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DEPARTMENT OF
MATHEMATICS

John McAlister - Teaching Statement

In teaching, and in teaching math in particular, I believe that the fundamental task of the instructor is to convince the students that they are capable of achieving understanding on their own. That is to say, empowerment is the most powerful tool in math education. This is especially important in developmental math and precalculus math at the college level. In my early career, I have been lucky enough to fill a variety of instructional roles. I started even before I entered graduate school, working as a tutor and recitation teaching assistant while I was an undergraduate. I spent time teaching both as a teaching assistant and as the instructor of record for several years during graduate school. I've also, more recently, had the opportunity to mentor an undergraduate research project in applied math. I have even had the privilege of working alongside faculty and staff to shape the way graduate teaching assistants are instructed on how to teach in undergraduate classrooms. Through each of these experiences, I have come to learn that developing great mathematicians is about empowerment, and this starts far before chalk meets the chalkboard.

In the classroom

In the classroom, I am not a very strict teacher as I believe it is my job to convince students that the work is worth doing, rather than forcing them to do the work. However, I do have one strict rule that I enforce: No one is allowed to use the phrase "*math person*." As someone who has always been called a "math person" and always believed himself to be a math person, I did not understand the impact of this phrase until my first time in a classroom as an instructor. During my time as an undergraduate at The Ohio State University, I led a trigonometry recitation every week for three classes of 30 students. During this first experience as an instructor, I saw how frequently my students would understand all the tools necessary to make a certain argument or solve a certain problem, but give up too early because they didn't believe that they could. When asking for help, my students would often say "I don't know where to start," which I knew to be clearly untrue. These students had the ability to do every step they needed to, but did not trust themselves to put the steps together. After a while of teaching this recitation I heard many students, when describing why they felt like they could not put the pieces together, say "I've just never been a math person" and it became clear to me that it was that exactly underlying belief that was preventing them from trusting themselves to try and put together the steps to solve a complex problem on their own.

Having had this realization, I made it a point to try to dispel the myth of the "math person" in each of the classes I taught. I continued on to teach developmental math in my last year of undergrad then I then when I started graduate school, I though college algebra (which is also a developmental math class) and basic calculus (which is called business calculus in other institutions). During these years, while I was a TA under a different instructor of record, my main tool for demonstrating this was simply being honest about the process of doing math. When students asked questions or answered questions incorrectly, I would try to make it clear that being wrong is a crucial part of math. I helped enforce the Idea that real math is an iterative process, one where every failed attempt to solve a problem tells us something new about the problem itself.

I continued to make this a priority when I first taught a class as the instructor of record. During my second and third years of graduate school, I taught a class called 'mathematical reasoning', which is a survey of different kinds of mathematics students wouldn't see in a typical high school curriculum, with an emphasis on the reasoning instead of the computation. I appreciated this class a great deal because it allows students to understand that math is not a list of algorithms to memorize, but it is a creative pursuit in solving problems. As the instructor of record, with the blessing of the course coordinator, I wrote my own lecture notes and was able to spend a lot of time talking about how mathematicians arrived at important results. Sometimes that looked like stepping through a simple proof with my students, other times it looked like honest conversations about how long it took for mathematicians to find answers to certain questions. I was also able to design my homework assignments to minimize the grade penalty for making a mistake in the pursuit of an honest solution. Throughout the whole class, the theme was clear: Math is not a linear pursuit; it takes twists and turns and

there are many dead ends. I think this is such an important point because it reminds students that there is no such thing as a "math person" who inherently knows how to put together a solution to a complex problem. There are only mathematicians who try many different ways to put a solution together until something works. In this way, I hope to empower students to understand not only that failure is an important part of the math process, but also that they are in good company when they try and fail. I find this reminder to be especially important for students, like many in the classes I taught, who do not intend do continue their math education. These students in particular can benefit from the knowledge that math, just like any other academic pursuit, is a matter of drafting and refining ideas iteratively. Feeling empowered to try and fail serves every student, not just math students.

