

## **Collaborating with CLASS:**

### **Creating Laboratory Access for Science Students with Disabilities**

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The CLASS Project (Creating Laboratory Access for Science Students) evolved from the dilemma of a group of scientists at Wright State University (WSU), in Dayton, Ohio, who were faced with the daunting challenge of educating a relatively high number of students with physical disabilities in their science laboratories. Rather than back away from the challenge or waiving requirements for this population of students, the science faculty approached the issue in true science fashion, as a problem to be studied and solved. They entered into collaboration with teacher educators and disability services personnel at WSU, and together they formed the CLASS Project. The purpose of the CLASS Project is to teach science educators how to make their laboratories and field experiences accessible in order to effectively include students with physical and learning disabilities in grades seven through sixteen. Universal design, attention to individual accommodations and a strong dose of common sense are essential tools used by CLASS-trained teachers. Ultimately, the aim of the CLASS Project is to facilitate the growth in numbers of persons with disabilities who successfully pursue careers in science.

People with disabilities are significantly underrepresented not only in the field of science, but also the fields of technology, engineering, and math (STEM careers) (National Science Foundation, 1998). A survey of employed scientists and engineers with disabilities reveals a minimal representation the natural and physical sciences. Marginalization, and often exclusion from science classes from an early age almost certainly contributes to this dearth of scientists with disabilities (Congressional Hearing before the Subcommittee on Science Research and Technology, 1988). Discriminatory practices, attitudinal and institutional barriers, and curricular deficits are only a few of the challenges people with disabilities face when they decide to pursue the field of science. Unless students with disabilities gain access to equitable learning environments, they will continue to be systematically, if subtly, shut out of opportunities to work in and contribute to the STEM fields. The CLASS Project facilitates access to inclusive learning environments through professional development efforts with science teachers.

The Individuals with Disabilities Education Act (IDEA) mandates a free and appropriate public education in the least restrictive environment for all students with disabilities (Houcutt, Martin, & McKinney, 1990). Commonly known as inclusion, this right to access to general education is typically endorsed by most educators, at least in theory (Scruggs & Mastropieri, 1996). The difficulty arises when general educators, science teachers for example, are faced with the possibility of including a student with significant disabilities into their classrooms. General education teachers report they are inadequately prepared for inclusion in their undergraduate work (Norman, Caseau, & Stefanich 1998). Most are uncomfortable around people with disabilities and believe they are not equipped to deal with the intense needs that some students with disabilities bring

to the classroom. Often teachers are also resentful at the prospect of having to make extensive modifications to their curriculum, particularly in a time when accountability is such a priority (Scruggs & Mastropieri, 1996).

Physical access to science classrooms is only the first step. In the CLASS Project we emphasize the need for *active, meaningful* participation that only happens when science and special educators work collaboratively, sharing expertise and problem solving, for the benefit of all students (Pugach & Johnson, 2001). Universally designed lessons that are sensitive to individual needs of students, yet challenging in the construction of scientific knowledge, are possible (Tomlinson, 1999). Students with disabilities in activities-based classrooms (including laboratories and field experiences) make academic gains equivalent to those of their typically developing classroom peers, and superior to most students with or without disabilities who are in textbook-based classrooms (Mastropieri, & Scruggs, 1998). The CLASS Project trains teachers to collaborate, design, implement, and assess active, meaningful science lessons in a way that opens up the world of science to all students, including those with disabilities.

### **Background of the CLASS Project**

The origination of the CLASS Project at Wright State is no accident. Since its founding 30 years ago, Wright State University has maintained a uniquely strong commitment to serving the needs of persons with disabilities. The campus is architecturally barrier-free and accessible, including a climate-controlled underground tunnel system for pedestrian and wheelchair traffic.

In addition to campus physical plant, philosophical beliefs about the rights of all students to opportunities for higher education make WSU an attractive university option

for students with a wide range of disabilities. In fact, WSU ranks in the top 25 colleges and universities in the United States in terms of the proportion of students who attend with a diagnosed disability. Currently, WSU's Office of Disability Services (ODS) provides assistance to approximately 500 students out of an approximate 16,000-member student body. As many as 200 additional members of Wright State's student body, faculty, and staff have disabilities but do not require support services from ODS.

