Passion for Science

One educator shares how she turned a fear of teaching science into excitement over hands-on science.

By Nancy Campbell

Does the thought of teaching hands-on science make your stomach do flip-flops? Are you intimidated by the constructivist approach to education? If your answer is "yes," read on to find out what happened to me. Five days before school started, I discovered I would be teaching science to seventh- and eighth-grade students. I didn't have any experience in either! Talk about four sleepless nights—I had always been a primary-grade teacher particularly interested in language arts.

For the first five years of my teaching career I specialized in reading and language arts. Teaching science, especially hands-on science, was something I had never considered. In fact, the mere thought of teaching science made me anxious. Having completed my fifth year of teaching seventh- and eighth-grade science, I can now emphatically say that hands-on science works! I've seen it work with both gifted and learning-disabled students alike. Here's how I not only overcame my fear of teaching science but also turned it into a passion. As Orlich challenges, "What better way to lose a fear of science than by getting involved in it" (1980).

Unsure of how to begin planning for middle-level science, I consulted the school's science coordinator. She told me that hands-on science was the way to go and suggested that I attend a hands-on electricity workshop with her. I didn't have a clue about how electricity actually worked. The only science courses I took in college were biology and environmental education.

As I entered the workshop, I was afraid that everyone knew more than I did and I would look foolish. After all, I was a teacher and teachers should know everything—right? Wrong! The workshop began with a lecture explaining circuits, protons, electrons, and so on. Next, the instructor asked us to pair up and build parallel and series circuits. I thought, "Is he crazy? I'll electrocute myself!" but relinquished my reservations, not willing to display my ignorance. The lead teacher and I proceeded to build a series circuit.

To this day I remember how excited I was when the light bulb illuminated. "Isn't it more fun to do science than to read a book and answer questions?" the lead teacher asked. After that, I attended as many hands-on science workshops as possible. The more workshops I attended, the more confident I became and the more my students benefited.

Two years later the lead teacher moved into an administrative position, and I became the science coordinator at Hanson Park Elementary School in Chicago. I vowed to do the best job I possibly could to assist teachers with whatever reservations they had regarding science education. "Encouraging teachers to move away from traditional methods of teaching science to more student-centered, open-ended methods is not easy. The most persuasive reports, the most compelling data, and the most articulate advocates do little to calm the very real and reasonable anxieties teachers may have" (Rossman, 1993). This was my goal.

As I looked at our school science program, it seemed—particularly at the primary level—that science took a backseat to other disciplines. This is due largely to the emphasis placed on students' performance on the reading
and mathematics sections of standardized tests. While these subjects are important, they are not the only subjects necessary for cognitive growth. Science is a vital part of a child's education. It was this realization that drove me to enter a master's degree program in curriculum and instruction in 1995. My research project centered on dispelling the science teaching fears of two first-grade teachers at my school and integrated nicely with our school's adoption of a Hands-on Science Program.

Sharing the Inspiration

The first-grade teachers I worked with both taught a general and a special-education inclusive class of 35 students. They decided to do a Building an Aquarium unit as their first hands-on lesson. When we discussed the time line for doing the unit, they understood that I would record observations of their presentations as well as students' reactions. I also agreed to provide equipment and any necessary background knowledge prior to each lesson.

Many teachers are reluctant to schedule other activities during reading period, but we were so excited about the project that we allowed the reading lesson to evolve from our science activity. The teachers began with a book that introduced the anatomical parts of the fish (mouth, eyes, fins, tail, gills, scales), and students were guided to use decoding skills to determine the correct pronunciation of the new vocabulary. This was a blueprint lesson plan for reading: The teachers read aloud to students books about the lives and activities of fish, and as a culminating activity students wrote and illustrated their own books about fish.

Building an Aquarium

There were four activities in the Build an Aquarium unit. In Activity One, students were taught how to read a metric ruler. They then poured sand into clear plastic aquariums to a depth of 1 cm. Students washed out the sand with purified water to remove any dust or impurities and set the aquariums aside until the sand was dry. The next morning one of the teachers reported, "The students are so excited. They keep going over to look at the sand to see if it has dried or anything has changed. Imagine how excited they'll be when there are fish in the aquariums!"

We often learn the hard way that things don't always work out as planned. Four days after fish (platys) were put into the aquariums, they began to die. When the teachers inquired at the local pet store as to why this may be happening, they found out that there wasn't enough oxygen in the water. Outfitting each aquarium with a pump was cost prohibitive, so we put all of the fish in one 10 gal aquarium with a pump. The fish not only survived but also reproduced! This valuable activity introduced students to new vocabulary, allowed them to use measurement skills, and provided a basis for a discussion of water pollution and its effect on aquatic plants and animals.

In Activity Two the students observed, described, and illustrated an aquatic plant (Anacharis). The students were taught to use 10x microscopes to examine each plant's leaves. They then drew what they saw through the lens in their science jour-
cept to explain to a young child. The teacher decided to list the different behaviors of fish and snails on the board. Students then observed the animals in the class aquarium for those behaviors and commented on the behaviors they recognized. To assess students' comprehension, the teachers drew a Venn diagram comparing the behaviors of fish and snails on the board (see Figure 1), filled in according to students' input. The lesson ended with students doing higher-order thinking and comparing fish to humans. One astute child commented that fish and people are alike because they both come in different colors and sizes.

A Lesson for Teachers
Before and after working on this project, I administered the Shrigley-Johnson Attitude Scale (1994) to the two teachers to ascertain their feelings and practices regarding science teaching. The scale consisted of 26 questions about their personal feelings about science, their likelihood of attending science workshops, and their background in science content course work. As the research project progressed, both teachers became more confident in their ability to present a topic that they had not previously taught. And as their confidence grew, they also began to enjoy the project more and more; they even began developing plans for another unit that involves hatching chicks.

Completion of my master's degree, including this project, enabled me to become the science coordinator for the school. I now visit each classroom and help teachers immerse children in hands-on science. The Hands-on Science Program was implemented at our school in 1996. Since that time, scores on the Illinois Goal Assessment Program, a standardized test given to fourth- and seventh-grade students, have increased significantly. In 1996, 72 percent of fourth-grade students and 64 percent of seventh-grade students met or exceeded the state goal. In 1998, 93 percent of seventh-grade students met or exceeded the state goal. I do not intend to imply that the sole reason for the improved performance was the Hands-on Science Program, but it is certainly one of the reasons. The message is clear—develop a passion and it can become the centerpiece of learning for you and your students.

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Resources
There is no doubt though that these students understood and will remember what they learned by doing and making sense of what they did as their teacher served as facilitator and guide through her use of productive questions.

**A Bridge to Understanding**

There are many teachers who engage students in hands-on activities and assume that since the children enjoy the activities, learning is occurring and understanding is developing. Few children, however, are able to construct understanding simply by engaging in an activity. Productive questions enable teachers to create a bridge between activities and students. They make it possible for all learners to arrive at understanding.

**Resources**


Sink or Float Kit—Grades 2 and 3. Delta Science Module #38-738-3133, Delta Education, P.O. Box 915, Hudson, NH 03051-0915.

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