I believe all children have the right to an excellent education. It is this belief that first inspired me to enter the world of education, and it is this belief that has kept me in the urban environment in which I have chosen to teach. I never aspired to be a science teacher; in fact, I did not imagine myself teaching. An incredible internship at an educational non-profit during my senior year of college convinced me to join a two-year program and teach in an urban area where teachers were needed. After that, I would return to graduate school. Instead, I found myself “hooked” – I am now in my sixth year of teaching. Every day presents a new challenge, a new opportunity to motivate and reach students. Today I continue to advocate for the program that inspired me to teach, and I serve as a mentor for other college students who work in the program and are considering careers in education.

This program inspired me to pursue teaching in Philadelphia. Science and math teachers were needed in the city, and this is why I began teaching science, despite my history and journalism background. I consider myself fortunate to have fallen into this position. Middle school science provides a unique opportunity to engage students, stimulate their curiosity and show them science is accessible to everyone. During the past five years, I have developed strong beliefs about science education.

I understand firsthand that effective teachers need to have a strong background of science content knowledge. Teaching science with a history background was less than ideal; a teacher should not be in a situation where he or she is learning content either with or simply a few days before the students. When teachers are not knowledgeable about content, they cannot accurately answer questions or anticipate possible student misconceptions. They might even share some of the same misconceptions held by students. A teacher without strong content knowledge cannot design a lesson that addresses these possible misconceptions.

My experiences with MISEP at the University of Pennsylvania support this. My teaching has improved dramatically since the start of this program; I now have a strong foundation of science to support my classroom teaching. I am confident of my own understanding, and can focus on the best methods to teach my students.

I believe that for one to truly grasp and internalize scientific concepts, the study of science must be an interactive process. Students need to not simply be told something is true; they must have the opportunity to learn through experience and exploration. While using text to gain information is a valuable skill, students must also have the chance to have an “aha!” moment, one in which what they have read and what they have heard clicks with what they are experiencing themselves. “Students should be asking questions, resolving discrepancies, figuring out patterns, representing ideas, discussing information and solving problems” (Chiappetta, 22, 1997). Recent research supports and encourages this type of inquiry-based science, and our leading national educational organizations promote inquiry learning in science. It is true that there is a strong group of educators who favor direct instruction – a model of teaching that “emphasizes well-developed and carefully planned lessons
designed around small learning increments and clearly defined and prescribed teaching tasks” (National Institute for Direct Instruction, 2007). Yet while there are positive results coming out of direct instruction schools, especially in math and reading, I do not believe that direct instruction is the answer for science education. To learn science, students need to experience science in a variety of ways. Scripted, paced learning is not always the answer. It does not allow students to explore and interact with science itself.

In order for students to have these inquiry-based experiences, teachers must have resources – both intellectual and material. Teachers must have materials available for student use; for example, microscopes and plant and animal cells must be available for a study of cell structure. Materials are not enough, however. Teachers must also have training and exposure to research into best practices for science education. If research shows students benefit from inquiry-based learning, teachers should have training in how to teach using inquiry and provide a learning environment that fosters inquiry and questions. Eugene Chiappetta, a science education researcher, states that questions can stimulate thought and action. “Skilled science teachers are good at asking questions that cause students to generate their own questions. When students form questions of personal interest, they are more likely to engage in actions they find meaningful” (Chiappetta, 24, 1997).

In addition to best practices training, teachers must also have ongoing professional development, both to maintain a high level of content knowledge and to stay abreast of current developments in the discipline. This September, I had the chance to tell students that their one-year old science textbook was already outdated based on information I had learned from a summer biology course. This knowledge helped me impress upon students that science is ongoing and always changing as we learn more.

An effective science education requires a learning environment that allows mistakes or wrong answers. Students should be encouraged to ask questions and test their skills without fear of being wrong. I tell my students that some of the world’s greatest discoveries were mistakes made when someone was trying to find a solution to a different problem. I believe students must experience a variety of teaching approaches and strategies. They must read, write, think, explore and apply scientific concepts. Science instruction is most effective when students are taught in all of these ways, not simply one.

Science teachers can create a positive experience for students by providing them with these opportunities. Yet to truly change science education for the better, we need to make science a valued part of the school day. Science needs to be integrated throughout the disciplines. Children often believe science is a separate subject and struggle to see the connections between science and other subjects. As educators, we need to help students to see these connections. We can start by working together as colleagues to integrate our curricula. Research shows that students who experience integrated curricula often have improved attitudes toward learning, greater intellectual curiosity and better problem-solving skills (Loepp, 1999).

For example, reading teachers can use science materials to text nonfiction reading strategies. Math does not need to be a separate subject; math teachers can use data from science labs to teach graphing skills. Science teachers, in turn, can reinforce reading strategies and math skills with the science class time. In
this way, we all support one another and help students to make important connections between disciplines. When students have opportunities to apply knowledge and skills from several disciplines, they see how curricula are connected and how it is relevant to the outside world (Loepp, 1999). Many leading educational organizations, such as Project 2061, the National Council of Teachers of Mathematics and the National Research Council, call for integrated learning (Kain, 1993). As we prepare students for the real world, we need to engage them in real-world situations. Curriculum integration is one way to do this, especially when the integration is centered on a real-life problem. Not only does problem-solving force students to use a variety of disciplines, but it engages them in authentic science investigations and further develops inquiry skills (Chiappetta, 1997).

Our role as science educators is not limited to the classroom. As we advocate for better science education for all students, it is also imperative that teachers encourage all students – especially girls – to engage in the subject and consider science careers. Many students do not know of all of the career opportunities available for science. It is our responsibility as educators to make this information accessible to students. In a city like Philadelphia, the opportunities for students to engage in science outside of the school environment are endless. My mailbox is filled daily with applications for science technology teams, engineering design contests, science camps and workshops. The Franklin Institute and the Academy of Natural Sciences offer summer workshops and institutes, many of which can be financially subsidized. Local organizations, such as Summerbridge of Greater Philadelphia, will work with students to connect with community mentors. So many connections can be made to the outside world, and students rarely have the opportunity to experience it. It is part of my job as a science educator to give students these chances.

I believe that it is my responsibility as a science educator to help students see science as not simply a subject they are required to take in school, but as a way to explain and examine our world. I treasure the fact that every day I have the chance to help students get excited about science, encourage them to wonder and help them design ways to answer their questions.

Works Cited


