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UMKC Math 204

Mathematics for Teachers: Mathematical Immersion

I am teaching a 3 credit hour UMKC class titled as above, which I have envisioned in two parts, an "immersion" in the doing of mathematics (a vital, personal experience I think every teacher should have at least once), and an "immersion" in the culture of mathematics (how we see and enjoy the profession, how it sees itself, its history, and so on.)

The course is designed for middle school mathematics teacher majors, so the mathematical background is mostly at the College Algebra level to at most the Calculus I level. I have 15 students enrolled this Spring 2012.

For the "mathematics" part of the course I am using the Journal of Inquiry-Based Learning in Mathematics course "**Discovering Properties of Real Numbers & Functions: Rigor with Vigor**, by Anton Zettl, from the web site: http://www.jiblm.org/jiblm/ . I make copies for the students, a few pages at a time, so it does not cost them.

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Student Testimonials/Journal Entries

From Spring 2012

Student A

Last semester, when I enrolled for this class, I was a bit curious as to what we would learn in Math 204. The description was vague and referred to problem solving skills, developing reasoning skills, and gaining confidence in those skills. Before walking into class the first day, I felt pretty confident in my mathematical skills. Little did I know…
I walked away from the first week of Math 204 feeling like I never really knew how to do math. I knew how to plug numbers into specific formulas to get specific answers, but I never knew the "whys" of the problems. I never knew how to break the problem down and explain why, for example, -(-a) equals a. Almost a complete semester later, I can now explain why this is.

Even though this class is unique in the teaching style- we work on the problems together in class instead of listening to the instructor lecture or explain the problems- I have learned more in this class than any other mathematics class I have taken thus far. I believe this has to do with the fact that I own my work. When I complete a proof, either in class or at home on my own, I have a great sense of accomplishment. I feel like I have painted the best masterpiece! Sometimes, I want to frame the work since I took so much of my creativity to produce such a proof.

Another thing I have learned in this class is a different teaching style. In my classes, I not only learn the material from the professors, but I also watch their teaching style. I have been in classes where the teachers barely notice the students- if there were no students in the room, I think the lecture would be the exact same. I have also been in classes where the teacher interacts with the students, but still lectures "at" the students. The teaching style Dr. Delaware uses is very unique. He sits in the middle of the class and guides the class to the right answer, but the students must decide which paths to take. Every class is like putting more puzzle pieces together so that, by the end of the semester, we will have one complete beautiful picture. Dr. Delaware knows what the outcome is supposed to look like and simply guides

us there without telling us how to get there. Even though most classes I leave frustrated, I enjoy the class. I look forward to coming back and figuring out the next step. I look forward to working at home on the problems to see if I can get the next proof- or steps to start the next proof- by myself without the help of my classmates. And, I enjoy bouncing ideas back and forth with my classmates during our class time to come up with the proofs.

I hope to incorporate some of Dr. Delaware's teaching style into my classroom when I am teaching. I hope my students can feel the same level of accomplishments as I have felt in this class. And I hope to inspire my students to reach for more the way Dr. Delaware has inspired me.

Student B

There are many things about Math Immersion that startled me from the start, but as the weeks continued on I started to really like what was happening. I will say learning math from the very beginning was kind of hard. What really tripped me up was when we did our 1st theorem, but we were only able to use the three axioms that were in front of me. I personally thought it was outrageous for this kind of work to be presented to us as if we knew nothing from our past. As the weeks went on I slowly started to get interested in the theorems that we were proving because I always got frustrated with them, but it made me think more than I've ever had to before. So in a way it expanded my knowledge. The real kicker was when we proved Theorem 5 part ix and the professor made me break down the quadratic formula to the point where I had to justify each step! Usually I would've gotten upset but I LOVED IT! Just to see how a formula I adore so much came about and the root of how to really do it. With axioms like these, it makes me think on how I should teach my students the "FOIL" method. Math Immersion has opened my eyes to new ways to look at math problems.

