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Feature
Approaches to Biology Teaching and Learning

Cultural Competence in the College Biology Classroom

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INTRODUCTION

> Your words and actions can make a difference.
>
> (Center for the Integration of Research, Teaching, and Learning, University of Wisconsin)

We would, of course, all like to think of ourselves as being "culturally competent." Any biologist looking at these two words themselves would rightly presume that they understand the phrase. General definitions of the two words are as follows:

> Cultural: of or relating to the arts and manners that a group favors; denoting or deriving from or distinctive of the ways of living built up by a group of people; of or relating to the shared knowledge and values of a society (www.dictionary.com)
>
> Competence: adequacy; possession of required skill, knowledge, qualification, or capacity (www.dictionary.com)

As a general phrase, "cultural competence" can often conjure for the unfamiliar reader a vision of a person who is fair, just, and open, a person who is nice, someone who is a good person at heart. Cultural competence, however, goes far beyond the everyday meanings that its component words invoke, and it is an active area of scholarship and professional development, especially in the training of K–12 education and health care professionals (Diller and Moule, 2005; Klump and Nelson, 2005; National Center for Cultural Competence [NCCC], 2007). In fact, one would be hard pressed to find a medical, pharmacy, or nursing school or a precollege teacher preparation program that does not devote significant curricular time to developing cultural competence among their trainees. Yet, the term cultural competence is rarely found within the vocabulary of most practicing biologists and university-level biology teachers, and its relevance to biology may seem questionable. However, given the limited progress that has been made in diversifying the sciences as a discipline, the time has come for us to consider the implications and importance of cultural competence within the biological sciences, especially in the context of our teaching in classrooms and laboratories. So, what is cultural competence? Why should biologists care about it? What are common pitfalls that reveal our lack of cultural competence? And what are some teaching strategies that we can all use to continue to increase our cultural competence? Here, we attempt to address these questions and to connect readers in the biological sciences with insights from other disciplines that may aid them in striving for cultural competence in their own college or university classrooms and laboratories.

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INTRODUCING CULTURAL COMPETENCE: WHAT IS IT?

The term cultural competence is by most accounts less than two decades old, and a multitude of formal definitions can be found, depending on whether it is being discussed in the realm of K–12 education, clinical practice, or workforce diversity. A general definition that would seem to apply to most any realm of human interaction is as follows:

> Cultural competence is a term used for the ability of people of one culture to understand, communicate, operate, and provide effective services to people of another given culture, or in other words, cross-culturally. The term is fairly recent but has become widely used in education, social work, and healthcare regulatory compliance within the United States, to discuss acceptance of persons from an array of diverse backgrounds and cultures.
>
> (Wikipedia, 2007)

Specifically in education, cultural competence is highly focused on how effective a teacher is for those students who do not share the same personal characteristics or the same cultural background of that teacher. These characteristics include gender, ethnicity, religion, country of origin, or sexual orientation, to name a few. For some biologists, the concept that one's own cultural background ever influences one's teaching may come as a

surprise. In particular, for those (including us) who come from the dominant culture of privilege in this country, that is, the white, upper middle class, it can be hard to even recognize your own culture, because it is so pervasive and dominant. In her book *Other People's Children: Cultural Conflict in the Classroom*, Lisa Delpit eloquently describes and challenges the culture-blindness that is pervasive in our society:

> We all carry worlds in our heads, and those worlds are decidedly different. We educators set out to teach, but how can we reach the worlds of others when we don't even know they exist? Indeed, many of us don't even realize that our own worlds exist only in our heads and in the cultural institutions we have built to support them. It is as if we are in the middle of a great computer-generated reality game, but the "realities" displayed in various participants' minds are entirely different terrains.
>
> (Delpit, 1985)

Given that we each have cultural boundaries and often cultural blindness, then the role of teachers, in any context, is to escape those constraints and to build awareness of their own cultural assumptions, stereotypes, and expectations of what is the norm, so that they can effectively teach those who do not share their own cultural terrain. In their 2005 book *Cultural Competence: A Primer for Educators*, Jerry Diller and Jean Moule state:

> Put most simply, it (cultural competence) is the ability to successfully teach students who come from different cultures other than your own. It entails mastering certain personal and interpersonal awarenesses and sensitivities, learning specific bodies of cultural knowledge, and mastering a set of skills that, taken together, underlie effective cross-cultural teaching.
>
> (Diller and Moule, 2005)

Regardless of the professional context in which cultural competence is being considered, there is widespread agreement that cultural competence is acquired neither quickly nor casually, but rather requires an intentional examination of one's thoughts and behaviors in the classroom throughout one's career (National Mental Health Information Center, 2007). All of these definitions of cultural competence emphasize the role of awareness, reflection, and continued change in striving toward cultural competence. In fact, the first step toward becoming culturally competent is realizing that you probably aren't.