The inception of the CLASS Project actually began early in WSU history, when faculty in the Department of Biological Sciences realized that every WSU undergraduate who had a disability would be taking, at a minimum, the year of a laboratory science required for general education. At most universities, students with physical disabilities are typically exempted or excused from laboratory requirements. Faculty at WSU, who are strongly committed to the experimental aspect of science, refused to consider this as an option. Professors understood that accommodations would be needed if all students were to receive an equitable learning experience. The problem science faculty faced was how to adapt "traditional" science labs and field experiences to enable students with physical or sensory disabilities to become actively engaged in their own learning. How could a young woman using a wheelchair get close enough to see specimens displayed on the lab table? How could she examine slides under the stationary microscopes? How could a student with limited hand movement manipulate glass beakers safely? How could someone with a severe visual impairment study the social movements of decapods or identify fossils at a field site?

The faculty addressed this problem with all the zest and zeal common to scientists "on a mission." First, seeking input from the individual students themselves, biology

professors began to make accommodations for their general education labs. For example, Wright State labs have a special, weighted microscope base that allows the microscope to “float” off the edge of the bench, making it possible for a student who uses a wheelchair to reach the eye piece. Cutouts in lab benches enable students in wheelchairs to move closer to their work. Plastic beakers replace glass ones. Models (purchased and constructed) permit students with visual impairments to explore materials with their hands. Careful preplanning, physical accommodations, and creative thinking offer students with visual and physical impairments the opportunity to experience authentic geologic work in the field.

Over time, this way of thinking became a natural part of the planning process for other faculty, and accommodations became more common in all labs across the science curriculum. Over 70 students with significant physical disabilities have successfully completed course requirements in biology. Several of these have gone on to earn bachelors degrees in biological sciences and are now pursuing successful science careers.

Dr. Michele Wheatly, current Dean of the College of Science and Mathematics at Wright State University, and former Chair of Biological Sciences, recognized the tremendous impact her faculty’s work could have on the lives of school aged students with disabilities and their teachers throughout the United States. In 1996, Dr. Wheatly initiated collaboration among the College of Science and Mathematics (COSM), the College of Education and Human Services (CEHS), and the Office of Disability Services (ODS). The combined effort of dedicated faculty, staff, students, and volunteers from each of these areas culminated in the CLASS Project. Funded by two successive National Science Foundation grants, the CLASS Project is a direct outgrowth of efforts by Wright

State biological sciences faculty to make their own laboratory/field experiences fully accessible to students with physical disabilities.

The initial effort to serve WSU students with disabilities has expanded to include students with disabilities from grades seven through university. During the past six years, ideas conceived on the Wright State campus continue to be shared and built upon nationally and internationally through many avenues, including sourcebooks, adapted lab manuals, video resources, a fully accessible web site, and professional development workshops. Biology professors have been joined in their efforts by faculty from other sciences, such as geology, chemistry, mathematics, and physics. They also collaborate with science and special educators from middle school, high school, and university levels, adaptive technology and disability services experts, media specialists, and many others who are committed to extending a quality science education to all students, including those with significant disabilities.

### **CLASS Mission Statement, Goals, and Objectives**

The CLASS mission statement illustrates the Project's multi-faceted perspective, which goes beyond accessibility to excellence in science education:

Individuals with physical disabilities, given appropriate accommodations, can participate fully in the scientific method. The CLASS Project aspires to achieve excellence in the laboratory/field science education of students with disabilities. To systemically reform science education of students with disabilities, intense efforts must be focused at all educational levels in an attempt to enhance training of future teachers as well as changing the culture of science. Consistent with National Science Education Standards, initiatives focus on: Inclusion,

Technology, Inquiry, and Innovation. Further, universal accessibility (presenting material using multiple modalities and employing multiple learning strategies) benefits all students, including those with undiagnosed disabilities and those without disabilities who possess different learning styles.

Accessibility, though critical, is not sufficient in and of itself. To afford all students a quality science education, science educators and special education teachers must work together to provide a unified classroom environment that nurtures and supports students as they learn. Best teaching practices, grounded in solid research from both fields are critical to success (Stefanich, 2001).

Physical accommodations notwithstanding, adherents to the CLASS philosophy primarily employ teaching and assessment techniques based on universal design with individualization only as needed. “The principles of universal design challenge all responsible persons to design products, environments, services, and resources to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design” (Stefanich, 2001, p. 147). Proactive planning by conscientious teachers can often negate the need for complex modifications.

