By Sally G. Hoskins

Teaching ingenuity

After a fulfilling career as a college biology professor, I'm retiring. "What will you miss most?" a colleague asked. My answer was something that, 30 years ago, I would never have expected myself to say: "I will miss the creativity of teaching." When I was a new faculty member, I considered teaching a necessary evil that took me away from the lab bench. I wanted to focus on research, guiding graduate students in what I hoped would be groundbreaking studies on nerve growth. I believed imagination lived not in the classroom, but in the laboratory—to be used for inventing techniques, designing experiments, and interpreting data. But when my life took an unexpected turn, I realized how wrong I had been.

I was 10 years into my career, happily plugging away at my research as a tenured professor, when my teenage niece was orphaned and I became her guardian and single parent. After taking some time to adjust, I decided that I wouldn't be able to manage a full-fledged neuroscience lab and give my niece the attention that she needed. So, I decided to shift my focus to teaching mostly undergraduate classes. Teaching made it easier for me to get home at the same time each evening and spared me the stress and time required to manage people and projects in the lab.

It was hard to drop a research program that—up to that point—had defined my career and fueled my passions. To stay close to the research world, I began to assign journal articles in my upper-level undergraduate course, anticipating lively discussions about the latest discoveries. This failed miserably. My students would skim the papers, but they'd rarely dive into them fully. Many wouldn't even look at the figures, which I had expected them to focus on.

A clue to the problem came when I took a look at the introductory biology textbooks they had studied in earlier classes. There were abundant illustrations of scientific facts—the array of bones in a bird's wing, the structure of a bacterial flagellum—but hardly any of the figures looked like the data presented in scientific papers. Equally problematic, the books had vanishingly few illustrations of *how* key findings had been made, or of *who* did the work. Now it made sense: My students were comfortable memorizing facts, but they lacked insight into how those facts were generated and how the conclusions were drawn. The ingenuity of research—what I loved most about being a scientist—was lost on them.

This epiphany changed the way I used the primary literature in my teaching; I started to go for depth over breadth.

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I spent multiple class sessions deconstructing a single paper with my students, analyzing each figure and table. I then asked, "If you had coauthored the paper we just studied, what would you do next?"

Some balked. "I'm not creative," they'd say. But I asked them to give it a try—adding a sense of urgency by announcing that, in a later class, we'd form "grant panels" that would rank their proposed studies and decide where to invest an imaginary pool of research funds.

After taking part in the panels, the students changed their tunes. They were amazed by the variety of follow-up studies their classmates had thought up. They argued passionately about which ideas were superior, expressing surprise when other panels made different choices: "Isn't it *obvious* that No. 6 is best?" It was a thrill to see each student commit to an idea, in the process discovering something about their own powers of invention. Afterward, one whip-smart woman told me that—for the first time—she realized that it was OK to come up with her own scientific ideas.

Could I have conveyed more information per minute by talking at my students? Sure. But that's not how I wanted to teach. My students already knew how to learn facts. I wanted them to think deeply about the research process and to develop their own inventiveness. I wanted them to tap into their imaginations.

In a famous lyric, Stephen Sondheim writes, "Look, I made a hat—where there never was a hat." To my decades of students, I tip my hat—hoping that what they learned about their own creativity is the knowledge that lasts. ■

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