So, how might one recognize what cultural competence looks like in practice, specifically in the context of teaching? In their 2005 report *Research-based Resources: Cultural Competency of Schools and Teachers in Relation to Student Success*, Jennifer Klump and Steve Nelson from the Northwest Regional Educational Laboratory describe six common teaching approaches identified through research studies that are used by culturally competent and responsive educators (see Table 1, adapted from Klump and Nelson, 2005). The first three of these teaching approaches—engaging students in active and hands-on learning, developing a climate of cooperation and community in the classroom, and knowing students and differentiating instruction to meet their needs—could be considered just good science teaching practices, ones that have been highlighted by many biology educators, including ourselves (e.g., Tanner and Allen 2002, 2004; Tanner *et al*., 2003; Allen and Tanner, 2005). The fourth characteristic of culturally competent teaching is to maintain high expectations for all students. This is much easier said than done. Although teachers may both earnestly believe and proclaim that they have high expectations for all students,

Table 1. Common characteristics of culturally responsive and competent educators (adapted and quoted from Klump and Nelson, 2005)

Employing Active Learning and Hands-On Teaching	"The most effective classroom practices are hands-on, cooperative, and culturally aligned. There is less emphasis on lecture. As Ladson-Billings says, educators should "dig knowledge out of students" rather than "fill them up with it."
Developing a Learning Community Among Students	"A climate of inclusion, respect, connection, and caring is fostered in the school and classroom. Interpersonal relationships are built and fostered, and a learning community culture is developed."
Building Knowledge of Students and Differentiating Instruction	"Teachers find out as much as possible about their students' culture, language, and learning styles so they can modify curriculum and instruction accordingly."
Maintaining High Expectations for All Students	"High expectations and high standards are set for all students. Remedial work for students is not acceptable. Activities are designed to foster higher order thinking."
Viewing Culture as an Asset to Academic Learning	"Bridges are built between academic learning and students' prior understanding, knowledge, native language, and values. Culture and native language (and cultural dialect) are valued and used as assets in learning, rather than deficits. 'Empower students intellectually, socially, emotionally, and politically using cultural references to impart knowledge, skills and attitudes' (Ladson-Billings, 1995)."
Being Explicit about Cultural Competence	"Teachers realize that students are at different stages of acculturation: Lesson plans need to blend information on how students can become more comfortable with American culture with ways that other students can become culturally responsive to members of diverse cultures."

their actions may suggest otherwise. For example, giving the "best" students more challenging topics for study or telling a struggling boy how to focus a microscope while doing it for a struggling girl reveals inherent differences in expectations for different types of students. It is important to note that most K–12 and university educators are likely unaware of the unconscious biases that influence their teaching. Few have been prompted to examine and explore their teaching practice for bias, and there may be well-justified fear of discussing issues of racism, prejudice, and bias openly. The final two teaching approaches (Table 1) that characterize culturally competent educators—viewing culture as an asset to academic learning and being explicit about cultural competence—are about directly addressing within activities, lectures, and laboratories the role of culture as a lens in teaching and learning. These strategies require instructors to explicitly generate cultural connections within the discipline, developing the relevance of the content at hand to diverse populations of people.

CULTURAL COMPETENCE AND DIVERSITY IN THE SCIENCES: WHY SHOULD BIOLOGISTS CARE?

