Making the Microbiology Lecture a Passionate Performance, with Stories and Songs

To teach more effectively, microbiologists or other specialists need to convey their passion for their chosen subject matter

Sheldon Campbell

Many of you reading this feature spend roughly half your waking hours in some form of professional activity. Why did you choose that particular activity? For the money? Because your parents or a teacher made you? Many of you might answer “because it’s important.” However, that answer is not very particular. We live in a complex world in which a capable person can pursue any number of career paths. Why pursue the particular path that you do? Why, among the vast array of potential occupations, are you interested in microbiology?

I suspect that at some point most of us fell in love with, if not our specific area of study or practice, at least some closely related area in microbiology. I know that I did. I recall the exact moment that, sitting in a session on the African trypanosome at a cell biology meeting in St. Louis, I fell for the study of microbes.

Challenges for readers: When did you “fall in love” with the area you currently work or teach in? Describe the moment.

One “Catches” a Love for Science

As a microbiologist, I would say that a love for science or for some particular specialty is not a skill to be learned but a contagion to be caught. That love requires an infected source, a susceptible host, and an efficient means of transmission.

Practicing and teaching microbiologists are the infected source. Some of our students are susceptible hosts. And lectures, embattled though they may be in current educational practice, can be an efficient means of transmission. Lecturers who incorporate interactive elements into their lectures, who develop a personal style and pay attention to the performance aspects of lectures, and who aspire to inspire as well as inform, can transmit not only knowledge and skills, but also their love of the field to their students.

To be competent, a lecturer needs to know the material, select relevant information for the audience at hand, organize that information in a way that illuminates underlying concepts, and communicate it clearly. Mastering those components is not only a good starting point, it is most of the work of teaching.

However, a lecture is both a cognitive exercise in communicating knowledge, skills, and attitudes, and also a performance, one that should capture and hold the attention of the audience, which might be jaded and oversaturated with other information. Like the science itself, the performance of the lecture is a learnable skill. That skill, the skill of performing to engage the audience, is something that separates a competent lecture, which merely informs, from an outstanding lecture, which both informs and inspires.

SUMMARY

➤ Showing passion for microbiology makes one a more effective teacher of this subject.
➤ Lectures are both a cognitive exercise in communicating knowledge and skills, and a performance aimed at capturing the attention of the audience.
➤ Lecturers can better engage students by posing questions for them to answer as pairs or small teams.
➤ Other elements of style, including songs, that encourage students to talk over subject matter, help to convey both the substance and the excitement of microbiology.
Engaging Students with Stories

Lectures need not be merely one-way broadcasts. In his book, *Peer Instruction: A User’s Manual*, physicist Eric Mazur describes “ConcepTests,” which are simple questions that are introduced during lectures as interactive tools for engaging students. This procedure is easily adapted for use in microbiology courses.

In outline, its use is as follows:

- pose question
- allow students to commit to an answer (1 minute)
- allow students to discuss and convince a neighbor of that answer (1 minute)
- show of hands for each answer (30 seconds)
- discussion (1 minute)

During a 1-hour lecture, dealing with two to four questions is about right. According to Mazur and his collaborators, this approach to teaching has a positive impact on students learning physics. Posing interactive questions markedly alters the dynamics of lecture classrooms, requiring students to apply what they hear, and then testing and correcting their skills. Moreover, anyone who was at risk for dozing wakes up.

The peer instruction component—having students confer in pairs—is essential for this method to work. The dynamics force each student to engage with every question posed during the lecture instead of allowing the most vocal students to carry the class.

Although this feature appears in a magazine, not in a lecture hall, readers might approximate the Mazur approach that I am describing by responding to each of the questions contained in this article. Then, try to contrast that experience with mere reading.

Challenges for readers: Find a time within the next day to tell someone else about the moment you fell in love with the work that you are doing now. Ask them to reciprocate.

Songs: Personalizing Your Teaching

Bob Dylan, the Grateful Dead, and Peter, Paul, and Mary each have performed the traditional ballad “Pretty Peggy-O,” but you could never mistake one performer’s version of that song for another. An essential component of engaging performers is that each develops a distinct style. A lecturer should do the same thing.

However, striving for a distinctive style goes against the grain of our prevailing scientific culture. Scientific procedures are supposed to be reproducible when moved from one laboratory to another. Similarly, in terms of style, scientists are expected to carry themselves as calm and objective. This manner, however appropriate to science, is wrong for moving lecturing style from merely competent to excellent or, to use terminology familiar to NIH-funded faculty, from excellent, meaning the grant application probably will not be funded, to outstanding, which means it has a realistic chance.

Performers of the stage and screen, however, strive not to be merely reproducible but to be unique and to speak with vivid and personal voices. Observe outstanding teachers, and learn from them. Two of my mentors in medical teaching exemplify the art of personalizing the lecture. Frank Bia, an amateur historian, incorporated historical anecdotes and analogies into every lecture he gave. Marie Landry, whose specialty is viral disease, uses personal stories and pictures describing her personal encounters or those that her friends and especially her children have had with viruses.

I sing about microbiology to my medical students, residents, and even to scientists attending national meetings. After attending folk-music camp years ago, I learned to play the guitar and began writing and adapting traditional songs, which I love, to microbiological themes—for example, “Oh, give me a home, where the parasites roam, where the worms play in cheerful delight...”

