Training Teachers to Identify and Explicitly Teach Academic Language

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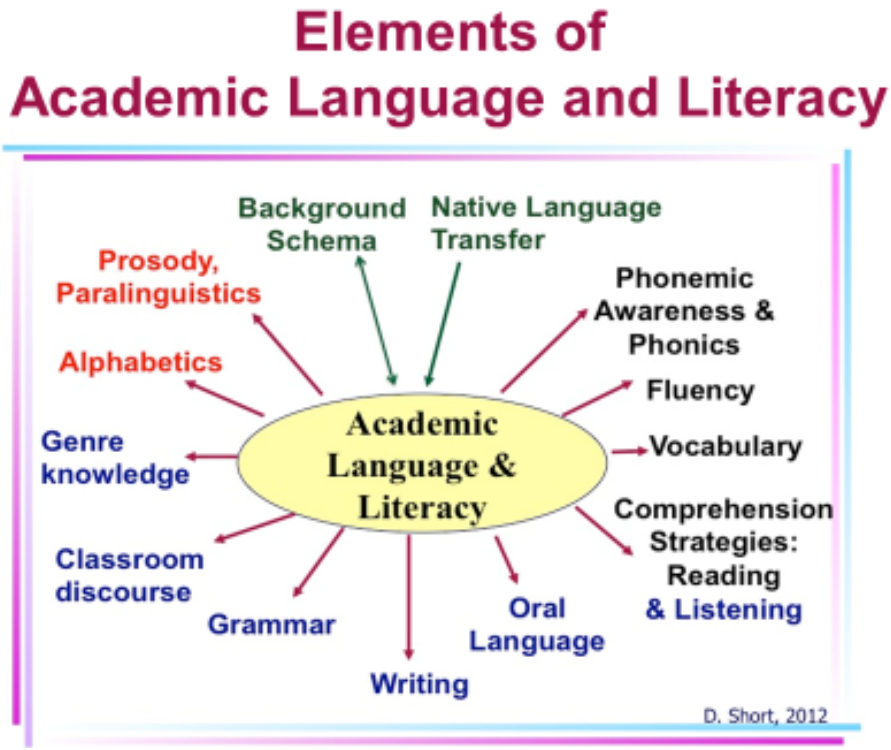
Objectives

Content

- Identify examples of academic literacy
- Explain guidelines for developing academic language in science lessons

Language

- Discuss and present techniques to promote academic discussions and strengthen scientific reading and writing skills



Find the scientific academic language in this passage:

Energy is defined as the capacity to cause change—for instance, by doing work. Potential energy is the energy that matter possesses because of its location or structure. For example, water in a reservoir on a hill has potential energy because of its altitude. When the gates of the reservoir's dam are opened and the water runs downhill, the energy can be used to do work, such as turning generators. Because energy has been expended, the water has less energy at the bottom of the hill than it did in the reservoir. To restore the potential energy of a reservoir, work must be done to elevate the water against gravity.

From *Biology* (Pearson, 2008, p. 35)

Academic Language: Examples of Challenging Terms, Syntax, & Discourse

Vocabulary

1. *New technical terms* (e.g., biome, hypothesis, photosynthesis)
2. *General academic terms* (e.g., result, conclusion, identify, analyze)
3. *Multiple meaning words* (e.g., root, attraction, power)
4. *Nominalizations* (i.e., verbs transformed into nouns) (e.g., evaporate > evaporation)
5. *Complex noun phrases* (e.g., exponential decay, frequency distribution)
6. *Synonyms* (e.g., add, increase, increase by, plus, more, and)
7. *Symbols* (e.g., +, =, %, H_2)
8. *Idioms* (e.g., rule of thumb, keep an eye on, start from scratch)

Functions

- Ask/answer questions
- Give information
- Define
- Provide examples and counterexamples
- Analyze
- Synthesize
- Build on others' ideas
- Describe
- Elaborate
- Predict/hypothesize
- Explain
- Sequence
- Clarify
- Retell
- Cite evidence
- Summarize
- Paraphrase
- Conclude
- Negotiate meaning
- Agree or disagree
- Support opinions
- Persuade
- Listen attentively and record information
- Distinguish fact from opinion
- Explain cause and effect
- Compare
- Justify
- Evaluate ideas and information
- Advise
- Generalize

Syntax

1. *Comparatives* (e.g., greater than, six times as much, as many as)
2. *Preposition usage* (e.g., divided <u>by</u>, divided <u>into</u>)
3. *Articles and modifier usage* (e.g., <u>One</u> factor is more influential than <u>another</u> in plant growth.)
4. *Passive voice* (e.g., The plants were harvested in the fall.)
5. *Word problems and Testing language* (e.g., Which type of relationship exists when…; Which process is represented by…, Determine the scientific instrument used…)
6. *Logical connectors* (e.g., if …, then ___; given that …)
7. *Similar language, different function* (e.g., I have 2 ounces. I add an additional 2. How many do I have? How many *more* do I have?)
8. *Embedded clauses* (e.g., relative clauses – A temperate rainforest <u>which has more than one season</u> differs from a tropical rainforest.)
9. *Multiple ways of expressing terms orally* (e.g., NaCl can be "sodium chloride," "salt," and "a compound of sodium and chloride atoms").

