Teaching Statement
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The benefits of an education outside of a classroom can be obvious for certain areas of academia: an English major will graduate with improved reading and writing skills; a history major will leave school with an improved sense of government, politics, and the world around her or him. Mathematics is a field that is equally applicable, but the question “when will I use this?” comes up so frequently because people do not use the mathematics they have learned when the opportunity arrives. I have met people who could not calculate what grade they would need on a final to get a B in a class and people who could not account for their own finances. The issue was not whether they knew how to set up or solve the problem; the issue in each case was that they did not even try to use mathematics. When I teach, the main goal of class is to help the students become “math literate” – that is for them to have the ability to use the tools presented in the curriculum spontaneously outside of the classroom setting.

How I attempt to achieve this goal depends on the level of the course I am teaching. One of the main tools I use is to flavor the examples I give in class. Virtually every problem presented can become a word problem, and each word problem shows the students a new setting where mathematics is applicable. I try to use settings that the students will appreciate: for remedial and appreciation courses with students from the humanities departments I use problems from everyday-life settings and for calculus courses with engineering and science majors I try to draw problems from their respective majors. Examples in calculus and appreciation courses will include pictures and diagrams to solidify the outside context in their minds. If I can find a real-life example, I will make a point of using it – with the same numbers and names and all. For advanced courses I would block out time to illustrate how a concept is used in my own research. Ironically, other than when I substitute-taught for my advisor, the only time I have presented work from my own research was to the lowest level class I have taught; when I introduced matrices to algebra 2 students at a gifted-and-talented summer camp of middle school students, I showed them how I used adjacency matrices in my undergraduate research. At all levels, the students respond to these examples with energy and enthusiasm. One student in an appreciation course even approached me after class to tell me how my lessons on game theory had clarified and enhanced concepts in her sociology class.

Students are more likely to use mathematics spontaneously if they already use it regularly; the students who become the most surprised at the breadth of mathematics’ usefulness tend to be those with a background in humanities. In appreciation courses, beyond the assignments and examples, even the curriculum is shaped for them to associate lessons with settings outside any classroom. In the past, students have worked on projects where they must research historical mathematicians or how mathematics is used in various settings. These projects usually tie into their personal interests (e.g., a project on acoustics for a jazz performance major) to enhance the connection between mathematics and their daily lives. When I taught “Math for Liberal Arts 2” at the University of Florida, I changed the curriculum to handle the “Verizon Cents Scandal,”
which had gone viral on the web. At the time Verizon had charged several customers one hundred times what they stated because of an error with units; the students read about the scandal and learned a few lessons on units.

But having the students see problems that tie into life outside the classroom is not sufficient; the students need an attitude of “I can identify this problem and solve it too.” Many students want to repeat steps taught to them in a formulaic way, and getting them out of this comfort zone is critical to getting them to realize the variety of problems that they are capable of solving. When students are faced with bonus problems and extra credit assignments, they intuitively understand that these problems will require creativity and ingenuity. I frequently use those settings as a way to draw out their critical thinking and their ability to apply lessons to a wider range of problems, while maintaining a standard set of questions they can feel comfortable answering so that their math anxiety does not grow. Outside of tests, I supplement lecture with worksheets to be done in groups; in those worksheets I sprinkle in harder questions at random places. The harder questions disrupt their rhythm, but that is exactly what I want – the students out of their comfort zone. When students correctly answer an above-and-beyond question, they feel more confident about their ability to answer unprepared problems. This confidence can change a student’s entire outlook on a field and their willingness to use it.

The goal of having students become “math literate” encompasses several ideas. The students need to overcome math anxiety, be able to transition and communicate from real world ideas to mathematical concepts and back, and then solve the problem. I encourage this by giving students problems with diverse difficulties and solutions, describing problems in targeted settings, and providing examples and projects that focus them on the world outside the classroom even when we are covering basic mathematical ideas.