Outside of the classroom

Empowering students to believe that they are capable of real mathematical reasoning and dispelling the myth of the "math person" continues outside of the classroom in things like tutoring and office hours. When I am teaching, I like to be exceedingly available through office hours and for one-on-one appointments because this is where a lot of the important personal growth happens for many students, whether they are aiming to become mathematicians looking for a deeper understanding of the content, or are averse to math and just trying to wade through their math requirement. I find that being available to my students makes them feel comfortable asking questions that they might otherwise feel embarrassed to ask, and when this happens, I always take it as an opportunity to demonstrate that there are no stupid questions in math.

These settings outside of the classroom are also important because it is where a lot of the self-doubt can be torn away. By prioritizing being respectful of my students and listening when they are struggling with a problem, I find that my students feel comfortable enough around me and their peers in these small group settings to describe their struggles with math more personally. Over my short teaching career, I have listened to many personal stories from students about their relationships with math education. Some describe past math classes full of shame or anger, some describe the pain of not seeing themselves represented among the mathematicians they learned about. Solving these types of problems is just as important for young mathematicians as solving exercises in a textbook. Just having space to talk about these very personal but very real struggles with mathematics allows students to recognize it as a real barrier. For this reason, I think that time spent outside the classroom in office hours and in tutoring is crucial for the empowerment of students.

Service to Teaching

There are also structural ways that students can feel empowered and, in the same way, there are structural ways to make students feel powerless. Serving on committees dedicated to mentorship and teaching is a way that I feel I can improve the structural support that students have and empower students further. I learned this after my first year as a teaching assistant at the University of Tennessee. During that first year, the campus was still recovering from the height of the COVID pandemic, and the adjustment back to in-person teaching was difficult for instructors and students alike. After the first year of in-person instruction after having been online for the entire 2020-2021 school year, neither the students nor the instructors felt like they had the support that they needed to succeed. In an effort to make things better, I got the opportunity to work with faculty and staff in the department and serve on the Graduate Teaching Advisory Committee for two years. In these two years, we put together a new system for instruction of lower division math and mentorship of graduate teachers that greatly improved the support available for students and instructors. We implemented new systems involving co-teaching for first-year graduate instructors and service opportunities for lecturers willing to mentor GTAs, and through these changes, graduate instructors felt empowered to teach and students felt more connected to the material.

The system we designed, like any system balancing all the demands of higher education, is not perfect, but my time on that committee showed me that the work of making students feel empowered and connected to the material is a huge effort that involves so many more people than just the instructors. I also got a better perspective for the kind of service that is required to keep a department running effectively and a better appreciation for the often thankless work that is put in.

Mentorship and Research

Much of my time in the classroom was spent with students who ultimately did not want to become professional mathematicians. In that setting, it is easy to see how empowerment can go so far to overcome past beliefs about not being a "math person." However, I find that this same concept holds true even in the vastly different setting of research mentorship. During my last two years at the University of Tennessee, I got the opportunity to mentor an undergraduate from the University of Pennsylvania in an applied math research project. Even in this setting, I maintain that the main role of the mentor is empowerment; any facts about math or computational advice I supply are strictly secondary. Through this research project, I gained some perspective on what empowerment looks like for a highly motivated student who is majoring in math as compared to a student trying to finish their math credit and leave math behind. In the undergraduate research setting, empowerment looks more like encouragement and a safety net. Instead of trying to convince the undergrad I work with that he can put together a solution, empowering him has been a matter of reassuring him that the method he is attempting will work, or letting him know that if a method fails, there are other things we can try. Knowing when to keep working on a particular method or when to pivot comes with practice and this opportunity has taught me how to leverage my experience in modeling research to help new researchers. This work as a research mentor has been one of the most rewarding experiences as an instructor. I find that, as a mentor, letting a student explore a research topic and attack it in their own way is so valuable for the development of a budding mathematician and an experience that is unique to the research setting.

Empowering a student to believe that they can be a successful mathematician is not an easy task. It involves a great deal of work and patience in every step of the process from administration to individual interactions. In each of these steps, I seek to be an effective instructor by allowing students as much freedom to explore problem-solving techniques as is reasonable for the setting. Through this respect and acknowledging that there is no such thing as a "math person" and that being wrong is an important step towards being right, I hope to empower my students to know that they are able to become great mathematicians.

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