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# Lessons from Human Experience: Teaching a Humanities Course Made Me a Better Math Teacher

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**Synopsis**

As a professor at a Liberal Arts college, I recently taught a General Education course called Human Experience. Far from my normal experiences in the mathematics classroom, in Human Experience I was tasked with teaching topics from the humanities, including art, philosophy, history, and political science. Teaching this course was challenging, but it was also transformative. Teaching a course so far from my background gave me the opportunity to experiment with different pedagogical techniques and to reflect on how I set up my math classes. I learned many lessons that I have brought back to my math classes — lessons that have impacted how I set up my classroom, the assignments that I design, and the topics and content that I cover.

## 1. Introduction

As Huston writes in the introduction to her book *Teaching What You Don't Know*, the potential disadvantages of teaching a class outside your area of expertise include being outsmarted by your students, being asked a question that you can't answer, extra time spent preparing for class, and the possibility of explaining a difficult concept poorly or even incorrectly [6]. As a mathematician, I expected all of these to occur when I stepped outside of my discipline to teach a General Education class called Human Experience. What I did not expect was the transformation I would experience as a teacher and the many lessons that I would learn and carry back into my mathematics classes. In what follows, I describe some of these lessons, focusing on concrete changes that I have made in my mathematics courses.

The experience of teaching outside of my discipline has made me a more flexible teacher by broadening the types of activities and assignments that I am capable of designing. It has also made me a more empathetic teacher, by reminding me of the hard work our students are doing and some of the frustrations and obstacles they face when trying to learn new material.

## 2. Set Up

I work at a small Liberal Arts college where each first-year student is required to take a General Education course called Human Experience. Although this course is multidisciplinary, the disciplines represented are largely disciplines in the humanities: topics include art, philosophy, history, political science, and so on. This course serves as an introduction to the Liberal Arts. Its focus is to explore how people, across cultures and centuries, have made sense of the world and come to terms with big questions like the balance between freedom and duty.

When I accepted my position, I knew that I would be required to teach Human Experience. I was excited about this opportunity to step outside of my comfort zone and work with colleagues from across campus. While teaching the course, I ran into challenges, of course. Unlike the mathematics courses that I am used to teaching, Human Experience is a course based on reading assignments and class discussions. In teaching it, I was called on to motivate students, craft and evaluate writing assignments, and lead in-class discussions, all while learning the material myself. I relied on the experience and expertise of my colleagues to make it successfully through the course. All the faculty teaching the course met weekly to discuss the lessons for that week, share ideas for discussion questions and activities, and discuss how all of these different readings fit together. These meetings were hugely helpful for me. Looking back on teaching a course so far from my area of expertise, but with the support of my colleagues, I find that the experience was truly transformative.

## 3. Lessons Learned

Teaching Human Experience gave me valuable experience that has translated well into my math classes and has made me a better math teacher. Some of these are obvious: facilitating classroom discussions has made me better at listening and responding to student questions during mathematics classes. Some are less obvious and more nuanced. Below, I expand on how I have

brought my experiences teaching Human Experience into my math classes, emphasizing concrete changes that I have made. I focus on three big categories: the importance of making lessons relevant; the challenges and rewards of using a wide variety of assignments and assessments; and the observation that, when thinking about content, less is more.

### *3.1. Make Lessons Relevant*

One of the lessons that I learned is the power and energy that comes from connecting lessons in the classroom to the big issues of our time. Before teaching Human Experience, I thought that using application problems from physics or from marine science was enough to cement my students' understanding and to demonstrate the relevance of what they were learning. But for students who aren't majoring in physics, these examples weren't motivating. Instead, now I try to include applications and examples from topics that are relevant to everyone's experiences outside the classroom. I include topics from climate change and sustainability, examples modelling the spread of the COVID pandemic, data and case studies to look at racism in America or about voting rights. I have introduced these examples in classes from Calculus to Topology.

In fact, I've gone beyond bringing these topics into existing classes and started to design classes that focus exclusively on what math can tell us about these big issues. I have designed and taught a course called Mathematics for Sustainability. Looking forward I am hoping to design more classes to focus on these topics: a Mathematics for Social Justice course, focusing on topics from social justice and using mathematics to deepen our understanding of social injustice, and a Data Justice course, looking at the connections between Big Data, the algorithms that are used, and how they are working to reproduce inequalities.