Inquiry-based learning is another critical component of CLASS philosophy; a hands-on/minds-on learning environment is the foundation of the Project’s belief system (Olson & Loucks-Horsley, 2000). Within this framework, students’ previous experiences, knowledge, and interests are clearly considered and respected. Flexible cooperative group learning opportunities, student choice making, and structure through ongoing teacher facilitation are other fundamental components of the CLASS Project.

CLASS Project educators use whatever adaptive teaching techniques are needed to effectively serve students with disabilities. For some students, additional time is the only modification required. Others must have ongoing access to assistive technology if they are to be successful. For example, virtual labs enable students who have limited mobility an opportunity to manipulate and explore their environment even if they lack dexterity and strength. Adaptive software, modified keyboards, switches, mouse alternatives, touch screens, and communication devices are additional accommodations used to facilitate learning. Physical accommodations and employing adaptive equipment enables students with disabilities to “touch the science.”

Customizing the format of particular exercises for different types of input/output capabilities, and developing alternative methods of assessment, while maintaining content rigor, are cornerstones of CLASS Project efforts. In this way, educators ensure that learning and evaluation of students with differing abilities is equitable and that it approximates the learning and evaluation of students without physical or other impairments.

One of the most essential components of the CLASS Project, is collaboration. In effective classrooms best practices from the field of special education and constructivist principles co-exist alongside a strong sense of community to create knowledge that is a “joint venture rather than a result of individual communication from teachers to students” (Skrtic, Sailor, & Gee, 1996, p. 149). Similarly, CLASS Project members have paired a dedication to research and practice with a commitment to respecting one another’s beliefs to create a powerful transdisciplinary team that constantly informs and rejuvenates. From

its inception, members of the CLASS Project have worked together closely, sharing their experiences, ideas, questions, doubts, and time.

As a member of the National Network for Educational Renewal (NNER), Wright State University is committed to what John Goodlad (1994b) refers to as the:

delicate process of cultivation and to connecting all the essential components of a healthy teacher education enterprise: the partner schools; the subject specializations of the university arts and sciences departments; and that part of the professional preparation of teachers that is commonly provided by schools, colleges, or departments of education (p. 632).

Drawing from the extensive personal and professional experience of their partners, including students and professionals with disabilities, scientists, science educators, special educators, technology “gurus”, and more, the CLASS Project team embodies the spirit of collaboration that is fundamental to the NNER and also vital to the successful inclusion of students with disabilities in general education science classrooms. Together, these individuals are dedicated to improving the teaching of preservice and inservice educators throughout the United States and beyond as they demonstrate how they can create and sustain an effective science learning environment for all students.

Experienced team members, those with tenure, those who are department heads, and deans, have a supplemental goal of “training” the next generation of academics in the ways of collaboration and effective teaching. Simultaneous renewal (Goodlad, 1994a) becomes a reality as evidenced by the consistent growth of individual CLASS Project members who learn even as they continue to teach and model for others.

The long-range goal of the CLASS Project is to increase the percentage of people with disabilities represented in science, technology, engineering, and mathematics (STEM) careers. Just as important, however, is the intermediate goal of developing resources that can be used nationally to assist educators in designing and implementing appropriate laboratory exercises for all students, including those with disabilities. Using resources from the CLASS Project, teachers are able to achieve a thoroughly stringent science curriculum, based on the highest standards, taught to a widely diverse student population, resulting in learners who can consider thoughtfully, think critically, make decisions wisely, and solve problems effectively...in science and in life.

Initial objectives of the CLASS Project included the following:

- Develop and disseminate nationally a source book for science teachers outlining ways to promote effective learning for all students, including those with disabilities.
- Develop and disseminate nationally an adaptive laboratory manual reflecting national science education standards and detailing preparation, materials, cost, set-up, clean-up and management of a full complement of laboratory exercises that are appropriate for all learners.
- Train science educators (middle school through university) from all over the United States and beyond in the use of the source book and adaptive lab manual through a two-week summer workshop, including one full week of direct experience with students who have physical, sensory, and/or learning disabilities.

The CLASS Project team has met these objectives and is currently refining and expanding their early work with funding from a second National Science Foundation grant.

As CLASS moves into its seventh year, team members have come and gone, and new colleagues have taken their places. The emphasis of the work has shifted slightly in some areas, but the primary focus remains the same: making quality science education possible for every student, regardless of difference or disability.