> When I asked my last professor what he was looking for in an applicant for a researcher position, he said, 'Somebody like myself.' I was very quiet and I thought, I guess I'm in trouble 'cause I don't look very much like you.' I didn't say that to him. I just thought it.
>
> (Male black science nonswitcher; Seymour and Hewitt, 1997)

What a seemingly innocuous statement: "Somebody like myself." Likely, this professor had no intention of discouraging this young black man in his pursuit of a scientific career, nor did the thousands of other professors who have said similar things and unintentionally discouraged students. This professor no doubt had in mind characteristics such as a deep interest in the research questions at hand and a willingness to work hard, among other things. However, this statement, in which all of the many characteristics of a good researcher are summarized in terms of an individual and thus inescapably all of his or her personal characteristics—be they gender, ethnicity, class, religion, or sexual orientation, to name a few—reveals a lack of cultural competence on the part of this professor. In this case, cultural incompetence is revealed in the professor's lack of awareness that a student could interpret such a statement negatively. Although this is only one statement, it is the tip of a larger cultural iceberg, lying just below the surface of interactions between faculty and students in university biology classrooms all the time. Increasingly, research in science education is uncovering evidence that scientists, science departments, and universities, many of whom believe that they are earnestly striving toward inclusion and diversity, are in fact doing just the opposite, in large part because those individuals and systems have not had the opportunity or push to examine their own cultural competence.

Three pieces of research are salient on this point. First, Sheila Tobias, author of *They're Not Dumb, They're Different*, writes that "not every student who doesn't do science can't do science; many simply choose not to" (Tobias, 1990). But why do they choose to leave? Tobias identifies the selection process of introductory science courses as a driving force against diversifying the profession. Students are not leaving science because they are unable or disinterested. Rather, they are unwilling to abandon their own cultural identities and assume a cultural identity defined by science, one in which people who look like them, share their language, and study problems relevant to their home communities are not readily apparent. Echoing these findings are the outcomes of Elaine Seymour and Nancy Hewitt's extensive interview study with >330 undergraduate science students from seven four-year colleges and universities. Published in 1997, their research study *Talking About Leaving* found that the students who left science were not significantly different from those students who stayed in the sciences by most measures. In fact, all of the students interviewed, whether they were a "switcher" out of science or a "nonswitcher," had similar frustrations and complaints with their experiences in undergraduate classrooms. What seemed to be different was that the nonswitchers had developed coping mechanisms and had been willing to conform to the monoculture of undergraduate science courses in a way that switchers were either unwilling or unable to do (Seymour and Hewitt, 1997).

More recently, a research study entitled *Unintended Consequences: How Science Professors Discourage Women of Color* by Johnson (2007) studied the experiences of 16 black, Latina, and American Indian women in undergraduate science classes in a large, predominantly white research university. In a time period where such great strides have been made for women in the biological sciences, this article is of specific interest, because the gains for women in biology have largely been for white and Asian women. Johnson (2007) found two cultural values commonly assumed and presented by science professors that negatively impacted women of color studying in the sciences: 1) a narrow focus on science that is decontextualized; and 2) science as a meritocracy that is neutral to race, ethnicity, and gender. The first of these issues, the decontextualization of science, is not uncommon in college and university classrooms. As opposed to starting the learning process with a real-world problem—a local increase in cancer incidence, increases in antibiotic resistant infections, or the story of a community member with leukemia—faculty often just teach the basic mechanisms of biology, in these cases, perhaps, cell division, natural selection, or stem cell biology. Context can be viewed by some faculty as superfluous to concept, yet context is the contextualization of science, the relevance that more of our students need to see in order to see themselves as part of the discipline. Second, few would disagree with the idea that science is a meritocracy, but many would take issue with the idea that the current meritocracy is race- and gender neutral. In reality, science has been built within relatively narrow cultural bounds because of the historical lack of involvement of significant numbers of women and persons of color. Both of these concepts, which Johnson (2007) identified as alienating to the women students of color—the concept of science as context free and the concept of science as neutral with respect to race, ethnicity, and gender—might seem familiar and accurate depictions of science to many scientists, yet this is exactly the problem.

The presentation of science in college and university classrooms should not be for those already acculturated in the field (scientists), but rather for those who are novices attempting to enter our field from a culturally distinct and perhaps even culturally hostile background.

