Creating Laboratory Access for Science Students (CLASS): Student and Faculty Perspectives

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The authors met in the winter quarter of 2000 when Holly was a student in Michele's Introductory Biology class for majors. More recently, Holly was a student in Michele's graduate seminar class (spring 2004). So Holly has been in Michele's undergraduate and graduate classes at various times. However, their interaction has really been one of mentor and mentee. This chapter is a framework to let Holly tell her story, and the informal format is a way to give her a voice. We have found that this is a very powerful avenue for getting the attention of readers who have never thought about disability and science. The Creating Laboratory Access for Science Students (CLASS) project has engendered a great deal of interest, and the questions in the chapter are the most frequently asked questions as we talk about our project. Our hope with this chapter is to let Holly dispel a lot of myths about students with physical disabilities. At the same time, Michele's role is to talk more generically about issues of universal access and how this improves science instruction for all students. The reflective dialogue is an interesting way to get our message across.

What got you interested in the issue of access in science?

Holly Slack (HS): Well, in March of 1997, I was involved in a car accident and suffered severe damage to my spinal cord. As a result, I had no movement or sensation in my lower extremities and minimal mobility in my upper extremities. Although I had to use adaptive equipment to perform simple everyday tasks, I never considered abandoning my academic plan of pursuing a degree in the sciences. Others were less optimistic about my decision to major in a discipline associated with a high level of laboratory participation. One person even suggested getting a degree in law because I would encounter fewer obstacles and less resistance from others in that particular field. I remember being offended by these remarks because I already had proven myself in advanced science courses. People were so focused on my disability, they failed to recognize and acknowledge my capabilities.

Michele Wheatly (MW): Well, to be honest, I hadn't given it a lot of thought until I became a professor at WSU [Wright State University] in 1994. WSU was constructed to be architecturally barrier-free. All our buildings are accessible and linked by underground tunnels. We have a large population of students, faculty, and staff with profound physical disabilities. I was very impressed that the Biology Department had been working for years in the area of creating accessible general education labs, so that students with disabilities could participate in the lab/field requirement. I had always given a lot of time and attention to issues of women and minorities in STEM areas and this "last minority" was the final piece of the puzzle.

From your perspective, why should we create curriculum that is universally accessible?

HS: I don't think limitations should be placed on any student, and if curriculum is not designed to be inclusive, then the scientific community is deprived of intellectual talent. Before my accident, I intended to major in science and had successfully completed college preparatory classes. My teachers and peers considered me a competent science student. After my accident, however, those people seemed to forget the thinking and reasoning aspect of science and focused entirely on the physical manipulations involved with science. Consequently, people no longer regarded me as a

student with a promising professional career in science. How could they arrive at such a conclusion? Apparently, they did not take full advantage of the Scientific Method when they were forming these opinions. Although they made observations and formulated a hypothesis, they failed to design and collect the data necessary to form a conclusion to support or reject their hypothesis! The scientific method is a cognitive process. Someone with a physical disability can participate in all the steps associated with the scientific method, except perhaps conducting the actual experiment.

MW: It has been established that people learn in different ways and through multiple modalities. In every class of "able-bodied" students, there are those who learn better through visual means, auditory delivery, or touching the science. By presenting ideas and materials in multiple modalities, we improve learning for all students. Research has shown that a degree in a STEM field will provide a good quality of life for any student. Science has become highly technical and often is performed through teamwork. By focusing on the capabilities of individuals with disabilities, we find ways for them to participate in the creation of scientific knowledge. To ignore this asset is to deprive our nation of significant intellectual capital.

What are the major barriers that prevent or discourage students with disabilities from participating in STEM?

HS: They say attitude is everything and that certainly is true for me! Following my accident, those individuals who had initially encouraged me to pursue a career in the sciences now questioned whether my physical limitations would prevent me from achieving my goals. Some of my strongest supporters became my biggest adversaries. It just didn't make sense to me…I lost the ability to walk, not the ability to think!

MW: I agree with Holly. Attitudes of teachers, parents, and the community are the biggest challenge. Teachers take one look at a student in a chair and make assumptions. Believe me, science is a cognitive process. I have supervised many research students and some of them aren't so good with manual dexterity! That's why, as a principal investigator, I try to match a research student with a project that fits his or her interests and skill set. Such accommodations can similarly be made for a student with a disability.

What are some commonly held misconceptions about access and science?

HS: People tend to assume that students with disabilities don't want to participate in lab/field work, but in many cases, they simply haven't had the opportunity. I always wanted the "hands-on" experience, even though I lacked the dexterity of the other students. Although I wasn't able to physically perform every step of every experiment, I understood the significance of each procedure. This enabled me to manage experiments, perform required calculations, and record and interpret the results of each step. What I lacked in physical contributions, I believe I made up for with leadership, skillful planning, and critical thinking. As a result, I was able to excel in biology, chemistry, physics, and anatomy labs.

