Developing Language Skills in Science

As you learned in the first module of this course, literacy has several key components. In Module 3, we looked primarily at how comprehending texts and understanding text structure is the foundation for critical thinking and learning, or formulating, new knowledge. In this reading, you will discover how language, speaking, and listening skills contribute to students’ literacy.

Common Core State Standards: Language

According to the Common Core State Standards, mastery of language includes three domains:

- An understanding of the conventions of standard English:
  - Standard grammar and usage in reading and speaking.
  - Standard usage of capitalization, punctuation, and spelling.
- The knowledge of language:
  - The way language works in varying contexts.
  - Language choices that affect style and meaning.
- The acquisition and use of vocabulary:
  - The use of context clues, word parts, or references to determine what unknown or multiple-meaning words mean.
  - Figurative language, relationships between words, and nuance.
  - Academic words and phrases, including the knowledge to find the meaning independently.

The Common Core State Standards break down the three domains so that, throughout the K–12 years, students develop increasing proficiency in language.
skills and thereby improve their ability to express themselves through language by the time they graduate from high school.

According to the Common Core State Standards Initiative (2010a), “The inclusion of language standards in their own strand should not be taken as an indication that skills related to conventions, effective language use, and vocabulary are unimportant to reading, writing, speaking, and listening; indeed, they are inseparable from such contexts” (p. 25).

**Developing Vocabulary**

Vocabulary development has always been an important education goal, but the common core standards view vocabulary a bit differently. First, the standards consider three tiers of vocabulary:

- **Tier 1**: Basic vocabulary and words commonly used by students.
- **Tier 2**: High-frequency and multiple-meaning words; useful words found across a wide range of domains.
- **Tier 3**: Domain- or context-specific words.

As explained in the video about the shift in language arts standards toward more academic vocabulary, the Common Core State Standards recognize the importance of all three tiers, but they put special emphasis on Tier 2 words, because they are powerfully useful, often containing nuance and insight into an author’s purpose and meaning.

How do students develop vocabulary—and what is the role of the standards in helping them do so? According to the Common Core State Standards Initiative website (2010b), “The standards expect that students will grow their vocabularies through a mix of conversations, direct instruction, and reading. The standards will help students determine word meanings, appreciate the nuances of words, and steadily expand their repertoire of words and phrases.”
Strategies to Improve Language Skills in Science

The emphasis of the standards is to always begin with a text. Keep this in mind as you consider how to develop students’ language skills in a science classroom, which exposes students to more new terms than any other subject area.

As Mary Lee Barton and Deborah Jordan explain in Teaching Reading in Science (2001), the “challenge of learning so many new words is compounded by the fact that learners have no existing schema, or mental framework, to help them grasp the meaning of these new terms and phrases” (p. 14).

Barton and Jordan (2001) recommend focusing vocabulary instruction on words that are critical to new content. In this regard, science teachers may be tempted to focus on specialized Tier 3 words—science terminology. However, research supports the emphasis on Tier 2 words, even in science instruction. Barton and Jordan (2001) write, “Students need to be able to construct meaning—to wrestle with their understanding of a word’s meaning in terms of their prior knowledge and in terms of how the word ‘fits’ into, or relates to, other academic content they are learning” (p. 15).

In Classroom Instruction That Works (Marzano, Pickering, & Pollock, 2001), the authors outline some guidelines for vocabulary development strategies:

- Offer students several opportunities to encounter selected terms in context.
- Provide instruction about key concepts prior to reading
- Show students how to connect an image with the new term.

Here are several specific vocabulary strategies that might help you address language standards in your classroom.
Vocabulary Knowledge Rating

As a pre-assessment strategy, the teacher chooses a group of words, perhaps a mixture of Tier 2 and Tier 3 words, for a reading, a topic, or a unit and then has students analyze their own understanding of the words by checking whether they know it, are not sure, or don’t know it at all. This tool allows teachers to know which words to focus on in vocabulary development.

Here’s an example of a vocabulary knowledge rating chart.

<table>
<thead>
<tr>
<th>Term</th>
<th>Know It</th>
<th>Not Sure</th>
<th>Don’t Know It</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
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Concept Mapping

A concept definition map is a graphic organizer that allows students to describe what a concept is, compare the concept, describe what it is like, and give examples of it. Through concept mapping, students learn the meaning of key concepts and science vocabulary.

Either individually, in small groups, or as a class, students fill out the concept definition map about a specific term, such as *phylum*. The teacher explains that a definition should answer the questions

- What is it? Does it fit into a larger category?
- What can it be compared to? Contrasted with?
- What is it like? What characteristics does it have?
- What are some examples of it?
After students have completed the concept definition map, they use the information to write a complete definition. Below is a sample of what a concept definition map looks like.

**Structural Analysis**

Greek and Latin roots and affixes are the basis of many scientific words. Exploring the meaning of the roots will support students’ vocabulary acquisition across many subject areas.

As you prepare to introduce new terms to students, look for words with common roots. Students may have seen these word parts in other words, and helping them connect that prior knowledge with the new vocabulary will increase students’ word knowledge and their ability to determine word meaning in context.
There are multiple ways to support structural analysis in your content-area instruction. One strategy is to have a word wall where students categorize words they know according to their roots. Below are some common affixes and roots that could work in a science word wall.

<table>
<thead>
<tr>
<th>Macro — large</th>
<th>Derm — skin</th>
<th>Rhino — nose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nano — billionth</td>
<td>Chloro — green</td>
<td>Quint — five</td>
</tr>
<tr>
<td>Peri — around</td>
<td>Poly — many</td>
<td>Ocu — eye</td>
</tr>
</tbody>
</table>

When working with specific terminology, you can introduce new terms by having students identify other words with the same roots or affixes. For example, if a key term for a coming lesson is *hydrology*, you would break the word into its two parts: *hydro* and *logy*. Ask students whether they know the meaning of either word part. If not, list clue words that students are familiar with that contain each word part.

<table>
<thead>
<tr>
<th>hydro</th>
<th>logy</th>
</tr>
</thead>
<tbody>
<tr>
<td>hydrant</td>
<td>biology</td>
</tr>
<tr>
<td>dehydrate</td>
<td></td>
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</table>

Now ask students to predict what they think is the meaning of the keyword. Then provide a more detailed meaning of the word: *hydrology* is the scientific study of the properties, distribution, and effects of water on the earth’s surface, in the soil and underlying rocks, and in the atmosphere.

This process helps students connect Tier 2 and Tier 3 vocabulary across content areas and encourages them to explore word meaning by providing experience with similar words.