Even though none of the research studies described above ever quite finds its way to the term cultural competence, all of the authors and their studies provide ample evidence of a lack of cultural competence in our college biology classrooms, and they link this problem to our continual loss of intellectual talent and diversity in biology and our sister science fields. So, what can we as individuals do to improve our own cultural competence? As the primary author of this article, I have no doubt that my cultural competence can be improved! I believe that I have developed a keen eye for issues of cultural competence as they relate to gender, largely due to my experiences as a woman in science. I have experienced first hand the disappointment of asking a question of a faculty member, a seminar speaker, or a high-level administrator, only to have a male colleague just to my right or my left be addressed with the answer and sometimes, unbelievably to me, credited with asking my question in the first place. Do I believe that these individuals consciously treated me differently because of my gender? No. Do I believe that they would be surprised by how few times they call on women versus men in their classrooms or inadvertently ignore women in their classrooms? Yes. Do I believe that they have been reflective about their behavioral interaction patterns with female and male students or fellow scientists? No. Do I believe that all scientists can learn to improve their cultural competence? Absolutely.

DEVELOPING CULTURAL COMPETENCE AS A COLLEGE BIOLOGY TEACHER

So, what does cultural competence mean in the context of the biological sciences? Practically, it would be the ability to communicate effectively with, and most importantly, to teach effectively, individuals from a variety of backgrounds that do not match one's own personal profile. For highly culturally competent biologists, the success of students in their courses and in their laboratories would not be predicted by a student's gender, ethnicity, sexual orientation, religion, linguistic background, country of origin, or other personal characteristics. Although teaching strategies that address multiple learning styles and that engage students in a variety of active-learning experiences can certainly make biology courses accessible to more students, cultural competence requires more. Cultural competence requires that college and university biology educators become aware of and reflect on the role of their own culture and background in their teaching. As a start, we have identified four aspects of biology teaching in which college biology instructors can begin to develop their own cultural competence. These are, from the simpler to the far more complex, the following:

- Monitoring and Changing Ordinary Language in the Classroom
- Becoming Aware of Patterns of Interaction with Students
- Integrating Cultural Relevance and Diverse Role Models into Curricula
- Confronting and Revising Differing Expectations and Stereotypes of Students

To introduce several of these topics, we share a brief story from Case Studies in Inclusive Teaching in Science, Technology, Engineering and Mathematics (STEM), an excellent resource available online from the University of Wisconsin's Center for the Integration of Research, Teaching, and Learning and its Diversity Resources Group (Friedrich *et al*., 2007). Each story or "case study" is intended to provoke individual reflection and prompt discussion about possible solutions or responses. For none of these case studies is there one correct response or one culturally competent way to respond. These cases highlight the tight linkage between cultural competence and attempts to diversify the sciences. The term cultural competence is not associated with these cases in the original reference, but these stories nicely highlight why cultural competence is so relevant to biologists.

Monitoring and Changing Ordinary Language in the Classroom

One of the simplest ways to begin to examine issues of cultural competence in one's own teaching practice is to simply listen to what you say, listening to it through the filter of cultural competence. What assumptions am I making with my words? Who will feel included by my statements? Who will feel excluded by my statements? Many biologists may actively try to keep science abstract and neutral as a strategy for being inclusive and nondiscriminatory. Yet, even when we are attempting to keep our classrooms and our language neutral, we are often blind to our own assumptions about culture and the cultural dominance that we bring to all interactions simply by being the teacher. In our attempt to generate a "neutral classroom," we may inadvertently produce a classroom where only people like ourselves feel included. The simplest window into this problem is language. Our cultural assumptions often come out in our common language. Although we might predict that students are most keenly listening to our lectures on biological mechanisms, our everyday common language, which fits in around our specialized jargon, often contains cues about our cultural assumptions (Table 2). Taking stock of one's language and considering small changes is a simple, concrete step toward cultural competence in the classroom. For more strategies on using culturally competent language in college classrooms, Chapter 5–Diversity and Complexity in the Classroom: Considerations of Race, Ethnicity, and Gender in the book *Tools for Teaching* by Barbara Davis is an excellent resource (Davis, 1993).

Becoming Aware of Patterns of Interaction with Students

In addition to the language that we use, our actions in a classroom—who we call on, who we talk to, who we praise, who we correct or discipline, even whose name we refer to when describing a group project—all of these actions and interactions with students are overflowing with cultural assumptions and values that are meaningful to students and invisible to us. Consider the case below.