Student C

January 10, 2012

I'm slightly nervous as to what this class is all about! I appreciate that we're starting from scratch and that he is treating us like we are all starting at a beginner's level but I haven't done a proof in 10 years! All I remember about them is that they were my least favorite thing to do. I hope I'm not alone in this! I'm not going to let myself get too nervous until after we go over the first assignment though. I may be making this more difficult than it really is.

January 11, 2012

Well, I just attempted to prove Theorem 1 on my own and while I know I did not format it or write it out in the correct way at all, I think I got the gist of it. I at least understand what Prof. Delaware wants us to see even if I didn't do it right. I think I'm actually quite anxious to get in class tomorrow and see how I did.

January 12, 2012

Well, I've come to the snap conclusion that the professor and I have the same thoughts on how math should be taught. I appreciate that, even with a PhD in math, he is not so caught up on fancy words and technical terms but the actual fundamentals and processes. That's what's important! Too often teachers are so particular about students writing out the 12 step process that by step 7, the student has forgotten what the purpose of problem is. That being said, I'm still not sure what the purpose of these proof are and how it relates to me teaching. I understand the "everyone has different methods to get the same answer" part, but beyond that I'm still not sure. Either way, I'm enjoying it so far. It's frustrating and patronizing but at least we're all in it together. If anything, I'm hoping this class expands my mind and helps me to think outside the box a little more.

January 16, 2012

I'm very frustrated. I'm attempting to write what Axiom 4 means to me but I feel like it's the exact same as Axiom 3 in different symbols. So far, I feel like everything is an obvious trick for us to figure out. These are the most simple of things but I have never felt more stupid. I don't think I have the patience for this.

January 18, 2012

I don't know if I'm ever going to get the hang of these proofs!! I go in with a completely open mind and a clear vision of what I'm trying to accomplish and then I just stare at the blank page like a lost child. I felt for a minute like I might have had a breakthrough and, holy crap did it feel good! Buuuuut, then I don't think it did anything. Damn.

Going over the proof, I was really frustrated in class that we spent so much time on the wrong proof instead of the right one. I completely understand why we did, but it would have been nice to get a better grasp on what *did* work instead of fumble through all the mistakes of the other one. By the time we were done, I basically forgot what it was we were trying to so in the first place! I think that for the beginning, we need to have a better understanding of how to do it the right way than stumble blindly in the dark.

January 19, 2012

HALLELUJAH!!! I actually did something right on my own!! I walked into class and someone else had the same equation for Proof 2 that I did and she needed the help in the middle just like I did as well!! Yaaaaaay!! Maybe I should start giving myself a little more credit.

January 30, 2012

What a successful weekend!! I think… Now, I'm definitely still going to get extremely frustrated with all these dang proofs but now my frustration will be directed at my lack of creative thinking. One semester cannot make up for 20 years of robotic, mathematical thinking but it sure as heck can help. At least I now truly understand what this class is all about and I can appreciate it so much more. I'm so glad I saved the Proof Without Words for after the essay. I applied my new thinking to it and I think it worked! It was like a light bulb went off when I looked at it and everything was so clear! At least I hope so. If it's wrong then I'll probably feel slightly defeated but at least I still have my new thinking. Math doesn't have to be so "mathy". It CAN be fun and creative and open-ended and I am reminded of why I chose to do this in the first place.

February 2, 2012

Aaaaaand I'm defeated again. I thought I finally did something on my own and I got it completely wrong. Awesome. Also, the first 30 min of class were the most frustrating so far. Seriously, I was in a great mood going in and then all I wanted to do was leave.

February 4, 2012

In class, it's frustrating, but it makes sense. We can work through these proofs together and I understand perfectly what we're doing and I even start to think I'm understanding the process better. Then I get home. And it's like I'm looking at a foreign language. End of story.

