6 Strategies to Support ELLs in Science
by Dana Frye

The Next Generation Science Standards (NGSS) bring enhanced opportunities as well as inherent challenges for ELLs. Because all students are learning new patterns of discourse and terminology in the science classroom (Lee, Quinn, & Valdés, 2013), ESOL teachers are situated to take the lead in integrating language learning support strategies. However, it might not always feel that way. Science content can be daunting, and many of us shy away from working with ELLS in that area. However, because we know our students and have a wealth of experience in language teaching, we can support them in acquiring the language and content of the science classroom with just a little bit of support. Here are six strategies you can use to take that lead and build a foundation for ELL success in science in the upper elementary grades.

1. Preteach Science Content in Reading

Many ESOL teachers already provide small-group reading instruction to their students. This can be the perfect place to integrate science content materials to build background knowledge, vocabulary, and language. Both nonfiction and fiction books lend themselves well to promoting discussions in reading groups and can reinforce discourse structures common to the science classroom (e.g., cause and effect, compare and contrast, problem and solution, making predictions, and communicating information). Any one of these structures can be the basis for a rich set of lessons.

For example, I've used Lynne Cherry's *The Great Kapok Tree* as a foundation for, among other things, a comparison of tropical rainforests and temperate forests. For a simple discussion, students compare life in the rainforest with their local environment. Providing a language frame allows all learners to participate. For example, "_____ *live in tropical forests, and* _____ *live in temperate forests"* (monkeys/deer). Science-rich texts that tell a story are beneficial to ELLs as they integrate science learning with common English language structures. Again, Lynne Cherry's *The Great Kapok Tree* serves as an example because it immerses students in rainforest ecology content through a repetitive pattern of dialogue, rich sensory description, and past tense verb use. Other examples of science-rich literature are:

- *The Umbrella* by Jan Brett
- *A House for Hermit Crab* by Eric Carl
- *Just a Dream* by Chris Van Allsburg
- *A River Ran Wild* by Lynne Cherry
- *The Water Hole* by Graeme Base

An expansive list can be found at The Reading Nook.

2. Provide Appropriate Materials

As an ESOL teacher, you are the expert on your students' English language proficiency and background knowledge. Let your knowledge of students' language abilities be your guide as you select relevant materials to support content comprehension and language learning. In my

experience, classroom teachers appreciate resources that go beyond grade-level textbooks to support learners at different levels. Some excellent picture-rich trade books with comprehensible text are:

- Kingfisher Young Knowledge series
- National Geographic Learning Cengage materials
- DK Eyewitness Explorer series
- NSTA recommended trade books

Figure 1. Materials. Appropriate materials for ELLs include a mix of fiction and nonfiction trade books and literature with engaging comprehensible content and illustrations.

In addition, many videos, online textbooks, and websites provide differentiated content. Some stellar examples include:

- Science videos for kids on Kids.gov
- Science Kids online games
- Science section of DK findout!, an interactive informational site
- Simple hands-on activities from education.com
- Online textbooks from CK-12

ELLs require additional exposure to content and language to reach mastery. Give ELLs more opportunities for independent discovery and exposure to content by sharing these links and others directly with students via Google Classroom or a similar interface when possible. Providing a question or prompt (e.g., How does a magnet work?) with an associated website (e.g., DK findout!) will open up opportunities for students to independently research, write, and share their ideas. These kinds of resources can also help science teachers manage multiple student levels of knowledge and language in the classroom, so ELLs are not left to manage on their own.

3. Explicitly Teach Vocabulary

Technical vocabulary is often taught along with content in the science classroom. However, ELLs will need double exposure to these words and additional opportunities to use them in context in order to retain their meaning. Interactive word walls and student science dictionaries organized around themes, with illustrations and a quick definition of terms, are great tools for assuring ELLs' understanding of this Tier 3 vocabulary (technical language associated with science content). Today's technology-rich classrooms also provide opportunities for group activities using interactive white board technology. For example, at the beginning of designing an experiment, I walked a group of fourth graders through an exploration of the word "variable," a Tier 3 word.

While Tier 3 words are typically part of instruction in science, the understanding of Tier 2 vocabulary (high-frequency words used by mature language users across several content areas; e.g., *create*, *analyze*, *develop*, *response*) is often assumed. Explicit instruction of these words will help ELLs with comprehension. Look at the words independently, perhaps with a vocabulary web activity, such as the Frayer model, and then apply the correct meaning to the word in context. You can also teach your students how to use an online science dictionary or a translate function, such as ESL Reader, to look up new words they encounter.

Frequent monitoring for student understanding is equally important to vocabulary acquisition. ESOL teachers can play a key role in making sure that ELLs are keeping up with the content in the science classroom through quick formative assessments, often known as "dipsticks." These quick comprehension checks (see some examples here) will show which students need further clarification and teaching of vocabulary and content. As an ESOL teacher, you can use these assessments to provide tailored instructions for your students in small group settings as well.