> Marie Louise Moreau wondered whether she was the only student in her chemistry group who had read the assignment before coming to class. She had expected more when she had taken a plane from Haiti to study at a prestigious college in the United States. She spoke up. "Well, when I was doing the reading," she said, "there was a note in the sidebar that said you should add titrant slowly near the endpoint. That way, when the solution changes color, it is easier to tell how much titrant was added." Joe, her group's self-appointed leader, looked at her with doubt. Could she be right? He didn't want to rely on Marie's word alone. "Adam!" he called to their TA. Joe repeated Marie's statement to Adam. "Is that true?" he said. "Good memory, Joe," said Adam, clapping Joe on the shoulder. "That's right. You're an asset to your group." —from Case Studies in Inclusive Teaching in STEM.
>
> (Friedrich *et al*., 2007)

This case raises many issues, including the lack of structure within the student groups and the different interaction patterns between Adam, the teaching assistant, and the two students Marie and Joe. Although an occasional misattribution of praise or judgment on preparedness can occur, this teaching assistant's interactions (or lack thereof) with his students, his assumptions about the source of the information he was being questioned about, and his quick praise of Joe without any understanding of the interworkings of the group raise many red flags about his cultural competence. In fact, interaction patterns such as this pattern, which have a strong element of potential gender bias, are reminiscent of the experiences of many women in science. Myra and David Sadker, researchers in gender bias in education, began their careers in this field because of their own experiences in graduate school (Sadker and Sadker, 1994) in which they observed interaction patterns similar to those in the case mentioned above. Myra would make a suggestion, and a male colleague would be assigned credit. Myra would make a statement, and it would not even be acknowledged. So, what can a college biology teacher do about this? Be aware of your interaction patterns with students. Record some data in your classroom. If you teach a large lecture, who asks questions in your class? What are the demographic characteristics of these students? If you teach a smaller class, use a clipboard to continually record whom you interact with over the course of a class period. Who do you tend to gravitate to? Who do you not interact with at all? To what extent do students' personal characteristics predict with whom you interact? Do you find it easier to remember student names that are common in European cultures, as opposed to Asian or African cultures? Simply beginning to notice these interaction patterns, not judge them, is a strong step toward developing cultural competence. Once you are aware of patterns in your own actions and behaviors, then you can begin to actively change those patterns.

Integrating Cultural Relevance and Diverse Role Models into Curricula

Imagine experiencing biology as a discipline in which you could never see a reflection of yourself and where none of the ideas under study seemed particularly relevant to you or your cultural community. Imagine you were African American and that you never saw any relevance of the biology you were studying for important health issues in your own community. Imagine you were a woman (or a person of color) and that you never explicitly heard the name or saw the picture of a biologist who looked like you who had made significant contributions through her work. Consider the case of Professor Melanie Wong:

> Professor Melanie Wong, chairperson of the Mathematics Department, looked around her at her colleagues as they sat in a department meeting. "Recently," Melanie began, choosing her words with care, "I received a letter from an organization that provides support for women in science and math. Women who major in mathematics as undergraduates tend not to persist into higher levels of education. They are asking us to include female mathematicians in our course material. I would like to hear from you as to what you think about this, and what you could do in your courses to make this happen." "This is all very well," Ross Kosovitch said, "But mathematics is a neutral science. Of course, women have contributed to mathematics, but to single them out seems biased." Another senior mathematician nodded in agreement. "I believe that we should all make an effort toward mentoring female students," he said. "But to skew the curriculum is a disturbing proposition." Many of the other professors nodded in agreement. —from Case Studies in Inclusive Teaching in STEM.
>
> (Friedrich *et al*., 2007)

Table 2. Moving toward cultural competence in common language (inspired by Davis, 1993, p. 41)

Common assumptions...	Moving away from...	Moving toward...
...that your students are culturally similar to you	"When your parents were in college, the biology they learned..."	"When I was in college, the biology I learned..."
...about students' religion	"As Christians, as we study evolution..."	"Whatever your religious beliefs, as we study evolution..."
...about students' sexual orientation	"If your wife or husband has cancer one day..."	"If a loved one, spouse, or partner has cancer one day..."
...about the structure of students' families	"Are you going to visit your parents during spring break?"	"Are you going to visit any friends or family during break?"
...about the gender of scientists	"When a biologist sets up an experiment, he..."	"When a biologist sets up an experiment, she..."

