

A young boy with dark hair, wearing a grey sweater with a red stripe at the bottom, is smiling and looking towards the camera. He is holding a large, open teal book in front of him. The background shows a classroom setting with other students at desks, some of whom are looking at their work. There are computer monitors on the desks in the background.

SUPPORTING ENGLISH
LANGUAGE LEARNERS'
READING IN THE SCIENCE CLASSROOM

by Greg Corder

Several organizations in the scientific community have communicated a need for individuals to develop scientific literacy (AAAS 1993; National Academy of Sciences 1996; NSTA 2005). The skill to read and understand science-oriented information is an important means by which students may enhance their ability to acquire scientific literacy.

It might seem obvious that students with limited reading skills also have limited educational opportunities. Students acquiring English as their second, non-native language—presently referred to as English Language Learners (ELLs)—face this obstacle. Fortunately, a body of research has emerged that provides specific techniques for supporting and developing their reading ability. These findings can be readily applied to the science classroom.

English Language Learners

Students in the English Language Learner population are formally labeled as Limited English Proficient (LEP) by the federal government and most states. Although sharing a low proficiency skill of the English language, this rapidly growing segment of students is extremely diverse. They represent “every echelon of society from wealth, privilege, and education to poverty and illiteracy; they speak varying degrees of English” (Roseberry-McKibbin 2002). Moreover, many immigrants, refugees, and migrants enter the United States with “limited, intermittent, or interrupted schooling” (Rivera and Vincent 1997). Some English Language Learners are actually American-born (Echevarria, Vogt, and Short 2004); however others “enter the United States from many places. In the different countries of origin, curricular sequences, content objectives, and instructional methodologies may differ dramatically from American practices” (McKeon 1994). An obvious language deficit challenges English Language Learners’ academic success, while cultural and socioeconomic differences compound their education struggle.

The population of students classified as English Language Learners in American schools has and continues to experience major growth. Between the 1992/93 and 2002/03 school years, the total population of American students grew approximately 11%, while the population of identified LEP students grew approximately 85% (NCELA 2004). Moreover, Ruiz-de-Velasco and Fix reported that immigrant growth has been concentrated in urban areas, thus causing more extreme growth for those school systems

(2000). Coupling their unique education needs with their population’s growth makes the task of teaching English Language Learners seem daunting.

Setting a language objective

In general, stating an explicit objective for a lesson is considered a good teaching practice. An example of an objective in a science classroom might be, “The student will determine the density of the sample.” This example is a content objective and identifies “what a student should know and be able to do” (Echevarria, Vogt, and Short 2004). However, English Language Learners’ needs extend beyond the science content alone. They need opportunities to listen, speak, write, and read English. Research suggests inclusion of language objectives along with content objectives. Language objectives range from lower order, such as, “The student will underline unfamiliar words in the passage,” to higher order, such as “The student will read the four authors’ descriptions and synthesize a model.” The language objective’s level should vary based on the language proficiency of your students.

All objectives must be comprehensible and explicitly communicated to students. The manner in which you direct students to an objective will determine its effectiveness: First, post the objective in a location that gives students easy access; second, orally state the objective; third, refer to the objective at the beginning and end of an exercise that demands reading. These steps will help your English Language Learners realize the importance of developing and practicing their reading skills.

Supplying background information

Many English Language Learners enter our classrooms with a different set of experiences than their fluent English-speaking counterparts (Echevarria, Vogt, and Short 2004). This means that many of them lack the background knowledge required for reading that many texts may take for granted. Therefore, teachers must supply that necessary background knowledge.

It may be necessary for you to “model how to follow steps of directions needed to complete a task” (Echevarria, Vogt, and Short 2004) such as a lab or project. As you model, you can think aloud by orally stating the objects you are manipulating and your thought process as you proceed. Modeling supplies English Language Learners with a visual image and accompanying terminology from which they can

draw when encountering those terms and concepts in a reading passage.

