Building Science Vocabulary:
Seeds of Science
Roots of Reading
Goal

- Review our model for vocabulary development
- Share some vocabulary instructional routines
- Approach to ELL vocabulary development
Vocabulary Research

• Low Vocabulary = Low reading performance (Johnson & Pearson, 1984)
• Large word gap between Low and High SES groups (Hart & Risley, 1995; Biemiller, 2004)
• Explicit and on-going vocabulary instruction makes a difference (Beck & McKeown, 2002)
• Few programs in place to improve second language reading vocabulary
Many science educators are apprehensive about vocabulary instruction.

**Apprehensions about vocabulary:**

- Long tradition of science as memorization of new words—high school biology texts have 45-50% more new words than are presented in a semester of foreign language. (Armstrong and Collier; 1990)
- Words are taught as an end unto themselves rather than as labels for new conceptual understandings
- Science vocabulary can serve as an obstacle to conceptual understanding
Seeds/Roots Approach to Vocabulary Development

1. Carefully select a limited set of highly generative and powerful discipline specific words
2. Use them repeatedly in: books, student sheets, teacher questions, discussion prompts
3. Reduce number of singletons in books
4. Allow students to see relationships between these words
5. Assist students in building active control of these words
Habitat

Knowing how the word sounds or looks when it is written.
Habitat: The place or environment where a plant or animal naturally or normally lives and grows.

Knowing its definition
A habitat has everything an animal needs to survive.
The grassland habitat is windy with few trees.

Knowing its context of use
Knowing its relationship to other words
# Unit Specific Words

**Terrarium Investigations**

<table>
<thead>
<tr>
<th>Focused Core Vocabulary</th>
<th>Words with Less Power</th>
<th>Words with Less Relevance</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Decomposition</td>
<td>• Decay</td>
<td>• Light</td>
</tr>
<tr>
<td>• Isopod</td>
<td>• Sprout</td>
<td>• Stem</td>
</tr>
<tr>
<td>• Habitat</td>
<td></td>
<td>• seed</td>
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<tr>
<td>• Adaptation</td>
<td></td>
<td></td>
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<tr>
<td>• Evidence</td>
<td></td>
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<tr>
<td>• Terrarium</td>
<td></td>
<td></td>
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<tr>
<td>• Organism</td>
<td></td>
<td></td>
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<tr>
<td>• shelter</td>
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</tbody>
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Side View of the Terrarium

Observations: (Evidence) I observe that seeds are growing roots and the plants are taller.

Predictions: (What will happen next?)
I predict that the seeds that are growing are going to become a tall plant.

Explanations (Why do you think that?)
I think this will happen because other seeds that we planted grew into plants.
Generative vocabulary

• We have been able to identify, across a range of K-5 science texts, a set of “high utility” science words
• Words that while not highly frequent in general discourse, recur with great regularity in science texts
• We teach these words and look for opportunities to use these words again and again in all of these language and experiential modes.
Grade Level Set of Words

- Observe
- Science/Scientist
- Compare
- Evidence
- Explain/Explanation

- Investigate
- Record
- Prediction
- Question
- Model
I. Everyday/Science Word chart

• Use everyday language as a conceptual bridge

• Teaching should involve meeting students where they are and building upon their prior knowledge
**Activity Structures that Promote the Language of Science**

<table>
<thead>
<tr>
<th>Everyday Language</th>
<th>Scientific Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>figure out</td>
<td>conclude</td>
</tr>
<tr>
<td>group</td>
<td>categorize, classify</td>
</tr>
<tr>
<td>guess, think</td>
<td>predict, infer</td>
</tr>
<tr>
<td>look at</td>
<td>explore</td>
</tr>
<tr>
<td>see</td>
<td>observe, analyze, discover,</td>
</tr>
<tr>
<td>show</td>
<td>demonstrate</td>
</tr>
<tr>
<td>tell</td>
<td>report, explain</td>
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<tr>
<td>tell, show</td>
<td>explain</td>
</tr>
<tr>
<td>write down</td>
<td>record</td>
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<td>--------------</td>
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<tr>
<td>try out, test</td>
<td>experiment</td>
</tr>
<tr>
<td>home</td>
<td>habitat</td>
</tr>
<tr>
<td>clues, proof</td>
<td>evidence</td>
</tr>
</tbody>
</table>
II. Talk about Words During Reading

• Call attention to the use of the word in the context of the text.
• Provide a concise definition of the word.
• Generate further discussion that elaborates definitions, provides additional context, and/or connects word to existing experience or understandings.
III. Help students build connections among words/concepts to develop rich conceptual understandings

• Opportunities to map out relationship among science concepts
• “asking students to explain scientific phenomenon, either orally or in writing, should enhance their content understanding” (Rivard & Straw, 2000).
Plants
Organisms
Animals
Etc.
Adaptations

- What is it?
- What’s it like?
- Examples
What is the relationship?
English Language Learners & Vocabulary

• Native Spanish speaking ELLs

• Cognates--words that have a similar spelling, pronunciations and meaning across at least two languages (e.g., cliente/client, televisión/television).

• False cognates-words that have a similar spelling and pronunciation but different meaning across at least two languages. (embarrassed/embarazada)
### Everyday Spanish/Academic English Cognates

<table>
<thead>
<tr>
<th><strong>English Common Word</strong></th>
<th><strong>English Academic Word</strong></th>
<th><strong>Spanish Common Word</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed</td>
<td>Velocity</td>
<td>Velocidad</td>
</tr>
<tr>
<td>Weather</td>
<td>Climate</td>
<td>Clima</td>
</tr>
<tr>
<td>Moon</td>
<td>Lunar</td>
<td>Luna</td>
</tr>
<tr>
<td>Dirt</td>
<td>Terra-rium</td>
<td>Tierra</td>
</tr>
<tr>
<td>Damp</td>
<td>Humidity</td>
<td>Humedad</td>
</tr>
<tr>
<td>Water</td>
<td>Aqua</td>
<td>Agua</td>
</tr>
<tr>
<td>Third</td>
<td>Tertiary</td>
<td>Tercer</td>
</tr>
<tr>
<td>Sun</td>
<td>Solar</td>
<td>Sol</td>
</tr>
</tbody>
</table>
Cognate Research


Seeds/Roots Cognate Frequencies

- **Cognate**: 79%
- **NonCognate**: 18%
- **False Cognate**: 3%
Seeds/Roots Cognate-type Frequencies

- **Cognate Type**
  - High Frequency English/High Frequency Spanish: 14%
  - Low Frequency English/Low Frequency Spanish: 43%
  - High Frequency English/Low Frequency Spanish: 4%
  - *Low Frequency English/High Frequency Spanish: 39%
Cognate Strategy when Reading

1. Explain that cognates are words that are spelled almost the same, sometimes pronounced similarly and have a similar meaning in English and in Spanish.

2. Provide an example: Look at the word *acid* and look carefully at the spelling.

3. Think of a word in Spanish that sounds like or looks like the word *acid*.

4. When students respond with ácido, have them think about what the word means in Spanish.

5. They could also give some examples of things that are acid.

6. Have them guess at the meaning of the word acid. They could give some examples.

7. Have students go on a cognate hunt and find other words that are cognates in the book.
Seeds/Roots Approach to Vocabulary/Conceptual Development

• Commit to a small set of core science words that together (and in combination with firsthand experiences and talk)
• Repeated opportunities for exposure and practice
• Immersion in the language of science through multiple language modalities
• Instead of avoiding scientific terminology and register in classrooms, we need to embrace it to help students build a rich conceptual network