Science

The National Research Council’s (NRC) National science education standards state that:
the commitment to science for all implies inclusion of those who traditionally have not received
encouragement and opportunity to pursue science -- women and girls, students of color, students with
disabilities, and students with limited English proficiency.
(NRC, 1996)

Vocabulary

Both fluent English speakers and English language learners will encounter new and unfamiliar
vocabulary as they move through their science education. Unlike their English speaking peers,
however, English learners are also constantly learning vocabulary in all of their school subjects
as well as in their daily lives.

There are a number of ways in which teachers can make the massive vocabulary-learning process
required of English learners easier.

• Use classroom routines to present vocabulary. You might spend two or three minutes at the
beginning of a class highlighting scientific vocabulary that students will need in the class.
Use the same type of language each time—for instance “Here are some key words.” By
making the presentation of vocabulary a routine event, students are not faced with the extra
task of working out what kind of instruction is going on.

• Exploit cognates. Cognates are words which sound similar across languages because they
have common origins. Much of the scientific vocabulary of English comes from words
with Latin origins (like experiment, observe, precipitation); these words are likely to have
cognates in languages descended from Latin (including Spanish, French, and Portuguese).

Talking Science

Communication is a vital part of the scientific discovery process. Students working in small
hands-on groups in the science classroom use back-and-forth communication to make meaning
out of their observations and discoveries. Teachers should ensure that English language learners
are not excluded from this crucial learning experience.

• Make sure that instructions are clear to everyone in the group, perhaps by providing them
in written as well as oral form, so that ELLs have time to digest the content.
• Allow speakers of the same language to work together and to discuss scientific concepts in
their native language before they communicate them in English.
• If groups are multilingual, teachers can assign roles to each member of the group, and
construct roles with more or greater linguistic demands to suit their diverse students. For
instance, a student with limited English might be assigned to connect key concepts to new
vocabulary; a more proficient student might be responsible for taking observation notes.
• When calling on students, give them a moment or two to jot down ideas before they speak
in front of the class. This allows students to marshall their thoughts and gives them time to
think about the language that they will need to express their ideas.
Writing Science

English language learners may understand the concepts of science very well, but unless they have the tools to communicate their understanding, teachers have no way of assessing their comprehension (and may underestimate it). Teachers can help ELLs by providing varying degrees of scaffolding. Of particular use to ELLs are partial “sentence chunks” that scaffold the types of sentences students should use to communicate their scientific knowledge. Sentence chunks allow students to express their scientific learning without being hindered by lack of language skills—they also model the types of scientific language students can use in the future. As students become more proficient, less scaffolding is required.

<table>
<thead>
<tr>
<th>LABORATORY REPORT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title</strong></td>
</tr>
<tr>
<td>Relationship between _________ and ______________</td>
</tr>
<tr>
<td><strong>Background</strong></td>
</tr>
<tr>
<td>This experiment investigates ______________________________.</td>
</tr>
<tr>
<td>This experiment tests the hypothesis that ___________________.</td>
</tr>
<tr>
<td>Based on _______________ I predict that _______________.</td>
</tr>
<tr>
<td><strong>Equipment</strong></td>
</tr>
<tr>
<td><em>(Ensure students have the vocabulary to list the equipment.)</em></td>
</tr>
<tr>
<td><strong>Procedure</strong></td>
</tr>
<tr>
<td><em>(Provide examples of verbs that students will need to list the procedure. For instance, you might include a list of verbs such as add, pour, fill, heat, distill, decant.)</em></td>
</tr>
<tr>
<td><strong>Observations</strong></td>
</tr>
<tr>
<td>At the beginning of the experiment, the __________ was __________. After ____________, the __________ became __________.</td>
</tr>
<tr>
<td><strong>Conclusion</strong></td>
</tr>
<tr>
<td>Adding ___________ to ___________ causes ______________.</td>
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</tbody>
</table>

Example of a laboratory report with partial sentence chunks.

Instructional Congruence

Instructional congruence refers to “the process of merging academic disciplines with students’ linguistic and cultural experiences to make the academic content accessible, meaningful, and relevant for all students” (Lee, 2004, p. 72). Instructional congruence can refer to both ways of talking and thinking about scientific inquiry as well as ways of presenting scientific topics.

Students from diverse cultural backgrounds may have ways of approaching inquiry that differ from Western norms. They may come from cultures where it is considered inappropriate to question authorities such as teachers and textbooks. Students from different cultural backgrounds may also differ in terms of their comfort levels with working collaboratively or individually. The presentation of topics in traditional science lessons may also miss chances to connect to students’ background knowledge.
Teachers can modify instruction so that it values students’ cultural norms while simultaneously facilitating scientific inquiry. In designing a unit on weather for a multi-year professional development program, a research team built elements into the unit designed to be convergent with students’ learning. In this case, the students were mostly Hispanic students from the Caribbean and Central and South America.

The unit:

• used both metric and traditional units of measure;
• incorporated weather conditions familiar to students, such as hurricanes and other tropical weather patterns;
• used inexpensive household supplies for hands-on activities so that students could replicate the activities at home with their families;
• allowed students to work collaboratively or individually depending on their comfort level with these patterns;
• integrated science standards with both TESOL and English language arts standards to encourage English language development in social settings, in the academic content, and in socially and culturally appropriate ways.

To Learn More About Teaching Science to English Language Learners

Web Resources


Print Resources