When students encounter unfamiliar words, a reading passage becomes more difficult for them (Dale and Chall 1948; Klare 1974). To counter this, you can preteach key vocabulary. All difficult terms should be considered, even those that are not considered science vocabulary. For example, you can create and maintain a “word wall” by defining, discussing, and posting words that students identify as unfamiliar. This technique provides valuable prereading instruction, while creating a resource to which students can quickly refer and reinforce English language gains.

Linguistic modification of text

Reading is only comprehensible if a selection’s linguistic complexity is within students’ grasps. Finding and supplying resources that match a student’s specific reading level and the desired curricular content is an ideal accommodation. However, availability and funding may limit your ability to do so. Therefore, linguistic modification of available texts may be necessary.

The level of text modification depends on an English Language Learner’s level of need. Some strategies are less time consuming. Examples might include highlighting text, writing notes in the margin, or including illustrations to accompany each direction. However, more time-consuming methods, such as rewriting reading passages, textbooks, or directions, might be necessary to linguistically simplify the text.

Linguistic simplification does not mean that the text is “dumbed-down.” When considering linguistic simplification, text adaptation must not “significantly diminish the content concept” (p. 25). What is more, it is suggested that “the major concepts be retained and just the readability level of the text be reduced” (Echevarria, Vogt, and Short 2004).

Researchers have identified several specific characteristics that affect a text’s level of difficulty, and you can draw on their findings when simplifying your own texts.

You can create and maintain a “word wall” by defining, discussing, and posting words that students identify as unfamiliar. This technique provides valuable prereading instruction, while creating a resource to which students can quickly refer and reinforce English language gains.

- First, passages with longer words and longer sentences are more difficult to read (Bormuth 1966; Flesch 1948; Klare 1974).

- Second, passive voice is not always as clear as active voice (Forster and Olbrei 1973; Savin and Perchonock 1965; Slobin 1968). An example of passive voice is “The cause had been identified by scientists.” An example of active voice is “Scientists identified the cause.”

- Third, a long string of consecutive nouns elevates reading difficulty (Just and Carpenter 1980; King and Just 1991; MacDonald 1993).

- Fourth, a subordinate, or independent, clause is more difficult to read than a coordinate, or dependent, clause (Botel and Granowsky 1974; Wang 1970). A coordinate clause can stand by itself as a sentence, while a subordinate

clause cannot.

- Fifth, an abstract statement is more challenging to comprehend than a concrete statement (Cummins et al. 1988). An example of an abstract statement is “Record your data.” An example of a concrete statement is “Record the volume of the cylinders in Table 1.”

Echevarria, Vogt, and Short suggested that the inclusion of idioms or slang may limit reading comprehension by English Language Learners (2004). Some examples of English idioms in a science classroom might include “hold on to your hats” to prepare students for surprising results or “don’t beat around the bush” to encourage students to use their time wisely. Poorly collected data may be referred to using slang terms such as “garbage” or “trash.” Although rare in science texts and other resources, idiomatic phrases and slang terms should be avoided.

A fair degree of judgment is necessary when modifying text. For example, converting an abstract sentence into one that is concrete may increase its length; however, that may be an acceptable compromise to clarify instructions. Linguistic modification may seem challenging at first, but with experience, the practice becomes easier and English Language Learners reap the benefits.

In a profession where teachers are perpetually burdened with more and more responsibilities and expectations, you may feel that linguistic modification takes away from preparing quality science instruction. If this technique seems overly time consuming, seek assistance. Many school divisions hire English as a Second-Language (ESL) resource teachers. Depending on their designated role and training, they may be able to help. If you work with an interdisciplinary team of teachers, you may have access to a language-arts teacher who is willing to lend a hand.

Conclusion

Reading ability can limit English Language Learners' success in the science classroom. However, these students need to develop their reading skills so that they can build scientific literacy, thus enhancing their contributions in society. Fortunately, educators can employ a number of specific techniques that aid English Language Learners as they strive to develop reading skills. Moreover, by gradually increasing student expectations and the degree of linguistic difficulty over time, students strengthen their language proficiency while lessening their reliance on their teachers. ■

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