

LITERACY IN THE SCIENCE CLASSROOM

Every Science Teacher Has a Role as Language Teacher

By Paul Dumas

Science classrooms across the Pacific include students who are English language learners (ELLs). Schools in Hawai'i have experienced a 40 percent increase in the number of ELLs in the last 10 years and teachers across the remainder of the Pacific usually face classes in which a majority of the students have a first language other than English. Diversity is a part of daily life on school campuses.

The standards-based science classroom can be an ideal setting for ELLs to excel. While the paths to success are as diverse as the students in the classroom, one critical ingredient is high expectations for all students. It is also especially important for teachers of ELLs to begin instructional units with direct experiences that provide a framework for the development of concepts and vocabulary. A checklist covering the characteristics of effective practice can be found in the sidebar.

The science teacher with ELL students needs to be particularly aware that students are attempting to build their understanding of science while concurrently developing their language skills. Developing background knowledge, pre-reading organizers, reading and study strategies, and opportunities to write with a variety of purposes and audiences all assist this process. The vocabulary of science can be particularly problematic. Effective science teachers make every effort to build vocabulary from concrete experiences and discuss the meaning of words, while giving examples and non-examples. Science teachers who place an emphasis on using the "words of science" in conversations and in writing help students understand the vocabulary and the conventions of scientific discussions. Special attention needs to be paid to words, such as "work," with very specific scientific meanings that are different from the meanings used in everyday conversations. It is well worth the time and effort required to involve students in a variety of strategies so that they can effectively use the language of science.

Though it is important, language is only one aspect of the diversity that ELLs bring to the classroom. A student's culture affects all types of communication – including interactions with teachers and other students. Understanding cultural diversity is as important as implementing strategies to address differences in English language proficiency in the multicultural classrooms found in Hawai'i and many other areas of the Pacific. According to Orlando Taylor's 1987 publication *Cross-Cultural Communication*, students from other cultures are

at high risk of failure if teachers have little knowledge of or appreciation for the cultures of their students. Understanding and using the communication norms of a new culture is often more difficult and a slower process than language acquisition. There are several steps that science teachers can take to create "culturally-friendly" classroom environments.



Photos: Lesley Lee

▷ Teachers of ELLs should begin instructional units with direct experiences that provide a framework for the development of concepts and vocabulary.



▷ Effective practice for teaching science to ELLs provides opportunities for students to connect the science they are experiencing in the classroom to events in their lives.

The first of these is for teachers to better understand the cultures of their students. Expecting students to ask questions, participate in cooperative groups with students of the other gender, or make eye contact with the teacher may lead to discomfort and confusion for students from some parts of the world. That is not to say that students cannot be expected to adapt, but teachers must be aware of these differences and show patience as young people adjust.



Secondly, science classrooms should provide all students with regular opportunities to connect the science they are experiencing in the classroom to events in their lives. These events are often very different from the examples presented in textbooks. Providing students with opportunities to share this knowledge communicates to them that the teacher values their cultures and backgrounds. It also enriches the entire class.

Thirdly, as students enter new cultural situations, their families and other community members from similar cultural backgrounds can be valuable resources. Family members know the child best and can provide information about the student's educational background, assist with the transition by supporting the student at home, and volunteer at school. This can sometimes be difficult because family members are often facing many of the same challenges that their children are, but simply by reaching out, teachers are communicating their interest in the success of these students. Inviting community members of diverse backgrounds, particularly those engaged in science and health careers, to participate in classroom activities yields many of the benefits mentioned above, as well as the added gain of establishing a variety of role models for all students.

Successful schools are critical to our future, and scientific literacy is part of that success. Scientific literacy includes the ability to read with understanding, ask and answer questions, and communicate orally and in writing about scientific topics. All teachers of science from kindergarten through high school need to assume responsibility for bringing students to this level of excellence.

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Checklist for Effective Practice

- Is science teaching organized around “big” questions?
- Are students involved in authentic reading and writing experiences?
- Is there an attempt to draw on students’ background knowledge and interests? Are students given choices?
- Is the content meaningful? Does it serve a purpose for the learners?
- Do students have opportunities to work collaboratively?
- Do students read and write as well as speak and listen during their learning experiences?
- Are students’ primary languages and cultures valued, supported, and developed?
- Are we engaging all students in learning? Are students involved in activities that build their self-esteem and provide them with opportunities to succeed?

Adapted from “Checklist for Effective Practice With English Learners,” by David Freeman and Yvonne Freeman, TESOL Matters, December/January 1999.