The core songs I use in my medical-school course are reworked from folk songs, and they include titles such as “Home in the Gut,” adapted from “Home on the Range”; “Fungi, Come Again No More,” adapted from “Hard Times”; “When the Ticks Go Marching In,” from “When the Saints Go Marching In”; and “What Shall We Do with the Infected Patient,” from “What Do You Do with a Drunken Sailor.” Folk songs are ideal for the purpose because so many students know the tunes already and because the songs contain refrains that students can join in singing. Consider, for example:

Tis the song of the immunocompromised
Fungi, fungi, come again no more
Too many antibiotics and other drugs I’ve seen
Oh, fungi, come again no more!
When these words are sung to the tune of Stephen Foster’s “Hard Times,” they make a point in a more memorable way than does a conventional summary slide.

My songwriting approach, of course, is not generalizable; not everyone can sing and play guitar. (In some circles, skeptics question whether I can.) However, almost all of us have some passion or interest outside science to bring into the classroom. Introducing such external interests into lectures serves three ends: it makes a lecturer’s performance more passionate, it connects with students on noncognitive levels, and it connects science with other activities from everyday life.

**Challenges for readers:** Write down a subject outside science or medicine about which you are passionate. Think of a way to connect that passion to your professional interest. Find a way to tell someone about it.

I owe this idea to Carolyn Hovde Bohach, who described it during her 2005 ASM Carski Lecture. Instead of presenting an intellectual framework for education, she presented 17 suggestions, describing teaching as an activity where the details matter and where good execution is essential. Her suggestion number 12 called for encouraging students to “Hear It, Write It, Say It!”

This advice impressed me. If a teacher can get students to think and talk about microbiology outside the classroom, it can have a powerful impact on their learning. Based on her advice, I created examples that differ slightly from her original concept. Instead of using her comments on a summary slide, I ask “Who you gonna call?” I ask students to talk about what they learned.

Use talking points like the following: Did you know that there are two major causes of fatigue, stiff neck, fever, and sweating, but only one of them is meningitis? You know, I’m feeling dizzy and disoriented around you. It’s probably your fabulousness, but in case it’s meningitis, you might want to make yourself eligible for meningococcal prophylaxis.

Yes, these talking points are lame. Relentless lameness is a style all its own. However, this exercise in translating learning objectives into everyday conversations is valuable because it forces the learner to re-examine information, putting otherwise esoteric concepts into new and more familiar contexts.

Another trick is to anthropomorphize microbes. For malaria gametocytes, the *Anopheles* mosquito serves much the same purpose that the back seat of an old car serves for some adolescents, providing a place to do one’s business without the parents—the other bloodstream stages of the parasite. While we discourage anthropomorphizing microorganisms in a research context, where this bias can be problematic, it can provide a “hook” for learning new information. In other words, creating recognizable stories from microbial lives is a valuable and effective teaching tool.

**Passion in the Lecture Hall**

Biomedical science deals with the essential mechanisms of life and death—the machinery of birth and love and music and all human activity. This machinery has astonishing complexity, baroque intricacy, and fundamental importance. Thus, the practice of medicine is among the most compelling activities of our society, as measured by its prevalence in so many TV dramatic series.

Why, then, are our publications and spoken presentations so dry? The reasons are twofold. The culture of scientific objectivity, utterly necessary for the careful study of nature, can be antithetical to passionate expression. The second reason, though, is perhaps more tractable and systemic. Scientists do not make expressing the joy of our work part of our work.

It is insufficient simply to be passionate about what we do. We must show it, especially when communicating with students, but even with our peers and our nonscientist acquaintances. We must aim not merely to inform, but to inspire. When speaking about your profession, you are speaking about what you spend
most of your waking hours doing, what you
devote your life to doing. Expressing passion
for that subject matter to your students will
raise your teaching from being adequate to out-
standing.

It is insufficient merely to feel the passion for
what you teach. You have to communicate it,
conveying not only information but attitude,
not only scientific knowledge but our appreci-
ation of the deep wonders of nature and the joy
of discovery. We have to become more inten-
tional and more expressive in the words we use
to describe science. Elegant is overused. Is the
biology peculiar? Baroque? Astonishing? Deli-
cate? Bizarre?

Find drama in the stories of nature, and
use your voice to emphasize it. Create sus-
pense; ask questions, delay answering them.
Listen to great speakers and actors and com-
dians. They change volume, change pace, use
dramatic pauses. For performers, energy is a
magical word. Use different voices—deep and
dramatic, high and squeaky—for describing
different concepts and different organisms.
Throw yourself into the lecture, and use your
body to illustrate concepts. Lecturing should
operate at more than simply cognitive levels.
Recognize and harness the value of nonverbal
communication.

Be vulnerable. It is amazing what questions
students will ask when you remind them that
ignorance is a lifelong condition, and that you
still think that it is fun to learn new things.
Above all, be passionate about your material.
Honor the fact that every fact conveyed in a
lecture is based on something someone
thought was interesting enough to spend years
studying. Organize lectures not only for con-
ceptual coherence but also for drama. Above
all, enjoy the process, and expect your students
to do the same.

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Suggested Reading