### **CLASS Project Process, Procedures, and Products**

The CLASS Project team is a diverse group of individuals, all sharing the same philosophy and goals (but varying widely in terms of area of expertise) with respect to persons with disabilities. Weekly team meetings throughout the calendar year provide the forum for planning, implementing, and evaluating past, current, and future endeavors. At any particular meeting, one is likely to see faculty, support staff, and students from the College of Science and Mathematics, the College of Education and Human Services (Teacher Education Department), and the Office of Disability Services. Some of these individuals have disabilities themselves, and provide an immediate “check” on the feasibility of plans. In addition to the “regulars,” weekly meetings may host a guest, such as a technology coordinator from WSU’s Center for Teaching and Learning, or a special education or science teacher from one of the local school districts. Sometimes the visitor is simply interested in the work he or she has heard goes on with the CLASS Project and comes to learn more and offer support.

Weekly meetings help the team brainstorm, plan, and negotiate the products and activities that will become part of the CLASS Project’s future. Caring, creativity, and

consensus are the foundation of these meetings, and because of this solid grounding the CLASS Project constantly evolves. Since the Project began, the team has initiated and supported numerous products and activities, many of which have become a mainstay not only of Wright State University, but also of school districts as far spread as Montana and New York.

### CLASS Summer Workshop

Perhaps the cornerstone of the CLASS Project is the professional development workshop held on Wright State University's campus during each summer. Since 1998, the CLASS Summer Workshop has provided a phenomenal opportunity for science teachers and special educators from middle school, high school, and/or higher education environments to learn and practice accessible science curriculum and instruction techniques. The CLASS Project pays for travel, room and board on the Wright State campus, provides a monetary stipend, and offers the option of earning graduate credit. Each year teachers are recruited nationwide through such avenues as advertisements in professional science journals, through promotional booths at conferences, and through direct mailings to Special Education Regional Resource Centers (SERRC), regional colleges and universities, and regional superintendents and principals. Educators have come from all over the country to learn about equitable, high quality science instruction and to share their own diversity and expertise with one another and the CLASS team. In 2001, one participant traveled from Great Britain to take part in the CLASS Workshop. This individual, himself a science educator with a physical disability, echoed the CLASS Project's assertion that there is a critical need to advance the opportunities of people with disabilities in the field of science.

The reasons participants give for attending the workshop are as varied as their locales. Some are middle school or high school science teachers anticipating a more inclusive classroom. Others are special educators who are currently team teaching with a science educator and who want more science training. If possible, the Project will invite both the science and the special educator; such teams hold a tremendous potential for systemic change back in their school districts. College and university faculty and staff have also come to get advice on how best to equip their new science labs or buildings.

The CLASS Workshop has always been a two-week commitment. During the first week, educators (maximum of 10) are trained in the use of the CLASS Source Book and Laboratory Manual (see below.) The focus during this initial phase is on disability awareness and sensitivity. Teachers learn about various physical and associated learning disabilities, as well as adaptive technology, and sound teaching techniques reflecting National Science Education Standards (Olson & Loucks-Horsley, 2000). Lab and field exercises are introduced and participants brainstorm appropriate accommodations for diverse student needs.

During the second week, middle and high school students, each of whom has a physical and/or learning disability, join the teacher participants for their one-week residential Science Camp. Student participants come to the CLASS Project on the recommendation of teachers, parents, and administrators. Most are from within a 100-mile radius of Wright State University. In choosing students, the CLASS team tries to balance a number of diversity issues, but primarily addresses the need for a range of differing abilities, which will give the adult participants a solid grounding in planning accommodations and modifications. Students with visual and hearing impairments,

cerebral palsy, and other severe physical/communication disabilities have all participated successfully in the CLASS Science Camp.

Two months before beginning the camp, students attend a one-day orientation/evaluation on Wright State's campus. During this time, they participate in an individual assessment conducted by the Office of Disability Services to determine what assistance they will need during their stay at Wright State. Adaptive technology, sign language interpreters, tape text readers, and attendant care providers are examples of necessary accommodations. For many students, the Science Camp is the first time away from home overnight without their parents. They discover they can be more independent. They find out they are competent in science, and they explore what it is like to live on a university campus. For some, the results are profound. For example, CLASS Workshop "graduates" have since joined the WSU student body or another university as full time students.

