Greetings from the new book editor team for The American Biology Teacher! I’m Kirstin Milks, an AP Biology teacher in Indiana. My spouse, Frank Brown Cloud, is a public scholar. We both hold PhDs in biochemistry, have a wide range of research and teaching experiences, and enjoy reading and sharing books on science and education from academic and popular presses. As such, we are delighted to be taking on this role together.

We’re grateful to Amanda Glaze, Bill McComas, Athena Lakri, and Valerie Haff for helping us to learn the ropes in this new adventure; to our NABT network of reviewers, from whom you’ll learn much more in months to come; and to you, for continuing to love books and what they have to teach us. We welcome your feedback, suggestions for books to review, and offers to join the NABT book reviewer network at kmilks@mccsc.edu. ~ Kirstin

x + y: A Mathematician’s Manifesto for Rethinking Gender. By Eugenia Cheng. 2020. Basic Books. (ISBN 9781541646506). 288 pp. Hardcover, $28. Ebook and audiobook also available.

Eugenia Cheng's x + y is marketed as a book about feminism and gender, but Frank and I feel as though it’s actually more radical and universal than that. In this slim, plainspoken, pellucid book, you will find—a brief section on mathematics—a charmingly practical approach to utopian philosophy, alongside specific recommendations for ways to improve your classroom practice to better serve all learners (including you!).

Cheng grew up as a competitive pianist. “Competitive pianist” is such an innocuous phrase, but by the end of the book, Cheng would like for this to give us pause. Cheng believes that music performance—the act of creating something beautiful—shouldn’t be competitive. There is no limit to the amount of beauty that can exist in the world, so why approach music with a scarcity mindset?

But we often do. The Greek myth of Arachne depicts her competing with Athena to create beautiful tapestries. In recent years, auction prices for works of fine art have been reported like sports scores. And televised cooking shows are spiced with competition: even on days when the contestants’ preparations are all judged to be absolutely delicious, someone is still eliminated after each taste testing, since the structure of the show requires that only one person win.

Cheng posits—persuasively, in my opinion—that our reflexive tendency to introduce competition makes learning environments worse, all the way from elementary or high school classrooms up to our postdoctoral careers. Cheng bolsters her message with both statistical evidence from the latest educational research and with personal anecdotes from her own journey as a student and instructor in a wide variety of academic environments.

Cheng describes her efforts to create a more collaborative learning environment, in which she relies heavily on group discussions and student-led pedagogy (which still seems something of a rarity in STEM classrooms). And she justifies her approach soundly: “Education involves a resource that can never be scarce: one person having knowledge and wisdom does not prevent someone else from having it. It might be scarce in the sense that not many people have it, especially when it comes to very specialized knowledge, but the whole point of education should be to share knowledge and wisdom with the next generation and thus ensure that it keeps growing. So the fact that we make education competitive is at worst contradictory and at best a choice that we should acknowledge and question.”

Even the introductory section on mathematics should prove helpful for many biology teachers. Cheng provides a charming summary of several important ideas from mathematics. Personally, I find that the statistical backbone of contemporary biological research to be among the most difficult topics for my own students to grasp, so I’m always happy to see how other instructors share this information.

The statistical primer leads into a key tip for interpreting data: Cheng warns readers about what can go wrong when we mistake a study subject’s response to its environment with innate characteristics.

Cheng makes this point in connection with students: “The received wisdom is that self-confidence helps you do better. However, students’ lack of belief in themselves can lead to them being much better at recognizing their weaknesses and improving themselves, as well as being cautious enough to check their work thoroughly and back everything up with evidence and strong arguments; they just need more encouragement and support to get there. Whereas students who are very confident might be better at persevering in an unsupportive environment, but they are always in
danger of putting forth shoddy work and baseless claims owing to their confidence."

That has certainly felt true in my experience. Some students, for reasons of neurobiology or traumatic experiences, might need more encouragement than others. If students like this feel isolated in a competitive classroom environment, they often perform worse than their peers. But that doesn't reveal an innate characteristic like aptitude or intelligence: if the very same student was educated in a properly supportive environment, they might be among the best.

Reflecting on the crucial importance of our environment, I thought about examples of biological research that were marred by insufficient attention to the outside world. For instance, laboratory mice exhibit different behaviors if they've been in a room with male or female handlers. Sorge and colleagues (https://www.nature.com/articles/nmeth.2935) found that the apparent pain response of mice can appear muted depending on who does the measuring (or even depending on who fed the mice earlier in the day) because the stress of being near a human male already felt painful. We can't study the full range of mouse physiology when we're subjecting them to a constantly stressful environment.

Nor will a constantly stressful environment allow many of our students to reach their full potential.

And we do ourselves no favors by presuming that a “sink or swim” mentality will prepare students for their future careers, because in an ideal world, all STEM practice would be intensely collaborative. Sometimes we might find ourselves side by side with a colleague who is teaching a new technique; at other times, we’re sharing data to get more opinions about what our discoveries might mean. And we are always building on the results of others, the many generations of scientists, doctors, and inventors who came before us.

Although it’s easy to get swept up into competitive thinking about the scientific literature—"publish or perish," the compulsion to submit work before it gets scooped—journal publication is fundamentally a vast collaborative exercise. It's a way to make our findings available for others to use.

As teachers, we have a huge influence on the environment where our students will be learning. That's why I'd encourage you to read Cheng's book and then engage in serious reflection: Are there ways that we can enhance our students' educations by conducting our courses in more collaborative and nurturing ways? (Cheng even provides some suggestions in an appendix.)

Then, if you feel like your hard work has earned you a fun treat, I might recommend Naomi Novick’s recent Harry Potter-esque fantasy series, beginning with the book *Deadly Education*. These are fun, fast young-adult novels that consider what could happen if students in an extremely cutthroat, competitive environment (their school of magic is out to kill them) adopted a more collaborative mindset.

I know, fantasy novels might not make you a better biology teacher, but if you’re still teaching during this pandemic (and even if you aren’t), you have definitely earned making space in your life for something fun.

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