Literacy Connections

Both research and practical experience demonstrate that language is an essential part of science learning and that both native English speakers and English Language Learners develop their language skills through authentic experiences. (Bybee 2002, 41)

Connections to Literacy

How do science notebooks promote literacy?

Literacy is defined in a broader sense today than it has been in the past. "For many years, literacy was defined in a very limited way—as the ability to read or write one's own name . . . A much more ambitious definition of literacy today includes the capacity to accomplish a wide range of reading, writing, and other language tasks associated with everyday life" (National Council of Teachers of English and International Reading Association 1996, 4). Science notebooks promote critical language use among students as they utilize the skills of questioning, hypothesizing, and reflecting. This chapter focuses on the role of notebooks within three areas of literacy: oral communication, writing, and reading.

Oral Communication

How do science notebooks promote literacy in terms of oral communication?

Children have a variety of reasons for talking in classroom settings. They talk to respond to questions posed by the teacher, to obtain answers to their own queries, to get assistance from peers and their teachers, to learn how to accomplish tasks, to participate with their peers and to understand why things happened as they did. (Fullerton 1995, 11)
Throughout an investigation, students are encouraged to discuss ideas with partners, in small groups, and/or with the entire class. This oral communication—science talk—allows them to make sense of their thinking, share their ideas with others, and receive feedback. It is talk that helps students "bridge new concepts and clarify thought" (Fullerton 1995, 16). As students work through an investigation, they talk informally as they record data and observations in their notebooks, which they then bring to the group for a more formal discussion. Often, it is in sharing their evidence with others during science talk that students begin to make sense of a concept and connect information in their notebooks to bigger ideas.

For some students, science talk is an essential precursor to writing in their science notebooks. Some students may even engage in self-talk when confronted with a difficult concept. Through this self-talk, students explore, predict, and analyze their work as they communicate with themselves. Putting ideas down in black and white can be scary for students who are exploring new concepts, as writing adds a dimension of permanence. Talk, on the other hand, feels safer because ideas are dis-

FIGURE 6-1 Two students discuss science concepts using their science notebooks.
cussed but are not permanently recorded. "Since talk assists learning, teachers must maximize talk opportunities for children" (Fullerton 1995, 16). Providing these opportunities will assist students in feeling more secure, and as students feel secure in their thinking, they may be more open to recording their thinking in their notebooks.

Thinking point: How will you incorporate science talk in your classroom?

Written Communication

How do science notebooks help promote written communication during science investigations?

Experiences provide a foundation for students to develop language; by engaging students in inquiry-based science, teachers are supporting this development. Therefore, there is a natural link between science notebooks and language development. Use of notebooks provides students with an authentic reason to write in science, and communicating ideas encourages students to synthesize their thinking in order to share it with others. Writing in science allows students to write about something with which they are familiar.

As scientists work, they record their information in their science notebooks. For some students, recording while working is a difficult task. The excitement of an investigation may make it difficult for some to stop and record in their notebooks; however, it is essential that they work toward being able to do this. When students are exposed to an integration of notebooks and the scientific investigations, recording while they work becomes second nature.

Recording during an investigation takes practice and may require support. There are some simple strategies that teachers can consider to prompt writing in the notebooks:

- Suggest students record the information in their notebooks, as they might find it useful later.
- Ask students to look at their notebooks during an investigation to see if they reflect all that they have learned. If not, ask students to take a few minutes to record that important information.
- Set the stage before students are expected to record in their notebooks. This can be accomplished by asking students to think about what or how they might want to record in their notebooks before beginning the investigation.
Students at the beginning stages of writing may find it easier to record with drawings. Technical drawings can be powerful tools for students at this stage to share their conceptual understandings; see Chapter 2, “Elements of a Science Notebook,” for more information on technical drawings. As mentioned earlier, some students find it helpful to talk about their investigation before writing, as this allows their ideas to come to the forefront. Students may feel that they need to record in complete sentences; however, changes in science occur quickly and it may be easier to capture this information with phrases and lists rather than complete sentences. Teachers should encourage various recording methods that allow students to capture the essence of the science. The goal of science notebooks is a deeper understanding of science content; it is important that this remains the goal and that writing elements (punctuation, grammar) do not get in the way of this learning.

Through using notebooks on a regular basis, students should become comfortable with recording in their notebooks and using various recording strategies. Eventually, students should be able to select a recording strategy that works best for the data they are gathering, whether that method is pictures, lists, phrases, graphs, tables, or sentences.

**Thinking point:** How will you promote writing in science notebooks during an investigation?

**How do science notebooks help promote written communication after the science investigation?**

Writing in notebooks and discussions reflect the most reasonable syntheses of data and conclusions drawn from individual and group experience. Then, findings are formalized in a report, presentation, and/or publication that is clear and honed—the final product of the work. (Bybee 2002, 42)

Throughout an investigation, students may reflect on their work, examine their evidence, and write about their ideas in order to clarify their thinking. When students are ready to share their findings with others, they refer to the information in their notebooks to create products (writing, slide shows, posters, oral presentations). These products provide students with an authentic opportunity to practice informational writing; therefore, the focus of scientific products should be on sharing the information in a nonfiction manner.

Many scientists present their research at annual conferences. (Olson and Cox-Peterson 2001, 43)
Just as scientists share their findings, students are also encouraged to do so in science conferences. The science conference is an opportunity for students to present and justify their understandings to other students or adults. It allows students to practice the skills of writing, speaking, and listening in the context of science. When discussing the science conference, Olson and Cox-Peterson stated this activity “allowed students to share their research in a manner consistent with how scientists share their research. The students felt the conference was more meaningful than a project or report completed for the class, largely due to the authentic audience” (2001, 43).

