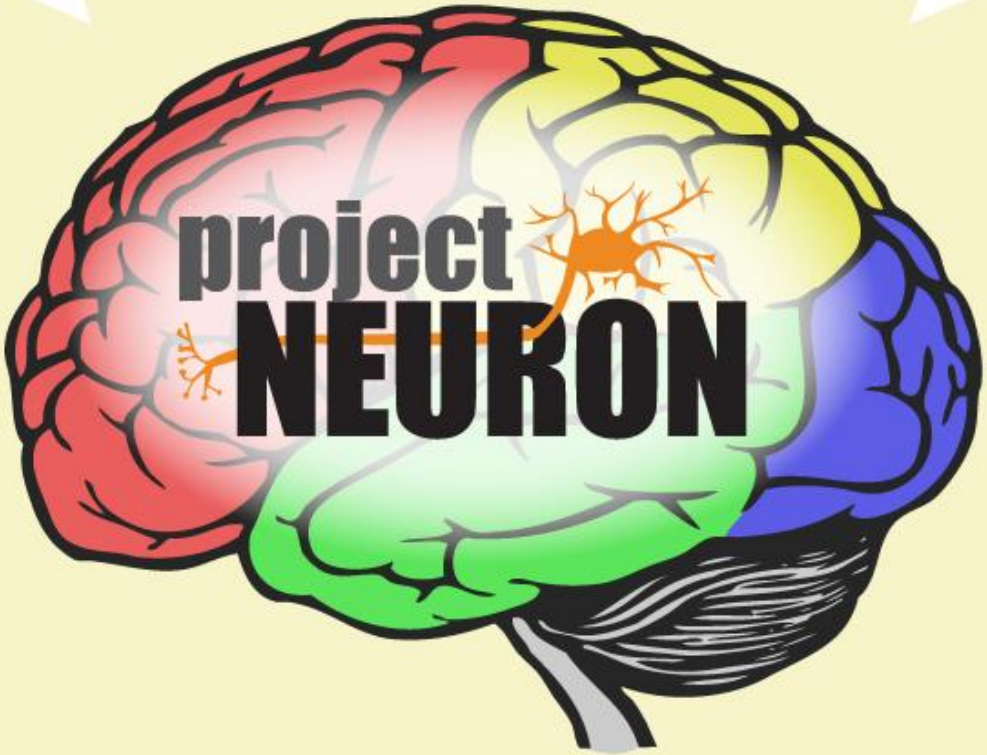
Engaging ELLs in a Project Based Science Unit



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SEPA
SCIENCE EDUCATION PARTNERSHIP AWARD

What is Project NEURON?

- A curriculum development group at the University of Illinois Urbana-Champaign
- A professional development group that invites teachers to our Summer Teacher Institutes
- Comprised of science educators, research scientists, neuroscience graduate students, education graduate students, and undergraduates

- Dedicated to bringing engaging inquiry-based units to high school science classrooms, using neuroscience research as a context

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Project NEURON Curriculum Units

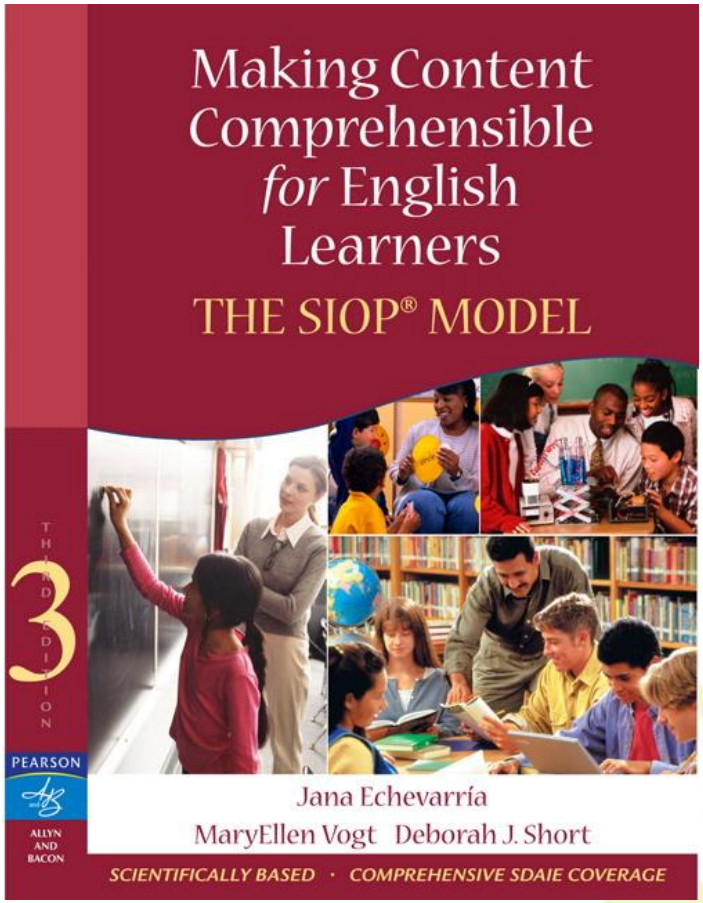
All available at http://neuron.illinois.edu