Text Discourse

1. *Reading process:* Left to right (sentences), right to left (an integer number line), top to bottom (tables), diagonally (graphs), and holistically (diagrams and images).
2. *Text structures and styles*: Varied structures, sometimes embedded (e.g., cause-effect embedded in sequential structure). Dense textbooks--abstract and technical terms with precise meanings for topic but different meanings in other contexts; long noun phrases, synonyms, conjunctions and other logical connectors; and reported speech.
3. *Background knowledge:* Student schema may not fit text assumptions. ELs may lack knowledge, have conflicting experiences, or be unable to infer due to incomplete schema.
4. *Tone:* Varied across disciplines; may be formal, authoritative, cautious or detached in tone.
5. *Point of View:* Maybe be first, second or third person in literature, first or third person in primary sources. Third person may also be omniscient.

Guidelines to Develop Scientific Oral Language

- Discuss topics of high interest – essential questions
- Ask good questions; teach students how to ask questions
- Use sentence starters/language frames to scaffold and practice key terms and turn-taking
- Provide language models and multiple opportunities to practice
- Talk less

Sample Oral Language Techniques

Academic Language Frames	Teach and post language frames for language functions. Ex. Cause-effect: ___ happened because …; ___ is caused by …. Compare: One similarity/difference is …; Both are ___, but … is … . Analyze: The diagram shows that ….;___ is important because …
Conga Line (variation of Inside-Outside Circle)	1. Students write or draw something unique on an index card (e.g., favorite element from Periodic Table). 2. Divide students into two groups. Group 1 stands in a line (by shoulder); Group 2 in a parallel line, facing a partner in Group 1. 3. Group 1 shares information from the index card with partner from Group 2. Partner comments. Group 2 then shares information with same partner from Group 1. Partner comments. 4. After a few minutes, have Group 2 take one step to the left so each person faces a new partner from Group 1. The last person in Group 2's line moves to other end of same line. Repeat sharing of ideas on index cards.
Guess the Fib	1. Students are presented with three statements about a concept from the lesson. Two statements are true and one is a fib. The students must decide which of the statements is a fib and correct it. 2. As a variation, ask student groups to create their own "truths" and "fibs."
Sentence Strips	Steps in a process, math problem solution, or order of events can be placed on individual sentence strips. Individual students are given a strip and asked to put themselves in order. Once arranged, they read their strips aloud and explain their order. Additional strips can be added in, such as those with sequence words (e.g., first, second, next, finally), and the students retell using the new terms as well.

Guidelines to Promote Scientific Reading

- Build background and vocabulary to support access to text
- Use and understand text features, including graphics
- Scaffold the reading process; teach reading comprehension strategies
- Link classroom interaction with reading and writing texts
- Teach students to support opinions/responses to questions with text evidence

Sample Reading Techniques

Information Gap activities	These activities, which include jigsaws, problem-solving, and simulations, are set up so each student (in a class, or in a group) has one or two pieces of information needed for the task, but not all the necessary info. Students read and work together, sharing info while practicing their language, negotiating and critical thinking skills.
3-2-1 Technique	1. List 3 interesting facts from the reading. 2. Make 2 connections to another text, a science experiment, a field trip, video, or other source of information on the topic. 3. List one question that remains about the topic.
Reciprocal Teaching	Students cooperatively develop comprehension of text through group conversation. It can be applied to fiction and non-fiction. Students work in groups of 4. 1: Introduce or review the process **summarizing**, **questioning**, **clarifying,** and **predicting**. Provide sentence frames (e.g., The gist of the passage is…. Do you mean…?) and let students practice. 2: Be sure students are clear about the type of conversation they should have with their peers during each process. 3: Assign a short text to the group and identify places in the text where students should stop reading and have a reciprocal teaching conversation. 4. Student roles may be rotated.
Fan and Pick	Create a set of questions or prompts, 4 or 5 per set, on index cards. Divide students into groups, the number per group should match the number of cards. Instruct one student to fan out the cards and have group mates pick one. Students take turns answering the question on their card and others add on or counter the response.

Guidelines to Promote Scientific Writing

- Model writing (model texts, think-alouds)
- Use interactive writing for younger learners and beginners
- Use writing scaffolds, such as paragraph frames, clozes, and graphic organizers
- Teach grammar mini-lessons and incorporate grammar in editing stage
- Have students collaborate for prewriting and editing

Sample Writing Techniques

Character Diaries	Students take the role of a scientist making a discovery, a food item moving through the digestive system, or a droplet in the water cycle and write several entries in a diary as that person/thing, including key events. Other requirements could be use descriptive language, use past tense or if-then clauses, or use key language frames.

