

UTA Reflection
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One of the best things that I have taken from the UTA program is how far I have come in terms of my mathematical ability. Sometimes when someone came into the tutoring room, I knew exactly how to help them with what they were having trouble with. Other times, students came in with problems from concepts I didn't quite remember and I was unable to help them as quickly as I did with other students. At first, I felt like an awful tutor, but the more I worked through different problems, I realized that already having learned this once, I could relearn it, and do so easier than the first time, because this time, all I had to do was fill in the gaps of my memory. I had the advantage of having perspective on what was being taught, what it was leading to, and what the most important concepts to grasp were. For example, when calculating a derivative directly from the definition, it was not a process that students would be doing for the rest of their mathematical career. Rather, they were supposed to understand what a derivative was and gain further familiarity with limits.

It also helped that while tutoring students, I was taking upper-level classes that I had been working towards. As I was proving why a constant multiple of a Riemann integrable function was also Riemann integrable in real analysis, I was learning about Newton and Leibniz in history of math, and calculating the integral of a function with numerical integration. And then when a student came in needing help with a multivariable integral, I thought about all the different facets of integral calculus, even though I only spoke to the student about one. Most of the students said that they were in a STEM field, and I knew they would be seeing integrals again, and hopefully they would think that its many uses were as interesting as I did. Although I couldn't convey all this to them, I tried my best to get my excitement and understanding of integrals across.

I absolutely feel that my confidence in my mathematical ability has improved in part due to the UTA program. It helped me "look back" on how far I'd come from the days where I didn't understand the point of an infinite series. However, my progress meant that it was also hard to look back and remember what it was like *not* to know something. After working with matrices for so long, I kind of forgot what they "did." Words like determinant and null space had lost their strict meaning in my mind, they were just something that I used to get to another step in a larger problem. I had to re-understand exactly what I was doing in these operations in order to teach it with others - I could not just give a hand wave-y explanation.

However, I know that this improved my communication skills. I know from my experiences in research that oftentimes, you will work with people at different skill levels and understandings of different subjects. Sometimes you will be able to teach others, while sometimes others will teach you, and it is important to know how to communicate a mathematical concept correctly and efficiently. No one wants to spend all day listening to a hamfisted explanation of math, and striking the balance between giving too much detail and not enough is crucial. While it's hard to remember what it's like not to know something, it's just

as hard to then reteach that concept to someone else and not talk down to them, nor talk too high above their level. You want to encourage and challenge them, even though in the tutoring room sometimes students just want the answers.

Doing tutoring online also improved my communication skills, because I wasn't able to point to their paper or mine; I had to be very specific about what I was talking about. "When the equation is simplified..." - what equation? Where? How is it being simplified? However, not seeing their paper usually forced them to rewrite the problem on-screen and explain it to me as they did it, which meant that they were rethinking it too. Sometimes all the "help" I gave was asking them to explain to me how they solved the earlier problems, or show me their thought process, and after writing it out, they say where they went wrong. One of the nicest things that I learned from this experience was that sometimes we do know what we think we don't - it just takes a step back to realize it.