

### **Some examples of what I suspect is gender bias in academic departmental advising:**

At a college-wide fair for undergraduates to gather information on different majors, a female sophomore approached our table, interested in a math major. I was present, a female staff member was present, and a few undergraduates, mostly from the honors track of the math and the actuarial track. When this approaching student expressed interest in a math major, she shared that she'd received a 5 on the Calc BC exam. This would indicate one is ready to take Calc III (multi-variable calculus), but sometimes students choose to repeat Calc II to help them get used to college expectations. In a heartbeat I would have told this student that Calc III was the course for her. First, I am not sold in general on the idea of retaking Calc II, and second, because of her sophomore standing, taking Calc II would essentially make getting a math major impossible. If it was truly something she wanted to pursue, she had to jump in with Calc III. This is what I would have said, and did say, but not before the female staff member with me strongly advised her to start with Calc II. Would she have given this advice had the student been male? Did she realize what taking Calc II would mean for this student's chances of pursuing a math major? Did she realize what kind of doubt this advice could place in a student's head, even if she did decide to pursue Calc III, and what effect that could have?

I was advising a female student the other day, who had been previously interested in getting a BBA, but was now leaning towards a math or econ major. She was a freshman, in the first few days of her second semester, and had just received an A in Calc III the previous semester. Because of her change in heart of the winter break, she was now scrambling to figure out what classes she should be taking to go in this new direction. A very responsible student, she had mostly figured out that proof-based linear algebra was the next class she needed to take. Although she was not yet enrolled, she had attended a section of the class she intended to take so that she would not get behind. During this initial meeting, she talked with the (female) instructor after class for advice. To be clear, this instructor was not a faculty academic advisor, and may not have even been from the math department (she was subbing for this first week of class). The advice the instructor gave was that the student should take EECS 203. This is the EECS department's discrete math class. The instructor's reasoning was: maybe this student isn't ready for proof-based linear algebra, a notoriously hard class, and this discrete math class would be a nicer, gentler introduction. The problem is, this course does not progress the student towards a math major; it does not satisfy any requirements of the major and is essentially never recommended by math department faculty advisors. During our meeting, I asked the student if the instructor had given this advice to the whole class. No, just to the student individually. Would the instructor have given this advice to a male student? Would a male student have been as likely to ask advice in this way about the appropriateness of the course? What were the repercussions of this student asking for advice? Did it project a lack of confidence or academic ability that prompted this inappropriate advice from the instructor?

This is less about a specific case of gender bias, and more about how much wiggle room there is advising for gender bias to play a significant role. One question I'm constantly confronting during advising is whether to advise a student "up" or "down". That is, based on what little

information I have, do I push them up--- towards the harder class, the honor's track, to skip a prerequisite, to take a graduate class? Or do I advise them down--- to 312 over 412, to repeat Calc I or II (even if they took it in high school), to 490 over 590, to 425 over 525, etc. I'm usually at a total loss as to what to base this on. Of course I look at their academic record, and all As is a strong indicator to advise them up, but maybe not too far up. Although I'm aware of my own potential gender biases, I think male students have to project only a little bit of confidence for me to advise them up, and female students have to project only a little bit of doubt for me to advise them down. As hard as I try to make this objective, my advice \_has\_ to be personalized to the student--- how hard they're willing to work, how much of a struggle they're up for, how quickly they'll pick up on new and difficult ideas, etc. One exception to what I perceive is a possible gender bias in my own advising is international students--- that is, transfer students from China. Unless an academic record strongly indicates otherwise (which it sometimes does), I find myself assuming *a priori* that both male and female international transfer students should be advised "up." This has some objective basis: international transfer students are held to extremely high academic standards to be able to transfer. How do I take into account this objective information, but still make sure I'm not introducing bias in my advising?

As hard as it is to recognize and admit my own gender bias in advising, at least by noticing it I can help rectify it

. Do my male colleagues have these same gender biases? More? Less? Do they notice?

### **Some examples of what I suspect is gender bias in teaching:**

My first example is in my own teaching. One type of course I teach is math content courses for future elementary teachers. The students in these classes are overwhelmingly female. Out of a annual cohort of 35-60 students, usually 2 will be male. As I first get to know my female students in these course, I don't find I have any preconceptions about how strong or weak they are mathematically; I assume that some will be strong, maybe really strong, and some will be weak, maybe really weak. But a few years I realized my assumptions about my male students were different. I was reading the mathematical autobiographies of my students, an assignment where they talk about teachers or events in their K-12 mathematical education that shaped them. Some are very positive; but many talk about a particular year or teacher that crushed their love or confidence in math. I was reading my one male student's autobiography and it described how, starting around 1st or 2nd grade, he was put in the special math sections for students who needed extra help. This was his continued experience throughout K-12, struggling, and feeling public shame for needing the extra help. I was surprised. And then I was surprised and embarrassed at my own surprise. I became aware that my surprise was at the fact that he was male. Unknowingly, I had been working under the assumption that my male students were coming off of strong and confident performances in their K-12 mathematics classes. If I assumed before reading this that this male student was strong and confident, what effect was that having on how I graded his homework?

We often assume (pretend?) that grading math homework is completely subjective, and maybe it's more subjective than grading an essay. But the assignments I give to these students are not just computations, they are lengthy explanations of why mathematics works. When I

grade homework, what I am ultimately looking for in homework is to be convinced that the student correctly understands the underlying mathematical reasoning. A student who, from my experience in class and office hours, is very strong mathematically, may leave out details or use a confusing word structure and I will skim past it, still convinced they know what they're talking about. A weaker student (weaker based on talking to them in class and office hours) that leaves out a detail will not convince me they're on the right track. Or when their wording is more confusing, I will more readily assume that they themselves are confused. These aren't conscious biases I'm implementing in homework grading, but I sometimes notice that they come up. My solution has been, just in the past semester or two, to use our electronic online homework submission and grade anonymously; the online system can hide the students' names while I grade. I'm convinced this is a better way to grade.

This is all to say, the assumptions I was making about my male student, as described in the first paragraph, could have unduly influenced and biased the way I was grading his homework.

Another example I have is second-hand. Our proof-based linear algebra class is taught by several different professors, lecturers, and post-docs. In the past couple of semesters, we've strived to make it a coordinated course, using the same exams across multiple sections, and using (roughly) the same course materials and teaching methods. In this setting, students can attend the office hours of any of the more than seven instructors teaching that given semester. Because of this, instructors may get to know students outside of their own sections. And students and student progress may be discussed during weekly course meetings among the instructors. A male and female professor were discussing a female student who was a student of the male professor's section but had attended the female professor's office hours. What's striking in the very different interpretations they had of this student's understanding of the material. The male professor (her instructor) viewed her as weak and hopeless; the female instructor, meanwhile, found she could understand the material perfectly well. Both instructors are full professors and great mathematicians; what lead to the differences in how they perceived this student's mathematical abilities?