During the student week of the workshop, educators are paired one-on-one with a different student for each of the labs. Together, student and teacher engage in hands-on, inquiry based laboratory and field exercises, taken from the CLASS Laboratory Manual (see below). The educators constantly monitor their student to identify possible problems. The students teach the educators how to best meet their individual learning needs for each lab or field exercise. After each activity, adult participants meet with CLASS science and special education faculty for a debriefing session on the inclusionary aspects of the lesson. By the end of the second week, educators have had an opportunity to work individually with up to ten different students, each of whom has a unique set of strengths and needs. Based on their learning over this two-week experience, educators develop a

detailed action plan specific to their home school. The action plans require analysis of present conditions, and specific steps the teachers will take to bring about the desired change and include a plan for evaluating their progress. Each participant presents his or her action plan to the rest of the CLASS team and receives desired feedback.

Extracurricular activities are also a big part of the Science Camp experience. Students and teachers alike participate in recreational activities such as visits to museums, art galleries, conducting craft projects, wheelchair basketball, adaptive swimming, and talent night. Viewing students from a social as well as academic perspective allows teachers to get to know the students as “real” people. They develop a more complete understanding of the strengths, challenges, and personalities of their students. The opportunity for teachers to interact in this way with their students is rare, but critical, if educators are to overcome their own attitudinal barriers and support their students’ right to a more “typical” education and life.

#### CLASS Sourcebook for Teachers

The CLASS Sourcebook (Wood, 2001) is a resource intended to help science teachers design and implement effective learning in a laboratory or field environment. The Sourcebook was written in collaboration with professionals from a number of fields, including biology, science education, special education, rehabilitation, disability services, and psychology with input from persons with physical and learning disabilities, parents, and others who were able to lend their expertise to the project. Contributors to the Sourcebook come from middle, secondary, and higher education venues. The book is divided into several sections for easy reference. Teachers can find broad descriptions of various disabilities as well as suggested accommodations for each general type. The

section on physical environment addresses lab safety and design. It also provides a description of specific equipment, adaptive technology and a computer hardware/software with an assessment of commercially available products.

The Sourcebook is available both in hardcopy and as a desk reference CD to assist teachers and others in locating universally accessible lab and field experiences. The CD also provides leads to existing websites that offer even more information on legal issues, collaborative learning, and alternate forms of assessment. The Sourcebook has been field tested since its origination and is constantly being revised and improved. Originally dedicated to the field of biology, current efforts with the Sourcebook focus on expansion to other areas, including geology, chemistry, and physics.

Technology plays a big part in disseminating CLASS Project knowledge and resources. In addition to the CD Sourcebook, CLASS has already produced one training video, and is working on others. Team members are also developing a distance learning course that will be available to educators across the nation. Such a course will support inquiry-based learning and inclusive practices while negating the need for teachers from other parts of the country to travel great distances to Wright State to attend the summer workshop.

### CLASS Laboratory Manual

The Laboratory Manual (Wood, 2001) is an assembly of specific lab and field exercises from a number of disciplines, including biology, chemistry, geology, physics, and mathematics. Each activity is grounded in constructivist philosophy and addresses components of the National Science Education Standards. Most of the inquiry-based exercises are primarily targeted to high school/introductory college level, although the

appendices illustrate how activities can be spiraled down to meet the developmental needs of students in middle or early secondary science classes. Practicality and the often-limited resources of our middle and secondary schools influenced the choice of exercises for the manual.

The lab manual describes in thorough detail how to design lab activities that are effective in mixed classes of students with and without disabilities. Essential components of critical thinking, problem solving, and creativity using scientific process are combined with innovative suggestions on how to meet the individual physical and other learning challenges that some students face in a lab situation. Each lab exercise can be duplicated and used directly in inclusive science classrooms. Examples of lesson plans included in the manual are: bread making and yeast, agonistic behavior in crayfish, isolating DNA, collection and classification of Ordovician fossils, chemistry in a bag, and introduction to microscopy.

Laboratory preparation instructions, and advice on how to find good materials, cost estimates, suggestions for organizing and storing chemicals and equipment, handling lab set up, clean-up, and management complete the contents of the CLASS Lab Manual.

The CLASS Sourcebook and the CLASS Laboratory Manual are intended for national distribution to educators who will use them to improve science learning outcomes for students with disabilities. Members of the CLASS Project team frequently disburse copies to attendees at professional science conferences, through exhibition booths, and at CLASS Project presentations. Currently, the team is devising a method whereby they may collect systematic feedback on the usefulness of these products to the educators who receive them.