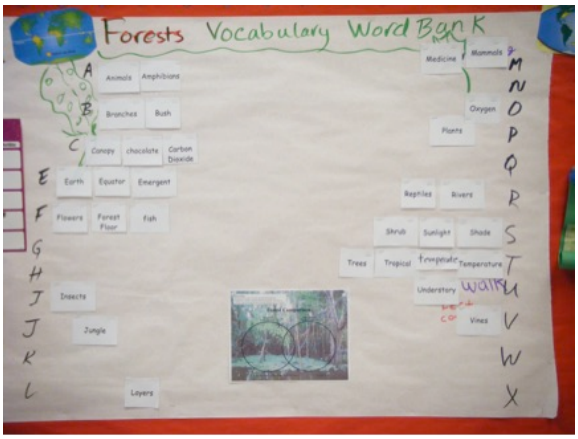

Figure 2. Interactive word wall. This is a simple interactive word wall used with students in the rain forest unit. Students place words on the board as they arise in content learning, and define them in a student journal.

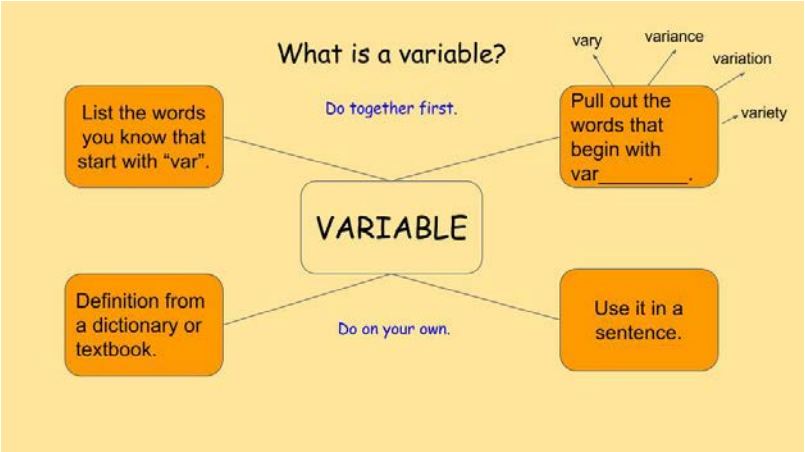

Figure 3. Interactive white board activity. This activity on understanding variables encouraged students to work with a partner to make connections followed by independent practice.

4. Coteach in the Science Classroom

All of the strategies discussed in this article can be used to support ESOL teachers and students in a coteach model. When you have the opportunity, modeling ELL-friendly teaching strategies will be more effective than simply recommending them to the classroom teacher. Showing is much more effective than telling, and your experience will allow you to integrate many ESOL best practices such as

- keeping lecture time short;
- providing lots of comprehensible input;
- varying instructional strategies and materials;
- using fictional and factual accounts of scientific content; and
- sharing videos (with closed captioning), authentic materials, and photographs.

In addition to modeling effective teaching practices, your presence in the classroom will support the differentiation of instruction. Teachers often shy away from student-centered activities because of classroom management challenges. With your help in pairing students for learning, creating flexible grouping, and providing the inputs needed for comprehension, more hands-on and student-centered activities can be planned. In addition, tiered instruction can help to meet the needs of all students at different stages of science and language learning. This might include incorporating word banks and sentence frames. Explicit modeling of what students are expected to do is an often overlooked, but timesaving strategy.

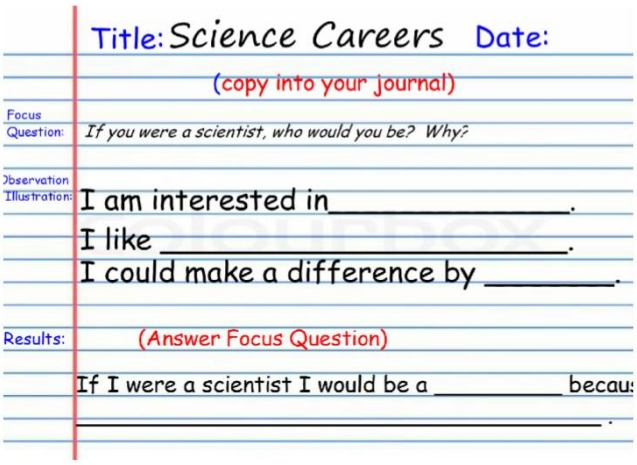

Figure 4. Science journals sentence frames.

Figure 5. Label the pictures activity. In this warm-up for an activity on science careers, a description of what each scientist does is revealed when the pictures are moved.

When students can observe a process and match that to written instructions, they will be much more successful in achieving the desired outcome. Finally, now is your time to demonstrate those frequent checks for student comprehension and tiered questioning strategies that will allow all students to participate.