The integration of culturally relevant examples in biology and the inclusion of diverse role models is a significant challenge. There are few curricular resources that achieve high levels of cultural relevance and inclusion, although nonmajors textbooks tend to be richer in contextualizing content, highlighting the people of science, and striving to include specific biological examples that might resonate with diverse populations of students. That said, some teaching strategies do lend themselves more than others to cultural inclusion. First, case studies or problem-based methods are a promising approach to both engaging students and linking biology content to culturally diverse and real-world issues (Chamany, 2001, 2006). Second, the inclusion of biographies of scientists and the study of their relative contributions to a key discovery is another way to bring biology role models from diverse backgrounds into the learning of biology. Instead of lecturing on the discovery of the structure of DNA, charge students to research the relative contributions of Rosalind Franklin, Erwin Chargaff, James Watson, Francis Crick, and Maurice Wilkins. Although this example does little for students of color in a biology classroom, it does highlight for female biology students the critical role of a female scientist in one of the great modern discoveries in biology. In addition, this discovery story provides an opportunity to discuss the myth that science is completely objective and somehow exempt from the quirks of human social interactions, including the cultural challenges in this example of the interactions between female and male scientists (Dugan *et al.*, 2003).

Although culturally inclusive curricular resources in biology are far too limited, efforts are being made to increase knowledge of the accomplishments of scientists from diverse backgrounds. One example is The Biography Project developed by the Society for the Advancement of Chicanos and Native Americans in Science, which highlights the contributions of scientists from these cultural backgrounds and also has links to related projects that have information on the contributions of women scientists and African-American scientists (Society for the Advancement of Chicano and Native American Scientists, 2007). Initial steps toward building a more culturally inclusive curriculum can begin with changing a single assignment, beginning one class with a culturally relevant example that relates to the topic of the lecture, or highlighting one story about how a discovery was made in biology that brings to your students role models in which they might see themselves.

Confronting and Revising Differing Expectations and Stereotypes of Students

Perhaps the most challenging aspect of becoming culturally competent is the process of discovering, confronting, and revising stereotypes that we may hold about members of other cultural groups and the differing expectations for achievement that may follow from those stereotypes. Consider the experiences of the student in the case study below.

> Martin Hernandez, Director of Graduate Studies in the Department of Industrial Engineering, stood up to greet Angela Johnson when she entered his office. Angela was dropping out of graduate school. "Have a seat," Martin gestured to a chair across from his desk. "So, let's talk about why you're leaving the program. Frankly, I'm surprised to see you go." "Well," said Angela, with some hesitation. "To begin with, my advisor, Larry Hofstedt, told me that I would have to take lower-level courses because my college education at a historically black institution was not up to par. I also had a series of very discouraging in-class experiences. I was even accused of cheating when I got an "A" on an exam. —from Case Studies in Inclusive Teaching in STEM.
>
> (Friedrich *et al.*, 2007)

Although there are many things we don't know about this case, we do know that a young woman, likely black, is dropping out of graduate school after a series of discouraging experiences, which seem to relate to assumptions about her and expectations of her abilities based on her cultural background. Research studies have shown that the expectations a teacher has for her/his students is paramount. Regardless of the origins or accuracy of these expectations, they can have a profound effect on the academic performance of students. This phenomenon, termed the Pygmalion effect, has been shown in multiple contexts and it has been demonstrated that when a teacher believes that certain children are more academically able—regardless of the children's actual ability—then those students perform significantly better academically in that teacher's classroom; conversely, if the teacher has low expectations of certain children, then they perform poorly academically (Rosenthal and Jacobson, 1992). To compound this enormous influence of teacher expectations, there is additional research showing that students perform poorly when negative stereotypes about their group membership are highlighted—explicitly or implicitly—in academic contexts. This second phenomenon is known as stereotype threat, and it is defined as a fear that one's academic performance might confirm an existing stereotype of a cultural, ethnic, gender, or other group with which one is identified; this fear has then been documented to lead to impairment of academic performance (Steele and Aronson, 1995; Steele, 1999). Originally demonstrated and named by Claude Steele in 1995, stereotype threat is an active area of research with two papers published in *Science* last fall (Cohen *et al.*, 2006; Dar-Nimrod and Heine, 2006).

