PRESIDENT'S MESSAGE

The Secret Mathematical Menu

—Francis Edward Su

My favorite Chinese restaurant serves authentic cuisine, just like my parents used to make. And when you order an entrée, they bring you a little appetizer and a dessert as well! It's a bargain, so I don't complain that the appetizer (crunchy noodles) and dessert (Jell-O) are not themselves authentic.

But one day I went there with a Chinese-speaking friend. And when the appetizer came, it was not crunchies, but delectable pickled cucumbers. Yet my friend had made no special request. And when the dessert came, it was red bean soup—my favorite when I was a kid! Why had I not gotten this before?

I began to see a pattern: when I came with non-Asian friends, I would get the crunchies and Jell-O. But when I came with Asian friends, I got the good stuff without even asking.

And then I noticed my Chinese friends were also given a completely different menu—a secret menu—with more authentic dishes. I looked around the restaurant and beheld a bizarre sight: people side-by-side in the same space having very different experiences: non-Asians ordering from a standard menu and getting Jell-O; Asians ordering from the secret menu, enjoying red bean soup.

"You won't like the stuff on that menu," I was told. Perhaps they thought my tastes were not that sophisticated, because even though I'm of Chinese descent, I speak perfect English. They treated me differently because I didn't fit their stereotype of an American.

This is an example of a microaggression: a tiny insult that one repeatedly experiences as a member of a stereotyped group. Often the offender is unaware. Each insult may seem small and harmless, but their repeated effects can wound. In my case, the waiter had no real power over me, so I felt only annoyance. But if I were a student, and a teacher repeatedly slighted me, I'd feel greatly devalued.

My last column discussed language we use as teachers that may unintentionally discourage our students. In this column, I want to highlight problematic assumptions and behaviors. This topic may be timely, for the recent spate of protests on college campuses is, in part, tied to the wounds some students have experienced from an unwelcoming college climate.

The examples I discuss were contributed by friends and by the Project NExT community from their own experience as teachers and as students. Quotes are edited for clarity and anonymity.

Assumption: Based on some nonacademic characteristic, I can prejudge your mathematical aptitude.

As teachers, we know not everyone yet has a sophisticated mathematical palate. But whom do we allow a peek at the secret mathematical menu? Which students do we shepherd toward more math courses, and which do we discourage? If I falsely assume I can judge promise based on nonacademic factors, I might behave as Pofessor X does in this story:

Toward the end of the term, Professor X announced that he wanted to chat with each of us about which course we should take next. He asked about my major. It was my first term and I wasn't sure, but I said maybe music. He kind of snapped, "Well, why would you take any more mathematics courses? You don't need any more mathematics." I was somewhat horrified and thought about this for a long time. Even still. I was doing very well in the course, so it wasn't like I was a weak student. Why wouldn't you encourage an interested student to study more mathematics?

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We can't know what the professor was thinking, but any victim of this strange behavior will naturally ask herself, "What is it about me that caused this? He barely knows me, so it must be some judgment he's made based on external factors." Victims who can't imagine a reason will probably chalk up the blame to a quirk about Professor X.

But victims who belong to a stereotyped group may take this behavior as an insult on behalf of their group, because it's consistent with the numerous other microaggressions they have faced as a member of this group or with other group members' experiences with Professor X.

I have a coworker who likes to "preview" the students in my classes for the semester to come. He brought up the name of a sophomore female mathematics major and said, "She'd be a really great elementary school teacher." I met her and got to know her quite well; she was quite capable of graduate-level work in mathematics. She had zero interest in teaching at the primary level, and never indicated so to my coworker.

If the student never heard this comment, why does this example matter? Because there is substantial research on "expectancy effects" that show our expectations of students can greatly influence their learning. The most famous is the 1963 Rosenthal-Jacobson study that gave students a fake aptitude test and told their teachers which students were expected to "bloom" (when in reality they were randomly selected). Over the next year, those students did significantly better than their classmates.

It is easy to make assumptions about why students aren't performing well in a class, based on our own experiential vantage point. We can't imagine other alternatives we haven't experienced.

Assumption: Based on your grade, I can prejudge your mathematical promise.

This situation is unfortunately quite typical:

A student places into an advanced course. Once in the course, the student (who might not have been challenged before) gets scared that she is not performing well enough. Rather than encouraging the student to stick it out, the instructor allows the student to drop to a less-challenging course, even though she was doing fine, especially for a period of adjustment, earning a B. Consequently, this student gets a more shallow preparation and doesn't develop some of the sophisticated skills needed to succeed in future

advanced courses (leading to future Bs or worse). The experience reinforces the idea that if the student isn't getting an A she don't belong in mathematics.

We must remember that although grades are a measure of progress, they aren't a measure of promise. Even the best assessments are just a snapshot in time, not a long view of a student's ultimate trajectory.

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A student once tearfully explained to me the hours she spent filling out financial aid forms because her parents didn't speak English. Her immigrant family expected her to spend every weekend at home in the inner city, an environment that wasn't conducive to homework. College was a culture shock, with many unwritten rules.

Many of these issues disproportionately affect low-income, minority, or first-generation college students. So if I make faulty assumptions about their motives or abilities, I will be disproportionately discouraging these students from studying mathematics.

Assumption: **Mathematical teaching doesn't involve culture.**

This leads to inaccurate assessments of student knowledge.

On an examination, I asked the classical Fermi problem: "Estimate how many piano tuners live in this city." A student timidly raised his hand. He whispered to me, "Is a piano tuner a device or a person?" Other students thought good piano players would tune their own pianos, like guitar players do. Some students thought piano tuners would work in a music store. Few students had a sense of how often a piano might need tuning, or how long it would take to tune a piano. This example opened my eyes to how important background experience can be in dealing with questions that may appear to be mathematical, but instead bring up all sorts of cultural or experiential issues.

Now imagine a student who didn't have the requisite cultural experiences encountering obstacles like these constantly. Would that student feel as if he or she belongs?

Cultural barriers are impossible to avoid, but if we are aware, we can mitigate their effects.

Assumption: **I'm doing a student a favor by telling him or her to leave math.**

This is never a correct assumption.

This faculty member had one of those private in-the-office conversations with me that begins with "I think it may be only a kindness to tell you that . . .," followed by a stated concern that I was not really cut out for a career in mathematics. I've not done all that badly since then, and in fairness I have to add that the faculty member sought me out in later years to apologize for the comment. I consider the person a friend, but when I'm working with our graduate student training program, I do stress that any conversation that begins with "I think it only a kindness to tell you that" will almost never be a kindness.

I, too, had a professor in graduate school once tell me he didn't think I could be a successful mathematician. It's too easy for such pronouncements to reflect personal biases from limited information. You see the snapshot, but you don't see the trajectory. It's not your place to tell students what they are capable of, since you really don't know. Instead, you can counsel them about what skills they need to improve, so that they will have a stronger basis for deciding for themselves whether they want to continue.

In raising this discussion, I join with all MAA friends in hoping that the secret menu will one day not be secret; that all students will be encouraged to develop their mathematical palate; and that someday they can be connoisseurs, even chefs, of mathematical cuisine.

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