5. Support Student Discourse

ELLs are sometimes left out of rich classroom discussions because of lack of language ability. Using science content as a nexus for discourse may be a challenge, but it is essential to helping all students meet the Next Generation Science Standards and other rigorous science standards. We can ensure that ELLs are included in classroom conversations by modeling discourse strategies using sentence frames to structure language, as already mentioned. One tool that brings all of these supports together is a "dialogue mat." Including pictures, illustrations, sentence frames, and word banks on one graphic can ground students in content and provide language for them to participate in higher order thinking and discussion tasks. These mats should include word banks that are specific to the discussion and reinforce Tier 2 *and* Tier 3 vocabulary. Again,

modeling and practice will be key to student success. Providing numerous opportunities for small-group interaction before students participate in larger classroom discussions builds confidence and competence for students.

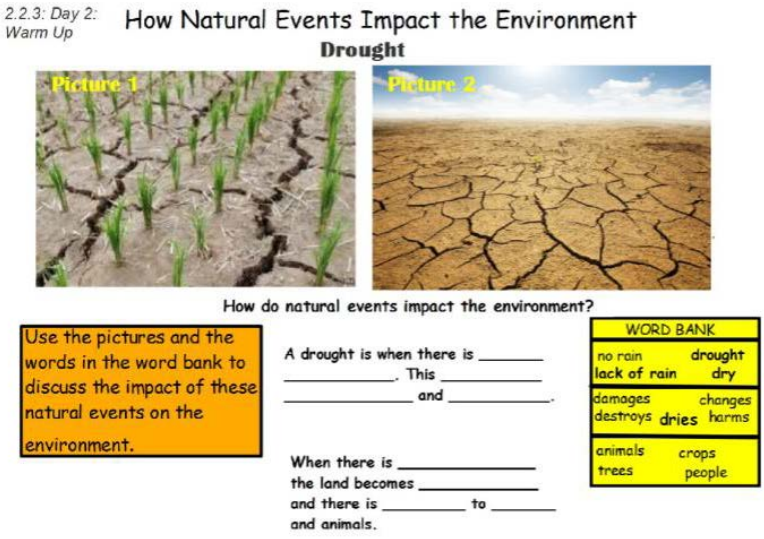

Figure 6. Dialogue mat. This dialogue mat was created to support ELL student participation in a fourth grade science class.

6. Help Students Get the Most Out of Science Notebooks

Many science classrooms use student notebooks as part of daily instruction. These interactive science notebooks help learners make sense of content and develop language, but can be a challenge for ELLs. One way to make journaling activities more engaging is to differentiate journal prompts and/or questions. Asking questions with different levels of complexity and allowing for a variety of responses while providing some of the language necessary to respond is an excellent practice for including ELLs. In all cases, providing some level of scaffolding to support student responses is ideal. For purposes of illustration, consider a science lab in which students are raising monarch caterpillars. The following differentiated prompts might be used:

- *Prompt*: Draw and label the caterpillar.
  Teacher input: Provide the word bank: legs, body, head, antennae.
- *Prompt*: Describe the caterpillar.
  Teacher input: Generate a word bank with students before writing.
- *Prompt*: How has your caterpillar changed since the last observation?
  Teacher input: model language for comparisons (e.g., bigger than, longer than, changed, the same.)
- *Prompt*: Why does it look like your caterpillar has two heads?
  Teacher input: guide students in discussion and write down relevant language for student reference.

Again, you should explicitly model the journaling task. Provide sentence frames and content-specific word banks to support responses. If you're able to, create a print-rich classroom environment with anchor charts, word lists, diagrams, and illustrations for easy referencing. Other journal activities to build comprehension and allow for participation of all ELLs include creating models, diagrams, and illustrations with drawing and labeling activities. As ESOL teachers, we understand that our students know more than they can express in words. Providing them both verbal and nonverbal opportunities for expression will allow them to demonstrate understanding. This, in turn, will give the teacher a fuller picture of who these students are and what they are capable of achieving.

Conclusion

As you move forward in integrating science and language learning, you'll find many engaging projects that will link you and your students to the global arena in science learning. A few that we have participated in are Journey North's Symbolic Butterfly Migration, International Migratory Bird Day, and Shad in the classroom. These are long-term projects that provide countless options for integrating language and science learning, as well as connecting students from different cultures and countries. Building, or adding to, your repertoire of teaching strategies by incorporating some of the strategies provided here will make you an asset in the science classroom and empower you to support ELLs in science content in multiple instructional models. (Get started with Larry Ferlazzo's Science webpage for an abundance of science-related links for ELLs.)

Hopefully, you've gotten an idea of how science and language learning are both facilitated in practice-oriented science classrooms. ESOL teachers possess a wealth of knowledge and practical experience that can bring immediate support to ELLs in the science classroom. The science classroom really is the perfect place in which to support our students. Their natural curiosity provides the drive to learn and can lower their affective filter. When ESOL teachers join in on instruction, our students will take more risks in the classroom and move toward a deeper understanding of science content and a more effective use of language.

Reference

Lee, O., Quinn, H., & Valdés, G. (2013). Science and language for English language learners in relation to Next Generation Science Standards and with implications for Common Core State Standards for English language arts and mathematics. *Educational Researcher*, 0013189X13480524.

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