Cultural Diversity in the Science Classroom

By Patrick L. Brown and Sandra K. Abell

“I teach in a growing area that becomes more culturally diverse each year. I am worried that I may not be reaching some of my fifth-grade class in science.”

How can cultural perspectives affect students’ views of science and science learning?

When students come to science class, they bring a variety of perspectives formed in part from their cultural heritage, religious beliefs, and family background. This may create challenges for students whose experiences are different from typical “ways of knowing” promoted in school science. In Texas, Allen and Crawley (1998) studied fifth-grade Kickapoo (Native American) students’ science learning. Students focused on their kinship with nature in interpreting their world, which often led to conflicts in science class. Studying Yupiaq children in southwestern Alaska, Kawagley, Norris-Tull, and Norris-Tull (1998) found that students learned by listening to and mimicking stories that drew on integrated science knowledge. This conflicted with the textbook approach, which divided science into separate, seemingly unconnected, disciplines. Furthermore, the curriculum encouraged students to abandon their traditional worldview of science, which included themselves, nature, and the spiritual world. All students need experiences with school science that connect science with their everyday lives in familiar ways.

Second, students from different cultural backgrounds may have different styles of interaction that make it hard for them to perform in the ways their science teachers expect. In their study of Texas Kickapoo children, Allen and Crawley (1998) found that students viewed science learning as a cooperative venture and wanted to share answers and assignments. To the frustration of their teachers, they viewed their grades in science as a low priority. Anderson, Holland, and Palincsar (1997) found that learning science was difficult for sixth-grade students whose background was different from the language and interaction norms used in school science. For example, when creating a presentation to explain molecules and matter, the students focused on getting along with each other and creating an attractive and well-designed poster, rather than giving priority to learning the science concepts. When student and teacher expectations differ, students may have a more difficult time learning science.

Can inquiry-based instruction help bridge cultural backgrounds and foster science learning success?

The hands-on, minds-on nature of inquiry may help all students develop authentic science interactions and learn science in a context that is meaningful and relevant to their lives. Working with fourth-grade...
Haitian and Hispanic students, Fradd, Lee, Sutman, and Saxton (2001) investigated how students performed in an inquiry-based curriculum for teaching the water cycle and weather. Although many of the students came from homes where asking questions and debating was viewed as challenging authority, over time their teachers guided students to understand that questioning and debating are essential features of scientific inquiry. Fradd and Lee (1999) also examined how inquiry-based teaching influenced the fourth graders in developing science and English language skills. They found that by engaging in scientific inquiry, students benefited from working in groups, gained an understanding of the nature of science, and improved their English. In another study, third- and fourth-grade students from various linguistic and cultural groups developed enhanced understanding of science concepts and abilities to do scientific inquiry (asking scientific questions, designing investigations, recording results, and drawing conclusions) by engaging in inquiry (Cuevas, Lee, Hart, and Deaktor 2005). As the above examples reflect, inquiry-based science instruction can indeed be effective in helping all students access the world of science.

How can teachers best support diverse cultural backgrounds when teaching science?

Teachers can help all students learn science by allowing diverse approaches to scientific reasoning in their classrooms. For example, students might use both their first and second languages to engage in science. Jean-Charles, a student in a sixth-grade bilingual classroom, used English to clarify technical terms not present in his first language, Haitian Creole. By expressing his ideas in two languages, he used his full range of linguistic capabilities to develop more in-depth arguments and understanding of metamorphosis in mealworms (Warren, Ballenger, Ogonowski, Rosebery, and Hudicourt-Barnes 2001). Students might also be encouraged to engage in creative thinking in science. Another student in the bilingual class, Emilio, designed an experiment to test whether ants prefer light or darkness. Unlike the typical science class in which students think about problems from an outsider’s perspective, Emilio was encouraged to be creative and to think about being both inside and outside of the ant’s habitat while designing his investigation. The interplay of Emilio’s imaginative (insider) and evaluative (outsider) perspectives resulted in deeper reasoning about variables and experimental design. By opening up the science class to different languages and types of reasoning, teachers can encourage students to cross borders between their cultural backgrounds and the science classroom.

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References