CLASS Website (<http://biology.wright.edu/CLASS>)

The CLASS Project website was launched in 1997 as a source of information and support for CLASS Workshop participants, students, and other interested parties. Since then, it has undergone periodic reconstruction for functionality and accessibility and is now entirely accessible. Each page of the revised website has a menu of offerings, making it easier for people with disabilities to access. All images have alternative tags so that if the mouse is placed over the image the description is displayed or read by the software. Tabular information is limited and, when necessary, includes tab indices.

The site also has interactive capabilities. Summer workshop application forms are available on-line, as are the CLASS Newsletter and Sourcebook. Teachers will also find an application for CLASS mini-grants (up to \$5,000, as available) on this website. A Discussion Forum is available for educators and former participants to address issues of concern. Former Workshop participants can also make presentations to their colleagues (“trainer of trainers” concept) upon return to their own institutions, using the PowerPoint presentation available on this site.

### **CLASS Project Outcomes**

The CLASS Project currently targets numerous educational environments, from middle school through university. Outcomes have potential significance at many levels and in many ways, from personal to systemic. For example, descriptive statistics from pre- and post-surveys (multi-point Likert scale, ranging from 4 = strongly agree to 1 = strongly disagree) administered to teacher participants in the CLASS Workshop indicate that the Workshop has a lasting effect on the way they think about science and ability. Teachers report they feel more confident about being able to teach the students with

disabilities who are in their classrooms. The teachers surveyed reported 1-2 point gains (on a 5 point scale) in preparedness to teach in 7 out of 13 categories of disabilities affecting students. More than half of all participants reported some increase in preparedness (minimal to adequate, adequate to moderate, etc.) to teach science to students with disabilities such as orthopedic impairments, hearing and visual impairments, physical or health impairments, and multiple disabilities.

The survey respondents also feel better equipped to create a more inclusive learning environment for all students. For example, they report a 1.90 point increase in their familiarity with resources on how to teach science to students with disabilities. They also demonstrated a 1.50 point increase in using appropriate management strategies and 1.10 point increase in awareness of best practices research for teaching students with disabilities. After participating in the workshop, teachers reported being more prepared to use metacognitive strategies, to design and modify assignments and assessments, and working with parents and other professionals (1.45, 1.05, .95, and .60, and .55 point increases respectively).

Workshop participants take what they've learned and implement it in their own institutions, often becoming role models for others. For example, one high school science teacher was able to successfully serve a student who is blind, by using the techniques she learned during the Workshop. She adapted equipment, methodology, and assessment techniques to enable her student to become an active participant in the learning process.

CLASS Project "graduates" have made significant strides toward fostering inclusive science education programs in their schools and districts. One special education/science education team in particular was instrumental in developing an

addendum to their district's science course of study that focused on adaptations for students with disabilities. This pair of teachers is currently committed to providing professional development through inservice, consultation, and collaboration to other faculty on concepts and skills they learned during the CLASS Workshop. A new element added to the later Workshops, a follow-up, individualized project implemented by teachers in their home school districts, will foster more definitive outcome data in the future.

Students who have been involved with the CLASS Project begin to think involvement in science is a real possibility for them. They report a rise in self-advocacy. Eight of fifteen students from the Project who have since graduated from high school have returned to WSU or other universities as full-fledged university students.

Wright State University science students with disabilities (majors and non-majors alike) consistently complete their laboratory requirements after participating fully in planning the modifications and adaptations they need to be successful. Professors respect and value student contributions to the planning and instructional process; in turn, they learn from their students. CLASS, in collaboration with other grant initiatives, supports the work of several WSU students with physical disabilities who are currently performing research in a range of laboratories focusing on environmental issues. Additionally, philosophy and methodology from the CLASS Project is also covered in science methods courses taught by science education faculty who are a part of the Project. In this way preservice science educators are learning more about how to design and maintain effective educational environments for all students, including those with disabilities.

More difficult to assess, is the impact on a wider scale. CLASS Project team members have presented at almost two dozen local, state and national conferences in recent years. The CLASS Sourcebook and Laboratory Manual continue to be disseminated to educators at every opportunity. Invitations to share CLASS philosophy and techniques with others arrive at a steady pace.