But why should biology professors take note of the Pygmalion effect and stereotype threat? Each of us, no doubt, holds stereotypes based on our own life experiences. Each of us, no doubt, makes assumptions about individuals with whom we do not share cultural similarities. And critically, these stereotypes and assumptions can insidiously and surreptitiously lead us to form expectations for individuals that are based on the little information we have about them: their surname, their gender, their skin color, their language skills, and any of a number of other cues. Is it simple to identify the stereotypes and biases one holds? No. Is it important to try? Yes. In fact, the three strategies described above—monitoring and changing your language in the classroom, becoming aware of interaction patterns with students, and integrating cultural relevance and diverse role models into curricula—are ways to begin to unblind oneself to these deeply ingrained stereotypes, assumptions, and expectations. Confronting and revising them is not generally an accessible place to begin one's journey toward cultural competence, but rather is the ultimate goal.

A FEW FINAL THOUGHTS

On Individual versus Organizational Efforts to Achieve Cultural Competence

It is worth noting that most of the information presented here has addressed how we as individuals can either begin to examine our cultural competence or continue to grow as effective biology educators by considering cultural competence in the context of our classrooms. However, what we have not considered here is the role of organizations in biology in promoting cultural competence. In particular, there are many dedicated, individual biology professors, lecturers, and researchers trying to promote diversity in biology and nucleate reform of university teaching practices to this end, but they are often islands of effort in a much larger sea. What if developing cultural competence in all classrooms and laboratories was a serious focus of a biology department? Or of a college of science within a university? What would that look like? What would be required to engage a biology faculty in a conversation about cultural competence in their classrooms and laboratories?

The National Center for Cultural Competence at Georgetown University (NCCC, 2007) has proposed the following Principles of Cultural Competence for organizations, which could apply to Departments of Biology and to individual research laboratories. Culturally competent organizations are those that explicitly, proactively, and continually 1) value diversity, 2) have the capacity for cultural self-assessment, 3) are conscious of the dynamics inherent when cultures interact, 4) institutionalize cultural knowledge, and 5) develop adaptations reflecting an understanding of cultural diversity (NCCC, 2007). Although I expect most institutions would say that they value diversity, how many departments, scientific societies, or laboratories have considered and addressed the last four principles? Certainly, a wholesale effort to improve the cultural competence in university biology classrooms will require institutional changes and much more than the individual efforts of a few.

On the Explicit Connection between Cultural Competence and Diversity Efforts in Biology

This article has attempted to introduce an idea that is familiar to other disciplines that would seem to be highly relevant to all teachers of biology, especially those teaching in colleges and universities. That said, the connection between cultural competence in biology teaching and its potential impact on promoting greater diversity in the biological sciences has, at best, only been alluded to. There are dozens of biology departments around the country that are recipients of millions of federal dollars to promote diversity in the sciences, with the goal of building a stronger pipeline to help women and minorities to attain careers as biological researchers—a laudable goal that most agree upon. Yet, there is often little or no evidence of any attention in these programs to cultural competence, or the lack thereof, among those shepherding these efforts, and one wonders whether this may not be a key to our lack of success.

Perhaps one reason why efforts to diversify science have made little progress is that we've spent too much effort trying to inculcate diverse populations of students into the culture of science as opposed to changing the culture of science itself to be inclusive of them. To even consider this, it would seem that an important shift in perspective is needed, a shift that a conversation about cultural competence could drive. The culture of science can shift to be more inclusive, to question assumptions about who we are, and to examine our common modes of interaction. Attaining cultural competence in biology would seem to demand recognition that 1) biology has a culture all its own; 2) that the culture of biology is currently dominated by a white, male culture that is a historical legacy from those who founded the discipline; 3) that the existing "face" of biology is an impediment to many students who are aspiring biologists; and 4) that we as biologists have the opportunity to develop cultural competence by using the strategies described above, and as a result can help to diversify the kinds of people who participate in our discipline.

On the Myth of Ever Attaining Cultural Competence

A dear university colleague of mine has often cautioned that cultural competence is really a myth, an impossible level of skill that no one individual could ever obtain and that cultural sensitivity may, in fact, be all we can ever strive for. I do not consider myself a culturally competent biology educator, but my growing knowledge of the concept has certainly shifted my perspective, profoundly changed my teaching, and caused me to attempt to continually expand the relevance and accessibility of my college biology curriculum. I aspire to be a biologist whose teaching leads to deep and profound learning for all of my students, one whose students' success in biology cannot be predicted by their gender, ethnicity, sexual orientation, religion, linguistic background, country of origin, or other personal characteristics. So, even if it is unattainable, I think I'll still aim for cultural competence, because it may be the only way that biology will ever really gain the talents of all.

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