Before, I would never have thought that it was my responsibility as a mathematics instructor to teach students how to use mathematical tools to address these types of topics, but now that is one of my primary goals. As Frankenstein writes, "Education is never neutral ... A trivial application like totaling a grocery bill carries the non-neutral message that paying for food is natural. Even traditional math courses which provide no real life [sic] data carry the hidden message that learning math has nothing to do with learning to understand and control the world" [4, page 78]. Now I am much more deliberate in recognizing the messages that I am sending in my classes,

and really drawing connections between the tools we are learning in class and how students can use them to make sense of the broader world. I still use some of the old examples from Physics, but when choosing between a related rates problem on a ladder falling down a wall or one about sea level change, I choose the one on sea level change [7].

It has taken a lot of effort to find these real-life examples to bring into my math classes. Another lesson that I learned from Human Experience has helped to keep me motivated. Unsurprisingly, since it is a course introducing first-year students to the Liberal Arts, Human Experience focused on building lifelong learners. Between research and a love of nonfiction books, I see myself as a model of a lifelong learner. But teaching a topic outside of mathematics made me realize that my role as a learner doesn't need to be separate from my role as a teacher. It is okay to learn parts of a topic as I am teaching it. Put another way, I don't have to be an expert in every topic that I teach. This realization has made me see the freedom I have in designing my classes, the opportunities for me to learn more as I design classes, and the confidence to teach classes even when I don't know all the answers. Before designing the course Math for Sustainability, I didn't know very much about Sustainability. But as I looked through resources to put together a class, I learned and developed a much better understanding of sustainability built from a mathematical perspective.

### *3.2. Different Ways to Assess Learning*

When teaching Human Experience, I had the wonderful resource that was all of my colleagues, their experience, and their suggestions. We met weekly to share ideas and lesson plans. Their enthusiasm and creativity really pushed me to try activities outside of my comfort zone.

The default set up for Human Experience was discussion, rather than lecture, so I borrowed discussion questions and listened carefully to suggestions for how to facilitate discussions. Over the year, I became much more comfortable leading a class discussion and predicting student responses — and handling it when students responded in unexpected ways. I also tried other types of activities to support our discussion: there were writing assignments, close reading assignments, debates, dramatic performances, and so on. There were types of assignments I never experienced as a student, but I was borrowing and creating now. I also became more comfortable grading all of these different assignments. I gained a newfound appreciation of rubrics.

I learned that all of these different activities were useful in assessing students' understanding, and that students liked being able to showcase their understanding in different ways because it let them play to their strengths.

Adapting this to my math classes, my comfort facilitating classroom discussion has allowed me to shift my opening day activities. In the past, I have opened classes by going over classroom expectations and then having students introduce themselves — names, pronouns, hometowns, etc. I still start with introductions, but now we follow that with a discussion of classroom culture. In particular, we discuss some negative characteristics that might appear in a mathematics classroom, such as perfectionism and valuing quantity over quality. The idea is inspired by the work of Gutiérrez on rehumanizing mathematics [5] and focuses on characteristics described by Okun in [8]. I give students an opportunity to share their experiences with these negative parts of classroom culture, and then we discuss ways that we can address or mitigate them during the semester. I have found students to be very eager to share their experiences, and that this discussion makes students much more comfortable participating in class and coming to office hours.

My experience planning and evaluating other types of in-class activities also translates well. One of my favorite activities is a jigsaw activity, where each student becomes an expert in one part of the material and then they share their expertise in a small group. In Human Experience, I used this to make long or dense readings more approachable. In Calculus I, I have used this to help review differentiation rules. Each student is assigned one differentiation exercise that requires combining rules. They prepare and then take turns presenting their work in a small group. Students like this type of group work because it is structured — each student has well-defined responsibilities. Students are motivated to prepare for their presentation but not too overwhelmed because they will be presenting to a small group.

I have also started using reading assignments. In Human Experience, I learned that students can learn a lot on their own if they have quality readings to guide them. In mathematics classes, I use reading assignments to give students a broader or deeper understanding of the material, because I want them to think of mathematics as more than algorithms and computations. I've started assigning readings and podcasts on the history of mathematics [3], readings to help students build better cognitive models [1], and readings to show students the beauty of mathematics [9].