February 7, 2012

Ok, Thm 5 and all of its parts are not getting any easier. I really thought that after doing so many of the these proofs that they would get easier. But I have realized that this is because of my years of terrible math "training." I have always been taught that doing the same type of problem over and over makes the understanding deeper and therefore those same problems begin to get easier. This has been true in all of my math classes so far but this is different. I already figured out that the depth of my mathematical thinking is slim to none and therefore I am extremely thankful to be taking this class and I suppose I can't expect this to change drastically in just a couple months after BUT I don't feel like I'm making ANY progress at all!! Yes, I have been able to see patterns that connect a couple proofs, that others didn't see but that's just from all my previous math classes. I don't give this class any credit for that. I want SO much out of this class. That one girl with curly hair seems to be able to do all of these in about two glances. Why can't I expand my mind?!

February 14, 2012

I freeze on tests!! Again, I feel like I understand concepts just fine while we're all doing it together. I even feel like I contribute to the completion of the proof sometimes, but when I am by myself, I lose all confidence and I feel like I'm staring at Greek. The practice test today really showed how I still refuse to open my mind and do my own problem solving. I even caught myself going back through my notes in my head to see if I could just copy down what I saw. That's not thinking!! But that's all I've ever done! Even if I can't pass these quizzes or tests, I can at least still appreciate that I have come away with a brand new understanding of math. I always knew why I wanted to teach math (because it is quite obviously the most hated subject). I felt like somehow I could make it better but I now I have a much deeper understanding of how, and if NOTHING else, at least I have that to take with me. Although, getting anything less than A's sucks…

February 23, 2012

The midterm went about as well as the practice test. Actually, much worse. I've mastered the part of the proofs where I write down what I *want* to happen, but I have no idea how to make it so. Back to the beginning I go.

February 29, 2012

We worked on a Thm 5(x) and Thm 5(xi) and we would not have been able to Thm 5(xi) without doing the previous one or any of the other before that! I solved it based off a pattern that I saw from the one before. I connected the pattern and plugged in the correct variables and ta-daaa, a proof!! But it would not have been accomplished in any sort of timely fashion if we had to start every proof like it was the very first one we did. The more we do, the more practice we get, the more patterns and trials and errors we see and we begin to get better at it. Seeing these patterns and knowing how to apply previous knowledge is a huge part of math. There needs to be some sort of structure and some sort of progression and it was so lovely to actually see why in class today.

March 15, 2012

More theorems and proofs. Nothing much new to report. I was sick for a day and couldn't make it to class, which really stresses me out! I hate not being there to see how we come up with a proof! I can always get the notes from someone later or look at the picture in the email, but it's not the same as actually being in the class, working hard to figure it out. I always learn the process better when I am actually a part of it. I know this has something to do with the different learning techniques but it always baffles my mind that not *everyone* is this way! I can easily read through something and figure it out for myself, but it sticks so much better and remains more solid in my brain when I am actually apart of the learning process. Even though I don't feel like I am making much progress when it comes to figuring out these proofs on my own, I always notice when I recognize a pattern or a technique that we have used before. It's like a little checkmark in my head that reminds me that I really am learning something, no matter how helpless I feel in class. I'm really glad he is making everyone teach a different proof because that way I can double check all of the work I have done and catch up on the things I have missed. Plus, it will be interesting to see what I remember from doing these proofs and what seems brand new all over again.

April 3, 2012

Today was a great class!! First, I rather enjoyed the teaching of the theorems from other students. It was great to reinforce what we have done so far. It was also very helpful to already know what the end result was and then go back and look in depth at the process. More things made a lot more sense that way since I didn't have to waste time figuring out how we got from one part to the next. Also, it was fun to explain one to the class. Instantly after I was done, and after watching a few others, I already knew what I would have changed about my presentation. Also, it was pretty cool that Dr. Delaware told me he told my next math professor that they need to get me to be a math major. What a great boost of confidence, especially when my other math professor [at a different college] couldn't be more discouraging! Also since I don't feel particularly smart when it comes to proofs it was nice to know he doesn't think I'm hopeless. It was just a nice way to start my day and a nice example of what a teacher should be like. (And no, I'm not trying to suck up to you since I know you'll be reading these! I told everyone I knew you said that to me).

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