MW: In my work, there are two major issues that people get hung up on. First is safety. Faculty/teachers are worried that having a student with a disability in the lab will be a liability in terms of safety. Having chaired a large department with 500 undergraduate students, I know accidents will happen from time to time, and 99.9% of these will involve able-bodied students. There simply is no correlation between physical ability/disability and safety in the lab! The second big issue is "expense." University administrators are often concerned about meeting the minimum requirements for ADA [Americans with Disabilities Act] to avoid lawsuits. They think it's all about ramps into buildings. While access to facilities is of course critical, there are so many things that can be done to make classrooms and curricula accessible with minimal associated cost. In fact, some of the best solutions are the cheapest! Finally, many accommodations designed originally for people with disabilities actually assist other students in their learning, much like the automatic doors and ramps into buildings can be of great utility to all of us. We developed a series of tactile models to teach biology to the visually impaired, only to discover that some students with excellent vision used the models because touching and seeing a 3D version of a concept improved comprehension and learning.

Why is science a good discipline for students with disabilities?

HS: Science is a good discipline for all students, period! As our world becomes increasingly complex and dependent

upon technology, it is in every student's best interest to receive STEM training. Even nonmajors need a good foundation in science to make informed decisions in a technically demanding world.

MW: Well, to begin with, good science involves multidimensional analysis (written, numerical, graphic, conceptual), and so it is accessible to people with different learning styles. For example, a person could have very limited written/verbal skills and still be able to prove a theorem! Also, these days, science is increasingly dependent upon team approaches. In my discipline (life sciences), many research projects now involve large groups of scientists. A genomics project would be an extreme example, where literally hundreds of researchers in cloning centers around the world have contributed to the cloning and sequencing of targeted genomes. And with science-through-teamwork comes the opportunity to use participants based on their capabilities rather than excluding individuals based on their disabilities.

How did you become involved in the CLASS project?

HS: I was introduced to the CLASS project when I first arrived on campus. The faculty members involved with the project were my professors, and, quite frankly, the philosophy of the CLASS project, "…individuals with physical and/or learning disabilities, given appropriate accommodations, can participate fully in the scientific method," permeates all aspects of the instructional program at Wright State. An example of this type of cooperation was demonstrated in one of my botany courses, during one of our regular field trips into the woodlands surrounding our university. Although I was able to get to the majority of the study sites, there was an instance when I was unable to access a particular specimen. When this occurred, the professor not only took pictures of the plant for me to review, but also sat down with me to point out the key characteristics that made the specimen identifiable. In short, every professor I encountered took care of my needs without any hesitation—I was always a welcome and important member of the course. Quite honestly, there were very few obstacles I faced while pursuing a degree in the biological sciences. Many of the issues I thought I would struggle with were already addressed by the CLASS project. This allowed me to put all my energy into my studies instead of worrying about how I would complete a laboratory exercise.

MW: Creating accessible labs was an initiative at WSU since it began in 1964. This morphed, under my direction, into the "CLASS project" in the late '90s when we received our initial NSF funding from the Division of Undergraduate Education. CLASS represents a collaboration between faculty and staff in the College of Science and Mathematics, the College of Education and Human Services, and the Office of Disability Services.

From your perspective, what CLASS project initiatives are the most effective?

HS: Broadening access in science will not only benefit students who acquire a disability later in life, but it also will impact students who are born with disabilities. Students with physical limitations and learning disabilities overcome challenges every day. There is no reason why a child with a disability can't tackle the fascinating challenges science courses present.

MW: In my opinion, changing the attitudes and preparedness of educators is crucial. Classroom teachers feel unprepared to develop accommodations for students with disabilities. If we can alter their mindset and create accessible curricula in the early grades and through college, this will be the greatest legacy of the CLASS project.

Tell us about some of the specific initiatives that CLASS is involved with today?

HS: As I mentioned before, one of the biggest obstacles that disabled students face is convincing others that they are capable of participating in advanced science courses. To show educators that this is possible, Wright State offers workshops that allow educators to experience inquiry-based science classes that are inclusive and universally accessible. During the first week of the summer workshop, educators are introduced to adaptive technology and alternative ways of completing laboratory exercises. Once this is complete, students with various disabilities participate in a hands-on and minds-on science camp where they work closely with the educators. As the week progresses, students and educators become more comfortable with one another, and all leave the camp with valuable educational insights.

MW: In addition to summer workshops, the CLASS project also offers a sourcebook about teaching strategies and laboratory experiments that allow students with disabilities to fully participate in science courses. Several of the ideas discussed in the book are currently used at Wright State in accessible introductory science labs. These labs provide students who were previously excluded from laboratory activities with an opportunity to get "hands-on" experience.

What future initiatives is the CLASS project envisioning?