These reading assignments give students a break from computations and help them to develop an appreciation of mathematics as a field — a field that is developed and studied by real people.

After teaching Human Experience, I came to view the assignments in my mathematics classes as very limited. After all, whether it was on homework, quizzes, or tests, all of the questions came down to doing a computation, remembering a definition, reading information from a graph ... It was very predictable, and there was very little room for students to create their own content or reflect on their learning. From Human Experience, though, I have brought a wealth of other ideas for assignments that I can use. Now I include student presentations, written reflections on problem solving, and even offer an alternative review project instead of in-class exams, where students design their own unit test, writing questions about the topics that they believe are most important. I have even assigned essays in some of my mathematics classes. In Math for Sustainability, for example, I had students write a research paper on a topic of their choice and the mathematical tools used by current researchers studying that topic. Having a variety of assessments also gives me a much clearer picture of what students understand and what they are getting out of the class. And, despite fears that students would revolt about being asked to write an essay in a math class, I've also found that students appreciate these assignments and the opportunity to create a product that is their own.

Previously, in particular, I was undervaluing the importance of reflection and metacognition in the learning process. Using a wide variety of assignments give students more ways to connect to the material, and more opportunity to reflect on their learning. As Bremsner writes in [2], "This is an illustration of the strength of active learning environments. We learn mathematics by being in conversation with others. I wanted students to write up clear solutions as well as reflect on their learning not because I wanted to grade those assignments (though they are much more interesting than a standard midterm exam), but because I know that those activities support long-term retention of the concepts in the course." These opportunities for conversation and reflection were not present in my math classes before Human Experience.

### *3.3. Give Students Time to Digest*

One final lesson that I take from my experience teaching Human Experience is something of an anti-lesson. In Human Experience, the students were inundated with reading. My colleagues wanted them to read deeply, but assigned hundreds of pages each week, supplemented with articles or podcasts to be read and discussed in our three hours of weekly class meetings. Maybe I felt the pressure of this reading more acutely than my peers because, as a mathematician, I am used to reading slowly, sometimes laboring over each symbol. In fact, this outside perspective is identified by Huston in [6] as one of the strengths of instructors teaching outside their area of expertise: teaching a subject as a novice rather than an expert makes it easier to judge how long it will take students to learn the material and enables you to better judge how much content can be covered.

What I take away from this experience is an understanding that less is sometimes more. I would prefer for my students to read shorter passages and better understand them, than for them to scan many books and not remember any of what they read. I would prefer to be able to talk about the readings in class, rather than to spend the whole time digesting supplemental material and leave no time for digesting the original reading.

In mathematics, this lesson translates well: I would prefer to cover fewer topics and leave room for students to practice those topics and really build an understanding. I prefer to assign fewer homework problems so that students really have time to attempt those problems. Slower and deeper is way to build lasting understanding. I am tempted immediately to point out the limitations here: after all, if you're teaching Calculus I, you have to prepare your students for what they will see in Calculus II. But I want to limit the focus of Calculus I to give my students a chance to actually remember what they have learned when they get to Calculus II. It is certainly a balance, but when I find myself rushing to cover a particular example or topic, I step back and remind myself that "covering" a topic is not the same as teaching a topic: lecturing on the example doesn't mean students will remember it. If I hadn't been pushed into trying to keep up with the demanding pace of Human Experience, I might never have reflected on how demanding the pace of my mathematics classes is for students who don't have my expertise.

## 4. Conclusion

I have outlined some of the major lessons that I learned from my experience teaching a humanities course and reflected on concrete ways that this experience has changed how I teach my mathematics classes. A common theme that connects these changes is a move to student-centered, active learning. This shift is common among teachers who teach a class outside of their area of expertise. In her book *Teaching What You Don't Know*, Huston points out that teaching a subject in which you are a novice requires you to move away from viewing the role of a teacher as a dispenser of knowledge. Novices are forced to move away from a "teaching as telling" model of teaching, since they have little to tell. Instead, novices must move to a more active, collaborative model of teaching as "creating a learning environment" [6]. It is undeniable that this shift in my view of teaching, and my role as a teacher, has made me a better teacher. Teaching a course so far from my expertise, so different from any of the classes I took as a student, was a very effective catalyst in creating change and providing the opportunity to reflect on my teaching.

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