

Teaching Statement

Katherine Morrison

My teaching experiences thus far have greatly shaped my teaching style by enabling me to learn what methods allow me to best reach my students given my background and my personality: I have learned that I need to take on a number of different roles at different points in a course in order to best help my students succeed. I have found that I am most effective in communicating material with my students when I play the role of *facilitator*, where I allow them to work in small groups on carefully crafted problems as I move between groups to assist them. Once this group work is completed, I turn to being a *contextualizer*, helping the students tie together these problems so that they understand the big picture framework in which this material sits. For certain material, particularly within certain time constraints, I will return to the typical role of *lecturer* to provide students with fundamental definitions or examples. Finally, throughout every course I have taught, the role of *motivator* has been critical to my students' success, although in different courses this role has taken different forms. In the following, I will further describe the nature of each of these roles by way of some explicit examples. I will primarily focus on examples from a course for pre-service teachers and a college algebra course¹, where I was the instructor of record.

I first saw the value of the *facilitator* role when I taught Math 300: *Math Matters*, a math content course in the *Mathematics Semester* for pre-service teachers; this semester is intended to provide the students with an integrated experience of both the mathematical content and pedagogy needed to excel as an elementary math teacher, together with the practical experience of being mentored by a classroom teacher. This immersion semester provides an incredible opportunity to convince the pre-service teachers that there is still content to learn, and that such content can significantly impact the way they interact with their future students. In the Math Matters course, I do very little lecturing and instead structure the class around carefully designed activities that highlight some of the students' deficits in conceptual understanding and help them to construct that understanding for themselves. This class is primarily driven by group work, and is focused around activities designed to enable them to construct the reasoning behind the arithmetic properties they take for granted and the arithmetic procedures they have taken to memorizing. In this context, my role as facilitator is most valuable; I move between groups to ensure that they are understanding the different parts of an activity and are comfortable explaining their answers.

When I first taught College Algebra, Math 101, I treated it like a typical undergraduate course and played the role of lecturer almost exclusively. While I worked hard to explain where each concept came from during my lectures, I still found that the students were not particularly successful and never got a strong grasp on the material. After this experience, I was inspired by the format of the Math Matters course to try to find a modified format for College Algebra that would allow me to better engage these students and get them more hands-on experience with the material. Towards this end, I returned to utilizing the role of facilitator by integrating a number of activities into each class to break up the lecture. As an example of an activity I employed, when reviewing equations for circles and lines, I leveraged the fact that it was "International Talk Like a Pirate Day" to get them engaged in a treasure map activity building on these concepts. Specifically, they were asked to work in small groups to track down the treasure hidden by math-loving pirates who used equations of lines and then

¹ Please see the last page of my CV for a full list of courses I have taught and short descriptions of those courses.

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equations of circles centered at intersection points of these lines to keep track of where the treasure was hidden. While this activity may seem a bit contrived, it was highly successful at getting all the students engaged, and their hands-on experience of actually physically graphing everything on grid paper helped to reinforce the meaning of all the equations they were playing around with. This idea of using multiple representations of a topic, e.g. equations and visual representations that the students created themselves, was also inspired by my experience with Math Matters, and turned out to be an important modification to the way I taught College Algebra the second time.

After each class activity, I like to bring the class together as a whole to allow the groups to share their solutions and comment on each other's reasoning and explanations. Following this point, my role shifts again, turning now to that of *contextualizer*. This is the stage at which we must step back as a class and discuss what big lessons were learned, and how this activity fits into the broader mathematical landscape. For Math Matters, this often entails discussing how the activity revealed a misconception in the pre-service teachers' thinking on a particular topic or how the ideas from the activity might be used to justify a certain arithmetic property to their future students. For College Algebra, these discussions generally focus on how a particular topic relates to other topics they have seen thus far in addition to focusing on the contexts in which they might see the topic, real-world as well as purely mathematical.

In College Algebra, this role as contextualizer dovetails well with my role as *motivator*. I focused on trying to show the students applications of and connections between the material whenever possible, in order to increase their motivation to engage with the material. As an example, I had a number of students who were Fisheries and Wildlife majors, so I specifically sought out word problems relating to the growth of certain fish populations. As another application of exponential growth, they did an activity investigating which type of student loan plan would be most advantageous for them as consumers; this activity gave them the opportunity to genuinely appreciate the impact of different forms of compounding interest by forcing them to sit down and do actual calculations in these different contexts and determine which conditions would make each plan more desirable.

To motivate my Math Matters students, I have used somewhat different tactics. The pre-service teachers often come into the semester feeling a strong discomfort with and aversion to mathematics, and often believe that math simply consists of a number of disjoint procedures and rules to be memorized. As a result, they expect to teach math in a similar way, and so often do not see what remains for them to learn given that they typically already know how to carry out the standard procedures. Thus, I believe that my primary job in this course is to convince them that mathematics should always make sense, and that they should not just accept a procedural answer to a problem. To help the pre-service teachers feel like they have the ability to make sense of mathematics, I often reassure them that we will go at whatever pace is necessary in order to ensure that they actually feel comfortable with the concepts, and I have found that this reassurance helps motivate them to keep trying to master the material. In addition, I find it helpful to frequently remind the pre-service teachers of the value of deeply understanding the material as a tool to helping their future students see where these concepts come from and preventing a negative math experience for this next generation of students. I have found that the pre-service teachers are generally receptive to these ideas because they do genuinely want to be good teachers. However, they do still occasionally ask the inevitable question "Why do I need to know this?" While I find this question frustrating in theory, I sympathize with the sentiment that it should be possible to justify why we are studying a particular topic and why we are studying it in a particular way, and I appreciate the fact that since I am constantly pushing these students outside their comfort zone, there is bound to be some push-back from them. Thus, I am

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always willing to entertain these questions, and my experience with this subject area has equipped me to quickly and comfortably respond to the questions in a way that conveys to the students that I have thought carefully about the material they are learning and about how it will prepare them to be better teachers. I believe that I am highly successful at keeping my students motivated and engaged with this course largely because I do not write off their questions and am willing to provide them with thoughtful responses.

Finally, as I mentioned above, there are certain circumstances where I must play the role of *lecturer*. In Math Matters, I primarily used this role to introduce key definitions that would then be built on through various activities. In College Algebra, I had to play this role somewhat more often for the sake of time and efficiency of presentation. I frequently struggled with the packed syllabus for Math 101 and the fact that there was common online homework across all sections of the course, which meant that I could not afford to fall behind since it would hurt my students to miss a homework assignment. Despite this constant battle over a lack of time, I worked hard to limit the length of time that I lectured because I found that my students typically retained more and performed better on the common exams when I enabled them to work problems themselves while I restricted myself to the other roles I described. Thus while it took a significant amount of work to implement these modifications to my teaching style, I believe it was an incredibly valuable experience both for my students and for me.