The Common Ground
A rationale for integrating science and reading

By Christine Anne Royce and David A. Wiley

For many teachers, integration of subjects like science and reading makes perfect sense; for others—including many school administrators—it does not. For these individuals, integration is an approach that takes away valuable time needed to ensure that specific learning goals are met in each discrete subject.

By building on the common ground between the subjects, you can address learning goals in both subjects without compromising either subject. In addition, you can maximize efficiency within the school day.

So, the next time you are faced with an administrator who advises, “We must focus all our efforts on our Language Arts program” or a colleague who confides, “I don’t have time to teach science anymore,” share the rationale for integration presented here. It is possible to teach both subjects—effectively—through integration.

Standards in Common

The learning standards in reading and science disciplines have much in common. Consider the National Science Education Standards (NRC 1996), whose introduction poses the question, “Why is science literacy important?” The document states, “First, an understanding of science offers personal fulfillment and excitement—benefits that should be shared by everyone. Second, Americans are confronted increasingly with questions in their lives that require scientific information and scientific ways of thinking for informed decision making ... Science understanding and ability also will enhance the capability of all students to hold meaningful and productive jobs in the future” (pp. 11–12).

The reasons identifying science literacy as important in the NSES are very similar to the reasons stated as the “purpose of reading,” in the Standards for the English Language Arts, Standard One (NCTE/IRA 1996). This Standard states the purpose of reading as “first, to acquire new information; [second], to respond to the needs and demands of society and the workplace; and [finally], for personal fulfillment” (p. 3).

As is evident from these excerpts, the overarching needs and goals of both reading and science education are similar. Both standards reflect a desire that Americans reach a level of literacy that will support their ability to obtain and acquire information and use that information for personal and global benefits and fulfillment.
The connection between science and reading is further supported in the following rationale, also explained in the *Standards for the English Language Arts* (NCTE/IRA 1996): Reading is “a wonderfully rich and complex human activity. It provokes reflection, introspection, and imaginative thinking and allows us to create and explore new ideas. It introduces us to different representations of the world. It fills our needs for information and communication and enables us to learn...” (p. 27). If an educator were to hear this quote without the citation, he or she may likely believe it part of the *National Science Education Standards*. After all, science also accomplishes each of the outcomes in those statements.

Recognizing the similarities between the goals of both science and English disciplines makes it easier for teachers to see the possibilities to meet learning standards in both disciplines when integrating subjects.

**Developing Similar Skills**

In addition to some of the overlapping goals reflected in science and reading learning standards, similar types of skills, such as problem solving and sequencing, are developed within both subjects. Armbruster (1992), who investigates the role of reading in science, contends, “reading and doing science are similar processes [that] draw upon the same cognitive base” (p. 347). Furthermore, Armbruster (1992) found “the study of science helps develop language and reading skills and strengthens the logical processes necessary for effective content reading” (p. 347).

Sequencing skills are an example of a similar process in both science and reading. In science, for example, sequencing skills appear as components of cycles (i.e., the life cycle of a plant or an animal or the water cycle), seriation activities, and throughout the process of conducting investigations.

Sequencing is also addressed in reading but often from a slightly different perspective. A common use of sequencing in reading often asks students to retell the components of a story by placing the events in the proper order. Teachers can use real-life examples from science to model this skill.

For example, the life cycle of a frog is described in the book *Growing Frogs* (French 2000). When incorporating this book as part of a reading lesson, the details about the life cycle of a frog may not be the focus of the lesson but rather the order of events that happen within the story.

**Maximizing Time and Achievement**

When it comes to teaching science versus teaching language arts, the time disparity is wide. Statistics from the Report of the 2000 *National Survey of Science and Mathematics Education* (Weiss, Banilower, McMahon, and Smith 2001) show that in grades K–3, there is an average of 115 minutes per day spent teaching the language arts (which includes reading) and 23 minutes per day on science. The averages change to 90 minutes per day for the language arts and 31 minutes per day for science in grades four through six. If reading and science could be integrated and common skills and processes combined, the time allotted to both subjects could be used to cover more of the common ground needed.

This approach is much more than an efficient use of classroom time, integrating these two subjects has been found to increase student achievement in both areas as well.

Research conducted by Romance and Vitale (1992) showed that in an approach combining the instructional time allotted for reading and science, student achievement in science was at significantly higher levels than student achievement when the subjects were taught separately. Other research cited in Mechling and Oliver (1983) suggests that reading scores improve as well. In their work, they cite evidence that hands-on science programs aid in increasing student’s reading achievement and reading readiness. Therefore, if both science achievement and reading achievement can be increased through the integration of the subjects and combining of instructional time, it makes sense to do so.

**Attitudes and Inspiration**

As teachers begin to implement literature-based programs that integrate subject areas, they are beginning to realize the advantages of children’s trade books as a means of teaching both reading and other content areas (Moss 1991). The *Standards for the English Language Arts* call for stu-
students to learn to read all types of print material, but there is a strong basis for the use of trade books beyond the appeal of the format.

Casteel and Isom (1994) found that student motivation increases and science becomes more dynamic when teachers use a literature-based method of instruction—surely compelling reasons for incorporating trade books into the science curriculum. Another advantage is the sheer variety of approaches and topics covered: Trade books can introduce the student to science processes, transmit knowledge about the world, and let students experience the excitement of discovery.

Children’s literature can also help teachers in designing hands-on experiences based on the concepts and information presented in the trade book (Pond and Hoch 1992). For example, Growing Frogs (French 2000) would be a perfect companion to a hands-on, inquiry-based lesson about the life cycle of a frog. Students could observe frogspawn in a classroom aquarium, make predictions about what will happen, and, based on their observations, draw conclusions about what frogs need to live, while incorporating both reading and science skills.

**Summing Up**
The integration of science and reading can help teachers creatively and effectively address learning standards in both disciplines while maximizing efficiency within the school day. In addition, the integration of science and reading can foster attitudinal changes in students and increases in student achievement levels.

In the reality of the classroom, an approach that motivates students and aids the teacher in meeting standards must be considered. If you find yourself among those hesitant to integrate science and reading—take our advice and try it. Sometimes, it takes a nudge to see the forest amid the trees. Consider yourself nudged.

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**Resources**


**Connecting to the Standards**

This article relates to the following *National Science Education Standards* (NRC 1996):

**Science Education Program Standards**

**Program Standard B:**
The program of study in science for all students should be developmentally appropriate, interesting, and relevant to students’ lives; emphasize student understanding through inquiry; and be connected with other school subjects.