

**Philosophy.** My goal as an instructor is to supply students with tools, demonstrate their usage, and then facilitate an exploratory environment. Learning is not a spell the instructor casts by way of a chalkboard. It is an iterative social process, and humans are social creatures. For this reason, I attempt to establish a very informal, conversational style to my lecturing and teaching. The “sage on the stage” method has its time and place, but largely my aim is to minimize the barrier to entry on classroom discourse and participation.

**Example.** As an example, I’ll briefly recount my lecture introducing the chain rule this semester to my Survey of Calculus<sup>1</sup> course. Class begins with a conceptual tee-up: biking is twice as fast as walking, and driving is four times as fast as biking.<sup>2</sup> What’s the speed of driving as compared to walking? I give the class ample time to consider it and wait for a student response. This introduces the notion of multiplicative behavior between nested relationships. Then the formal rule is stated, and a loose and extremely brief proof idea is outlined. The tools have been supplied. Next, two basic examples are worked in excruciating detail with student input requested for straightforward, concrete questions. The usage of the tools has been demonstrated. The next example is “Compute the derivative of  $\sqrt{1 + (x^2 + 1)^5}$ .” They are asked to take about five minutes to attempt the problem. After this, I asked them to consult with their neighbor, essentially running a think-pair-share. Discussion ensues as people aren’t altogether sure what happens when there is a second application of the chain rule. After wandering around and asking people their opinion, I ask if anyone would like to solve the question at the board. This semester, this tactic worked effectively, and a student presented a perfect solution.

**Summary.** The thrust of the above example is that quality and engagement is chosen over raw information throughput. Indeed, I sacrificed somewhere around twelve minutes of a fifty minute lecture on a single, fairly straightforward example. Had the student struggled to produce a solution at the board, it might have been as high as fifteen minutes. In theory, I could have covered four or five more examples in this time, but engagement was higher under this approach and active discovery was occurring. Having been a student myself, I can attest to the fact that it is extremely easy to sleep through four or five examples. Simply put, it doesn’t matter how many things you say or how well you say them if nobody is listening.

**Mindset.** I maintain that social interaction as a form of engagement is vital: not only are students energized by conversing with their neighbor, but writing and speaking forces one to crystallize their thoughts. That said, students can’t engage unless they feel free to be wrong without judgement or embarrassment. In particular for lower level courses, I make an active and explicit effort to dispense of the myth that people “just get” math. Often, I’ve found people will self-sort into one of two complementary categories: “math person” and “not math person”. I suspect the reader has encountered students with similar attitudes. One of my main concerns in

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<sup>1</sup>It would probably be titled “Business Calculus” at most institutions.

<sup>2</sup>This example is shamelessly ripped from the Chain Rule Wikipedia page, where it is attributed to George F. Simmons.

the classroom is to instill a growth mindset in my students and emphasize that math skills are a craft to be practiced, rather than an innate trait one has. Moreover, I make it clear to my students that the primary requirement for learning is time and repetition. My personal adage for this is “If you’re really clever, you understand something the second or third time you see it. Many people won’t really grasp a concept until the fourth or fifth time they see it. And if you’re me, it’s not until the sixth or seventh!”

**Conclusion.** The best instructor embodies aspects of critic, cheerleader, mentor, clown,<sup>3</sup> and sage. The precise way by which I encourage my students to pursue excellence is difficult to phrase concretely: it is an emergent property of the ongoing social contract we share. By fostering an unsophisticated, human relationship with students, I display my investment in them and, historically, they have responded in kind. As for the future, I intend to continue practicing my craft, accepting feedback, and striving to be a stand-out in my community.

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<sup>3</sup>I have certainly mastered the aspect of the clown.