

What is the first job in planning a course or lecture? While many think their first job is to decide what needs to be said, I believe we must first identify our audience. I have taught students at Nicholls State University, Louisiana State University, and Massachusetts Institute of Technology, and I have seen how students from all backgrounds can succeed. By focusing on my students, I build a course that is appropriate for them. I engage students with the use of active learning strategies and use examples to encourage higher order thinking. I reassure students with my personal experience that often hard work trumps talent in determining success in mathematical study. Moreover, I make choices in my teaching to minimize the impact of issues like stereotype threat on students.

Active Learning Strategies How do I ensure that students obtain the intended learning outcomes in a course? How do I know that students are understanding the discussion? I offer a laid-back environment in which students feel comfortable speaking up and participating. I openly admit when I find a mathematical topic to be challenging, while conveying that we can succeed together. Breaking up class time improves students' focus [3]. Furthermore, it gives me the opportunity to assess students' learning. Based on feedback from students, I can modify my content or delivery to better accommodate students. Here are some strategies I've incorporated into my classes:

- I learn my students' names and refer to them by name.
- Each class begins with time designated for homework discussions and questions about previous material.
- I have my students break into small groups to work through an exercise. By discussing the problem with peers, students must articulate their understanding and clarify any confusing issues from the lesson.
- I brainstorm problem solving techniques with students, allowing them to see through examples how a solution emerges.

Research indicates that active learning strategies improve attention and help students retain information. By analyzing 642 studies in university STEM courses, [2] showed the average failure rate decreased from 34% to 22% when active learning strategies were employed.

An Environment that Promotes Learning Understanding the mathematical background of the student is extremely important, not to anticipate who will succeed, but to ensure that most succeed. In a classic experiment [1], Chase and Simon investigated the performance of three groups on a certain chess-related task. The three groups consisted of novice, mediocre, and expert chess players. Initially, the experts outperformed the other two groups at recalling the placement of chess pieces. However, after about 6 or 7 trials, the three groups converged and were doing equally well. The underprepared can catch up to those who start with an advantage. My belief in this has shaped my interactions with students and the classroom atmosphere I offer.

During my first semester as a graduate student, a professor, anticipating the variety of backgrounds of first year graduate students at Louisiana State University—decided to cover *everything*, but to go through introductory material quickly. I started off behind. Unlike many of my peers, I hadn't been exposed to many of the introductory topics. I had to work hard, but because this professor started with the basics, I had a better chance of catching up to my peers. This little success gave me confidence when I branched out into other areas. Because of my experience, I truly believe that practice and determination are more strongly correlated with course improvement than prior knowledge. It took years of experience to offset

growing up with the idea that mathematics ability was innate. However, I hope to actively dispel this myth by encouraging discussions with students and reminding them of their progress at key points in the semester.

Moreover, student performance is not only dependent on ability or academic background. I will remind students that their self-perception or society's perception of them can affect their performance. Being a female in a male dominated field and coming from Louisiana to MIT, I often worried about how I was perceived. Did I say *y'all* too much? Instead of being able to fully focus my mental capabilities on the math at hand, I was distracted and overwhelmed. It definitely affected my performance. My experience as both teacher and student has motivated me to make my classroom a safe place for students from a variety of backgrounds, where the challenges are mathematical, and students feel confident taking risks in their problem solving strategies. Recently, my freshmen MIT students gave feedback about how much they appreciated that I did not talk over their heads and about how accessible I was.

Sometimes, a few inspiring words from a respected teacher can make a difference. Even though I enjoyed mathematics, majoring in math did not occur to me. My high school linear algebra instructor Mrs. Mangum suggested, "Of course, you will major in math!" All it took was the suggestion, and I knew it was the right course of action for me. Through my teaching, I aspire to be the same type of role model to my students and share with them my appreciation of mathematical reasoning and the joy of discovery.

References

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- [2] Freeman S, et al. (2014) Active learning increases student performance in science, engineering, and mathematics. *Proc. Natl. Acad. Sci. USA*, 10.1073/pnas.1319030111.
- [3] Hartley, J., and Davies, I., Note Taking: A Critical Review, *Programmed Learning and Educational Technology*, Vol. 15, 1978, pp. 207224.