I have no strengths as an algebra student." Before the final exam I would add a fourth question to the self-assessment that gave the students an opportunity to discuss a topic that was still giving them difficulty.

I read and commented on these papers every night and returned them to the students at the next class meeting. I think the exercise would be pointless if I didn't return these papers promptly. Many students had a hard time asking questions. If a student asked no question, I would suggest something outlandish until they felt comfortable asking questions. Often I was asked questions about topics I knew nothing about such as baseball or which pickup truck is superior, but eventually all students asked questions and the vast majority of the questions had to do with mathematics.

OUTCOMES

Students claimed they benefited from reviewing the material at the end of class. (Examples to follow.) Students who were timid about asking questions during class time used the minute papers to ask questions that might otherwise not be asked. The minute papers were an excellent assessment tool for me because I had daily feedback from my students on what was taking place in the classroom. This alone was enough to make reading these papers worthwhile.

There were several unexpected and wonderful outcomes as well. I usually have a difficult time sorting out the students in my classes, especially learning names. But, after several minute papers, I felt I knew my students better than I had in previous terms; I knew their fears, their interests and their sense of humor, which is far better than eventually learning their

names and getting to know only the students who approached me outside class. My students and I were in dialog with each other throughout the term.

Non-native speakers took longer than other students did to complete their papers, and one student remarked at the end of the term that she dreaded having to write in English. But this same student sought me out the following semester and told me how much the minute papers had helped her writing. She was taking a history course and was required to write essays on exams. The minute papers had helped her get over her fear of expressing her ideas on demand and in writing.

The best part of reading these papers was being able to respond to the students' questions. The brighter students who rarely had questions about mechanics often asked questions about how the topics we were studying related to other disciplines. I had one student who often discussed how strange it was that mathematics described the natural world, and he asked in many ways whether or not the universe was indeed mathematical. (How often can we discuss these questions in an intermediate algebra class?) I often was asked why I taught mathematics and why I found it interesting. (My responses to these questions were significantly longer than the students' papers!) Not only did I get to know my students, but my students got to know me as well.

STUDENT FEEDBACK AND SUGGESTIONS

I have used minute papers for the last two terms. For the last minute paper of the term, I ask the students to tell me what they thought of the minute papers. By this time, my students feel comfortable with me, and I believe the responses to be honest and genuine. Here are a few examples:

- I think the minute papers were a good idea, because it allowed us to reflect on what we did in class, and I was able to ask questions about something that had happened earlier in class. Instead of making the whole class go back to it, it allowed me to get my answer on the following day.
- I thought the minute papers were cool. They were a chance to ask a question about anything and to keep us thinking until the end of class.
- I thought the minute papers were great. I have to say that I thought it was a pain, but it made me

consider all the points of the class for the day. Plus, it made me pay attention that much more because I knew you were going to ask what we talked about.

- It was a good way to gather my thoughts and review at the end of class what we had learned.
- The papers made me realize my strengths and weaknesses.
- I wish I highlighted in my notes what was confusing about the lecture. It would have been more useful, and I would have been able to refer to specific problems.
- It also gave people a chance to ask obscure questions that were inappropriate at that time in class.
- I've taken math classes before where the instructor and I exchanged ideas for approximately two minutes. I definitely liked them.
- I didn't always have particular things to ask or say, but it was good to know there was a line of communication there.
- I think it encourages students to communicate with their teachers and forces them to think of information they may have been pondering...
- I was surprised by the time you took out of your own life to answer our problems.
- I think the minute papers are great! It's great to see you take the time to read about how we feel or any questions we may have. I must say I don't like to take the time to write them, but I am glad that I did.
- In my opinion, I didn't like minute papers because of the English, but on the other hand, I liked it because I could communicate with you easily. Especially when I had a lot of frustration, the paper helped a lot to express my feelings and idea.
- I especially appreciated the feedback from you.
- They made me ask questions I probably wouldn't have thought of.
- I titled things better in my notes because of it, which helped when studying for the final.
- Now I can understand how algebra can be applied to real world situations. Throughout the years of learning math, the teachers were asked the question "When are we going to use this?" They never directly answered the question, which I think held back the students on how math works. Either the

teacher didn't know or didn't want to go into it.

- There were a few other instructors I wanted to hand one in to.

On the other hand....

- I didn't really enjoy doing minute papers. I actually thought they were a waste of time. I thought that if I had any questions or concerns, I could have asked you rather than write them down. Maybe others liked them, but I can't say that I did.
- The minute papers were painful, like getting a root canal and then chewing on tinfoil kind of pain.

IDEAS FOR USING THESE PAPERS IN THE FUTURE

Students have made several good suggestions they believe will help improve minute papers.

Of course, students all want credit for these papers. I have intentionally not "graded" these papers so that the papers would not be a source of further stress. But, I have decided to include the students' work on the minute papers as part of a participation grade next semester.

Some students feel that doing minute papers every class period is too much. Yet, I found that the papers were most successful in the courses that met four days per week. I don't think the papers are as effective when a class meets only two days per week. I still intend to have students write every class period.

Students tire of the same questions. Many students have suggested varying the questions. Including the self-assessment and asking for feedback on a new text were my only attempts at varying the questions last semester. One student made a good suggestion this semester. She suggested that I ask students to discuss their understanding of a particular type of problem or one concept in a minute paper. In fact, I used to ask questions like these on take-home writing assignments all the time, but I have gotten away from it. I plan to experiment with questions like these in this new format next semester.