HS: Although we have made significant progress in our quest to remove the barriers that prevent students with disabilities from participating in the sciences, we continue to address issues that threaten the involvement and contribution of every student. We want to create an educational environment that is inviting to every student, regardless of gender, race, or ability. In addition, we want to reduce the anxiety often associated with pipeline transitions from high school to college and from college to employment. I remember when I was an incoming student, I was excited and nervous about beginning my college career. However, I had additional worries about how faculty and other students would respond to a student with a disability. Much to my relief, I learned that Wright State is home to several hundred students with disabilities. In order to ensure the success of such students, Wright State's Office of Disability Services offers numerous programs for students with a variety of challenges. In addition, all of the classrooms at Wright State have wheelchair access and include tables for students with mobility issues. In the labs, there are lowered workspaces and adaptive laboratory equipment. While I quickly grew comfortable with maneuvering around the university, I still had concerns about how faculty and staff in the Department of Biological Sciences would react to a disabled student in their program. However, once I was under way with my studies in biology, those concerns were quickly put to rest by the professors, who treated me just like any other student. When I had an issue with a course, I was well received by faculty who worked diligently to resolve the situation so that I could participate fully in the lab experience. Without this kind of support, I may have fallen out of the pipeline and pursued a career that did not require a high level of physical contribution.

Finally, we want our message to travel out of the classroom and into the community. While it is critical for teachers at every grade level to encourage students to pursue their educational and career goals, it is equally important that guidance/career counselors and parents offer similar support. During my rehabilitation, I worked with tutors to complete my high school curriculum and, with the support of my family, continued planning for college. While my family encouraged me to pursue my college plans, others were surprised that I still wanted to attend college and major in a science-related field. Some people verbalized their skepticism, saying it would be impossible for me to get a degree in the sciences, since I would not be able to fully contribute to laboratory experiments. They thought science is about doing, but I knew science is about thinking! Without support from my family, I may have placed unnecessary limitations on myself.

MW: Systemic transformation is the most important future goal of the CLASS project from the faculty perspective. How can we translate some of the tools and strategies developed by the CLASS project to the K-12 educational environment and other institutions of higher education? So far, our outreach efforts have produced varying degrees of success. We have trained a large number of educators, but they have returned to their home institutions where they may be the sole faculty member who is trained in accessible science. We have had better success in institutions where a teaching team (science educator and special educator) attended the workshop together and have implemented change through working together in classrooms and universities/colleges. We need to find ways to have our strategies adopted by whole school systems. Investing in pre-service teachers is another important goal. Students must acquire these competences in both their methods and content classes. In polls of in-service teachers, we routinely discover that coverage of teaching students with disabilities has been minimal during their training. Many schools now have inclusion classes, and these underprepared teachers struggle to deal with such a broad spectrum of abilities. Transforming the instruction of science (attitudes, expectations, delivery) is a problem our nation faces, and the disability piece is part of this.

From your perspective, what was the major value of the Congressional Briefing and the NSF Conference in DC?

HS: This was my first scientific meeting, so that in itself was a tremendous opportunity. I enjoyed attending the sessions and learning about current creative projects in STEM education. I particularly liked meeting faculty and students from the small-college environment and learning about the "out-of-classroom" opportunities for student engagement. Since I intend to become a college professor, this was a wonderful exposure to the wealth of new ideas and thinking in science education. The Congressional Briefing was a wonderful opportunity for me to meet congressional staff and to bring a spotlight to the issue of making science accessible. Afterwards, I was contacted by two journalists who retold my story in the popular press.

MW: Well, I attend many meetings, but this was also a career high for me. The Congressional Briefing was great recognition of the value and uniqueness of our work and our university. As for the conference, it has helped me better understand issues that I encounter in my role as Dean of Science and Mathematics—namely improving instruction across the sciences and mathematics. I tend to go to biology conferences, so mixing with faculty from other disciplines was remarkable. Many of the strategies I learned could be translated to my own classroom teaching. The interdisciplinary interactions were intellectually very stimulating.

At the conference, what did the CLASS project workshop accomplish in your mind?

HS: The CLASS project workshop promoted out-of-the-box thinking. We had attendees form small groups and work through a videotaped vignette, which presented a laboratory situation involving a disabled student. Groups were then asked to find solutions to the challenges that the student faced in the laboratory. Several of the ideas that the groups offered were very creative, and in most cases, they were easy and inexpensive enough to incorporate at their own university.

MW: Well for me, I felt that Holly's testimonial was very powerful. She talked about her journey and her ambitions. She was gracious enough to open up for general questions, and people were very interested in learning about her life. Underrepresentation often results from ignorance and misinformation, and so any time we can open up an authentic dialogue, we stand a greater chance of debunking myths and eliminating stereotypes.

If you would like more information on the CLASS project, please visit our website at:
www.wright.edu/biology/class/main.shtml.

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