One of the most significant outcomes for one of the authors is the collaboration that exists among the CLASS Project team members. As a special educator and faculty member in Wright State's Teacher Education Department, this author's experience with science education had been minimal. As a former special education supervisor, she had witnessed "inclusive" science classes where students with disabilities struggled to read textbooks and complete worksheets. Participation on the CLASS Project has solidified this author's own belief in the potential for effective inclusionary practice. The CLASS Project is a microcosm of the collaboration that should exist between general and special educators in every school in our country. Mutual respect, shared expertise, a relinquishing of the fear of learning something new, and a willingness to commit precious time to effect change are critical components that enable adults to empower students. Every member of the CLASS team exemplifies these traits and the time spent working together is often openly acknowledged as our most invigorating and rewarding.

#### Discussion and Future Direction

Scientists love a good problem. The science faculty at Wright State University recognized inequitable science education as a significant problem for many students with disabilities and they were determined to do something about it. Their collaborative efforts with special educators and others expanded into an award-winning program

known as the CLASS Project. The CLASS Project exemplifies the good that can come from dedicated professionals taking the time to learn from one another. We are sharing one another's language, philosophy, and methodology. We are finding both similarities and differences; and we are exploring ways to come together for the benefit of all students. Meetings are lively and respectful; ideas from all participants are seriously considered, from the Dean to untenured professor to graduate student. A sense of humor and of tolerance pervades our group; an understanding that the work we do is so important but so impacted by our many other obligations. Deadlines and due dates are sometimes fuzzy, but still we move forward! New initiatives abound.

#### Museum Accessibility

One of the CLASS Project team members is currently traveling to several local, state, and regional museums to assess accessibility for students and adults with physical and sensory disabilities. The CLASS Project team is willing to work with the museums to open up their exhibits to a wider audience. We will be detailing findings on our CLASS website. Parents and teachers should find the information helpful when planning visits or class trips to science, art, history, or other children's museums within driving distance of Dayton, OH.

#### Science in a Box

Designed to be a resource for teachers in general or special education classrooms or for teachers providing home instruction for students unable to attend school, these boxed sets will contain supplies and instructions for complete, inclusive, lab experiments or activities that are standards-based.

### CLASS On-line Course

The CLASS team is currently designing an on-line course that will teach CLASS philosophy and skills in meeting science standards while accommodating the learning needs of all students, including those with disabilities. This course will soon be available to pre- and inservice teachers all over the United States. Essentially, this course will offer the benefits of the CLASS Workshop to a much wider audience.

### Mini-grants

The CLASS Project has offered two successive rounds of minigrants (of up to \$5,000) to teams of educators in public schools who are committed to inclusive, quality science education. So far, we've awarded five minigrants to science/special education teachers in Ohio and other states who are involved in developing materials, acquiring assistive equipment, and teaming with special educators to improve outcomes for all students. Follow-up data from these mini-projects will impact our future work.

### Outreach Programs

As the CLASS Project matures, we are beginning to consider how our efforts might be directed towards teachers and students at the elementary level. Help with science fair projects, after school science programs, and a homework hotline are just some of the ideas resulting from collaborative brainstorming.

Getting excited about science and having the opportunity to engage in hands-on/minds-on learning will benefit both elementary students and the teachers of these youngsters in a way that can produce lasting change.

### Continued Research

As the CLASS Project reaches in to its sixth year, we are concentrating more on analyzing and sharing data from a formal evaluation of our efforts. We're also expanding our understanding of what science education is like for teachers and their students with disabilities in elementary, middle and high schools in the geographical region around Wright State. Toward that end, we are currently conducting semi-formal interviews with science and special educators and with students with disabilities from our region. Results of this research will further inform our future practice within the CLASS Project.

### **Conclusion**

As educational reform efforts focus more on outcomes for all, students with disabilities and their teachers may find themselves under an unexpected spotlight. It is no longer enough to teach; we must now make sure that students learn. For some, this is no easy task. Yet, the potential of students with disabilities is exciting for those who believe in it. It's also exciting to realize that students with disabilities are going to be afforded better opportunities to learn than ever before—opportunities to learn in environments with high expectations *and* appropriate modifications and accommodations. Projects like CLASS will be invaluable as teachers and students work together to match learning needs and strengths with effective methodology and assessment. The end result will be mastery of content standards, a love of science, and unlimited possibility for the future.

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