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Teaching Statement

When I first started teaching, I modeled my courses after my own experiences as a student, drawing on the aspects I found most effective while trying to avoid the ones I found actively unhelpful. I worked to hone my skills as a lecturer and made significant progress in emulating the professors who had the biggest impact on my education. However, to my bewilderment, student outcomes changed remarkably little over the years. Improving these measures would require more modern pedagogical techniques that provide better motivation, more connection with my students, and a more inclusive and equitable classroom environment than passive lecture alone can provide.

Having only experienced courses centered around lecture, I sought guidance by applying to the Mathematical Association of America's Project NExT (**N**ew **Ex**periences in **T**eaching). As a fellow, I have attended workshops to effectively implement active learning and inquiry-based learning techniques in my courses. These strategies engage students, improve student performance, and provide opportunities for students to collaborate with their peers in a way that develops the critically important problem-solving and communication skills necessary to effectively utilize the material beyond the confines of the classroom. While the literature confirms this observation for all students [FEM+14], there is evidence to suggest that students from historically underrepresented groups in STEM fields reap these rewards at disproportionately high rates. Indeed, active learning has proven an effective tool in closing the achievement gap between genders in physics [LCM06], improving student outcomes for economically and educationally disadvantaged students in biology [HHRLPF11], and increased retention of female students in mathematics [KL14]. As a result, I have made it a priority during my time at ULM to structure my courses to be active in an effort to promote an inclusive and equitable learning environment for my students.

The first time I used these principles to build a course from scratch was the History of Mathematics course I offered for the mathematics education concentration in Fall 2022. The course traces the development of mathematics from pre-Hellenic empiricism to the material axiomatics of the Greeks and the eventual formalization of the modern axiomatic treatment, which many students had never considered as relevant to their education or their career trajectory. However, as a direct result of the discussions facilitated in this course, the students found a broader context in which to understand their other upper-division courses. This sentiment shines through in the following comment from student evaluations

> "This class was very helpful for getting a better overall view of mathematics, helped me understand better why we do things certain ways, and was very helpful for reviewing things from 2040/3040 [Foundations of Mathematics / Introduction to Analysis and Algebra]. It was a great class and semester - I'm glad it was offered."

Consequently, these future teachers will begin their careers with a deep enough appreciation for and a broad enough understanding of mathematics to inspire future generations of STEM students.

To complement my active classrooms, I utilize a Mastery Based Grading (MBG) scheme to accommodate the varied backgrounds and pacing needs of my students. Rather than a point system with partial credit, MBG forces students to display full mastery of the objectives on in-class assessments in order to receive credit. While the expectations of student performance are increased on individual assessments, students are provided multiple opportunities to demonstrate their mastery of the material throughout the semester. This iterative process affords the students relief from grade pressures so they can more readily focus on learning the material, rather than how to string together enough partial credit to pass the course, as evidenced by the following student evaluation comment

> "I love the mastery system. I wish more classes were like that. It took some pressure off of me to not get all of them right if I didn't have time to study as much or did not understand a topic as much as I thought I did. I also like that your grade can only go up. Once you make an M, you can't lose it." (Student, Calculus III, Fall 2022)

For the instructor, this grading scheme provides a more accurate measure of each student's content knowledge at the end of the course. Increased flexibility in when students can demonstrate mastery helps to mitigate grades that under-represent their knowledge, while the lack of partial credit ensures that students won't earn a grade that over-represents their knowledge. Indeed, while a weighted average grading (WAG) scheme and an MBG scheme produce nearly identical grade distributions, the students in each grade category from the MBG courses display a more complete understanding of the material than their counterparts in the WAG courses.

Beyond the classroom, I support student engagement in mathematics by supervising research projects through the Emerging Scholars program at ULM. By designing my courses around collaboration and guided inquiry, the students in my courses learn to engage with mathematics in the same ways working mathematicians do. Reinforcing these research habits of mind in my students provides a natural pathway to recruit mathematics and computer science students from courses like Applied Linear Algebra and an opportunity to develop an undergraduate research community. These students engage with accessible projects from areas like number theory and knot theory that provide them the opportunity to work on novel problems and a true research experience.

As an instructor, I structure my courses around the observation that mathematics should be done collectively to create an inclusive and responsive classroom environment that both challenges and engages my students. I keep my courses as conversational as possible, guiding the development of the material by providing the framework of necessary definitions and techniques, while leading the class to collaboratively make connections beyond purely mechanical or algorithmic manipulations through discussions, group work, presentations, and activities. This not only encourages students to be active participants in the learning process, but builds the intuition necessary to utilize the material beyond the confines of the course-work and molds them into independent learners capable of critically assessing the mathematics they and their peers produce.

References

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