Scrambled Sentences	Write the steps to a process or experiment (or the sentences in a paragraph) individually. Make sure there are some language cues to the sequence (e.g., use of sequence terms, transitions, nouns and pronoun referents). Scramble the order. Have students put into original order.
Writing Headlines	Students write a headline to summarize a story or article, or to describe the results of an experiment. Students practice summarizing skills and descriptive language skills. Advanced students may provide most of the language, but beginners can copy the final product in a fancy "script." Focus on word choice to create compelling headlines.
Questionnaires and Interviews	Student groups design questionnaires and interview respondents. Interviews may be conducted in students' first language. Groups analyze data and prepare a written report and/or oral presentation.

RESOURCES

Altieri, J. (2016). *Reading Science.* Portsmouth, NH: Heinemann.

Echevarria, J., Vogt, M.E. & Short, D. (2017). *Making Content Comprehensible for English Learners: The SIOP® Model.* (5th ed.). Boston: Pearson Allyn & Bacon.

Gibbons, P. (2015). *Scaffolding Language, Scaffolding Learning: Teaching Second Language Learners in the Mainstream Classroom* (2nd ed.). Portsmouth, NH: Heinemann.

Short, D., & Echevarría, J. (2016). *Developing Academic Language with the SIOP Model*. Boston, MA: Pearson Allyn & Bacon.

Short, D., Vogt, M.E., & Echevarria, J. (2011). *The SIOP Model for Teaching Science to English Learners.* Boston: Pearson Allyn & Bacon.

Unsworth, L. (2000). Investigating subject-specific literacies in school learning. In L. Unsworth (Ed.), *Researching language in schools and communities: Functional linguistic perspectives*. London: Cassell.

ESL Student Textbook Series with science and history readings:

Edge (National Geographic Learning/Cengage) - High School (newcomer to advanced), 4 levels

Inside (National Geographic Learning/Cengage) - Middle School (beginner to advanced), 5 levels

Reach (National Geographic Learning/Cengage) - Elementary School (beginner to advanced), 6 levels

Websites

www.siop.pearson.com

www.cal.org/siop

www.ngl.cengage.com

www.nationalgeographic.com

Sample Science Lesson
Grade 7: The Rock Cycle, Day 5 Lesson
Developed by Hope Phillips, St. Paul Public Schools

Background: Students have been studying types of rocks for several days.

Content Objective:
Students will distinguish the components and characteristics of the rock cycle for the following igneous and metamorphic rocks

Language Objective:
Student will use new vocabulary words to write a letter to a family member pretending to be a rock moving through the rock cycle.

Students will use sequence words to tell a story about the rock cycle:

"First …"	"After that ..."
"Next …"	Many years later ..."
"Then …"	Finally ..."

Key Vocabulary:
rock cycle, metamorphism, melting, crystallization, weathering, transportation, deposition, compaction, cementation, pressure

HOTS:
Applying vocabulary; Interpreting diagrams

Visuals/ Resources/ Supplementary Materials:

igneous, sedimentary and metamorphic rocks

projected image of the rock cycle diagram (on a transparency or via computer)

image of the rock cycle without labels for student to label (one copy per student)

vocabulary words with graphics

rubric for rock cycle letter

Connections to Prior Knowledge/ Provide Background Information:
Instruct students to take out their 4 Corners Vocabulary papers from the prior lesson and review the vocabulary words with their groups. Students take turns reading a definition while all others listen and try to guess the word, until all of the words have been reviewed. Review the words with the class.

Tell students that today they are going to use these vocabulary words in a writing activity about the rock cycle and goes over the objectives.

Meaningful Activities:
Ask the students questions about the rock cycle such as, "How could a metamorphic rock turn into an igneous rock?" Students think-pair-share responses.

Distribute a rock cycle diagram without labels and have students work in groups to complete it.

Tell students that now they are going to apply their new knowledge of the rock cycle and pretend to be a rock in the rock cycle. They will write a letter to their family telling about their journey through the rock cycle. Students should include all of the vocabulary words in their letter.

While introducing the assignment, discuss how a friendly letter is organized, including the sections such as date, greeting, body, and closing. Review the sequence words to use. Share the assessment rubric.

Students write their letters to their family and include vocabulary and sequence words.

Wrap Up:
Students circle one paragraph from their letter they would like to share. First, have them pair-share their paragraph. Then use magic name sticks to call on students to share their selection. Review the objectives for the day and ask students if they have met all of the goals.

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Rock Cycle Letter Rubric

Name _____ Date _____

Pretend that you are a rock in the rock cycle. Write a letter to your family telling about your journey through the cycle. Include the key vocabulary and use sequence words in your letter. Use the rubric below to guide you in your planning and implementation of the project.

Criteria

Student correctly uses each vocabulary word		_____/13 points
rock cycle	igneous	deposition
metamorphism	metamorphic	transportation
melting	sedimentary	compaction
crystallization	pressure	cementation
weathering		

Student uses at least 5 sequence words _____/5 points

Student includes the four sections of a friendly letter _____/4 points
(date, introduction, body, closing)

Student puts best effort into the assignment _____/3 points

TOTAL _____/25 points