**Thinking point:** How will students formalize the information in their science notebooks to share it with a broader community?

**Reading**

**How do science notebooks help promote reading?**

In this Information Age the importance of being able to read and write informational texts critically and well cannot be overstated. Informational literacy is central to success, and even survival, in advanced schooling, the workplace, and the community. (Duke 2000, 202)

Science notebooks serve as another tool the teacher has in promoting informational literacy among students, as the data and evidence students are collecting fits this category. Student-generated writing can be a powerful motivator for beginning or reluctant readers, as it is their language and therefore highly readable. By asking students to reread their notebook entries, the teacher is encouraging them to work with informational text at their level. After using notebooks as a beginning stage of reading, students can progress to other related informational text.

After an investigation, students use other printed information for various reasons. One reason may be to verify their findings. Another reason may be to research questions that they were unable to answer through their investigations, as some questions lend themselves more to research than to inquiry. A third reason may be to see what others have to say about the materials they have been working with, as much of elementary science is the exploration of developed concepts. Finally, printed materials may also be used to raise new questions. After an investigation, students are prepared to be critical readers because they are to some degree now experts themselves. They question text rather than accept everything they see in print. This questioning may motivate students to return to the
materials in order to investigate ideas about which they read but of which they are not entirely convinced. Based on their reading, students may choose to add information to their notebooks.

In the vignette that follows, a teacher describes how second-grade students used their experiences as a basis for the critical examination of a book.

After several days of working with solids, students created and recorded a working definition for the term solid, which became part of our class word bank. They defined a solid as an object that can hold its shape without a container. During reading I introduced books about solids based upon the work they had done in science. As students read these books during our independent reading time, they were engaged, looking at what others said about solids. One of the students came to me with a book in his hand and a puzzled look on his face.

"This book's definition for a solid is different than what we said."

"Why do you say that?"

"It says that a solid is a hard object. I know that feathers and fabrics are solid objects, but they don't fit this definition."

This student was using his experiences in class to think critically about the material he was now reading.

The next vignette describes how a teacher working with a group of third graders used literature to help them answer their research questions.

Throughout the investigation of crayfish, students had recorded questions in their notebooks. Some of these pertained to information they wanted to know but would be difficult to investigate in a classroom setting. As the investigation started coming to an end, we looked back at our questions and determined which ones we had not found answers to at this point. Some of their questions included What is the natural habitat like? What do crayfish eat in their natural habitat? and How are the crayfish able to regenerate their claws? I suggested that other scientists had studied crayfish, too, and we might refer to what they learned to help us answer these questions. I introduced a variety of books on crayfish and other crustaceans. As students read and found answers to their questions, they added this information to their notebooks.
Thinking point: What opportunities can you provide for students to connect their notebooks to reading?

Vocabulary Development

What is the role of science notebooks in vocabulary development?

Science notebooks also aid in the development of vocabulary. While vocabulary is not the main focus of notebooks, it is a by-product of their use. Within science, vocabulary is developed in the context of the investigation. As students begin writing in their notebooks, they use language with which they are familiar to describe the work they are doing. Throughout the investigation, the students' informal language is connected to the formal scientific vocabulary by both the teacher and other students. Some students may record this in their notebooks while others may not. As students continue to work through an investigation, they may begin to include the formal scientific vocabulary as an integral part of the oral and written language. Figure 6-2 shows how a student has included formal vocabulary in her writing.

Science vocabulary is learned within the context of the investigation and recorded in notebooks in a similar manner. As students become comfortable with the formal vocabulary and make sense of it, they incorporate it into their notebooks naturally. The notebooks provide students with an opportunity to use vocabulary in a contextual manner. Notebooks should not become a place where students copy vocabulary words along with their definitions. This does little to demonstrate how well they understand the words; rather, it demonstrates that they can copy. Eventu-

FIGURE 6–2 A fifth-grade student demonstrates understanding of vocabulary by embedding it in her notebook entry.
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![Figure 6–2](image)
ally, students should understand the vocabulary well enough to be able to use it in the correct context while speaking and writing.

**Connections to the Standards for the English Language Arts**

**What connections are there between science notebooks and the Standards for the English Language Arts?**

Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes. (NCTE and IRA 1996, 35)

Many times students write for others; however, within their notebooks, they are writing for their own needs and using the information they collect to share with others. Writing in their notebooks allows them “to understand the varying demands of different kinds of writing tasks and to recognize how to adapt tone, style, and content for the particular task at hand” (NCTE and IRA 1996, 35).

Writing about science provides students with a real purpose based on firsthand experiences. Research shows that "students’ ability to create text . . . is best developed through engagement in meaningful reading and writing activities" (NCTE and IRA 1996, 36). Just as scientists record their daily work, students need to record their daily work. By asking students to then utilize their recordings, teachers provide them with the meaningful experience that is important in showing students the value of writing.

Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience. (NCTE and IRA 1996, 37)

An experience in science is one means that students have to gather evidence and assemble ideas. The evidence and ideas gathered are recorded in students’ notebooks, then shared with others during science talk and conferences. For many students, recording the information in their notebooks serves as a means of making sense of the work they have been doing.

**Thinking point:** How do science notebooks help address your literacy standards as set forth by your state or district?
Besides building scientific content and replicating the work that scientists do, great potential exists for notebooks to support the development of literacy through reading, writing, and speaking. The true potential of science notebooks will be realized when teachers provide "students with opportunities to read, write, and speak as scientists; attaching purpose to the use of print materials; and making the conventions and forms of reading, writing, and speaking in science explicit" (DiGisi 1998, 3). When used to their full potential, science notebooks help promote the idea that science is a context for literacy development.

Thinking point: What role will science notebooks play in literacy development within your classroom?