- Do you see what I see?
  - *Light, sight, and natural selection*
- What can I learn from worms?
  - *Regeneration, stem cells, and models*
- What makes me tick…tock?
  - *Circadian rhythms, genetics, and health*
- Why dread a bump on the head?
  - *The neuroscience of traumatic brain injury (TBI)*
- What changes our minds?
  - *Toxicants, exposure, and the environment*
  - *Foods, drugs, and the brain*

What can I learn from worms?: Using planarians to study regeneration

- Lessons aligned with National Education Science Standards and Benchmarks for Science Literacy
  - Lesson 1: What is regeneration?
  - Lesson 2: How do planarians react to their environment?
  - Lesson 3: How do planarians regenerate?
  - Lesson 4: What happens in the worms' cells during regeneration?
  - Lesson 5: How can we see the worms' cells during regeneration?
  - Lesson 6: How do DNA and protein determine behavior?
  - Lesson 7: What does planarian regeneration tell us about human regeneration?

Modifying existing curriculum to meet ELL needs



- *The SIOP Model* outlines 30 features to improve ELLs academic language capabilities in content areas
- Strategies based on ELLs research used to modify current Project NEURON unit

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Planarian Unit: Lessons 1-3 Overview

- Jigsaw reading of various uses of stem cells
  - Planarians used as model organism to study regeneration
- Examine mechanical, chemical, and light responses of planarians
  - Students observe planarians' reactions to various stimuli and record their observations
- Design regeneration experiment
  - Students devise hypotheses, experimental protocol, and record daily data to observe how planarians regenerate

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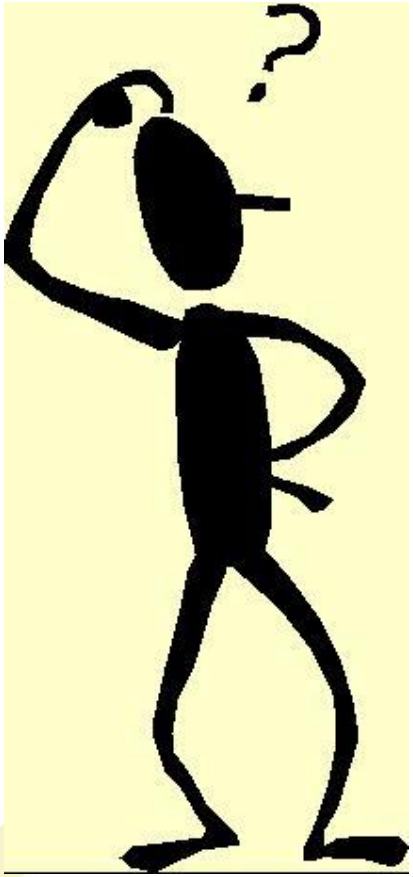
Creating a Formative Assessment to Improve Content Comprehension

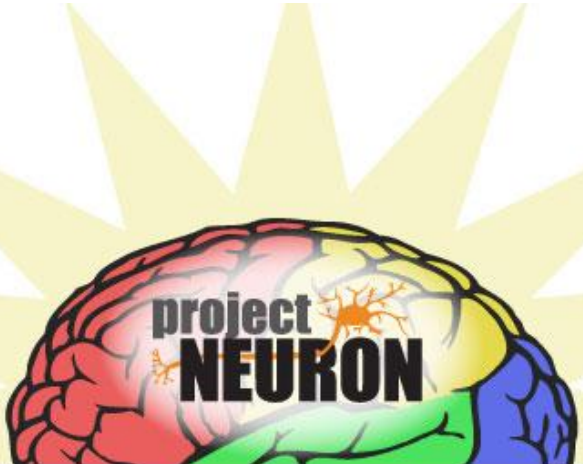
- How do we review basic vocabulary from earlier in the semester and draw connections to Planarian Unit content?
- How do we support students' English language development by assessing all four language modalities: reading, writing, listening, and speaking?



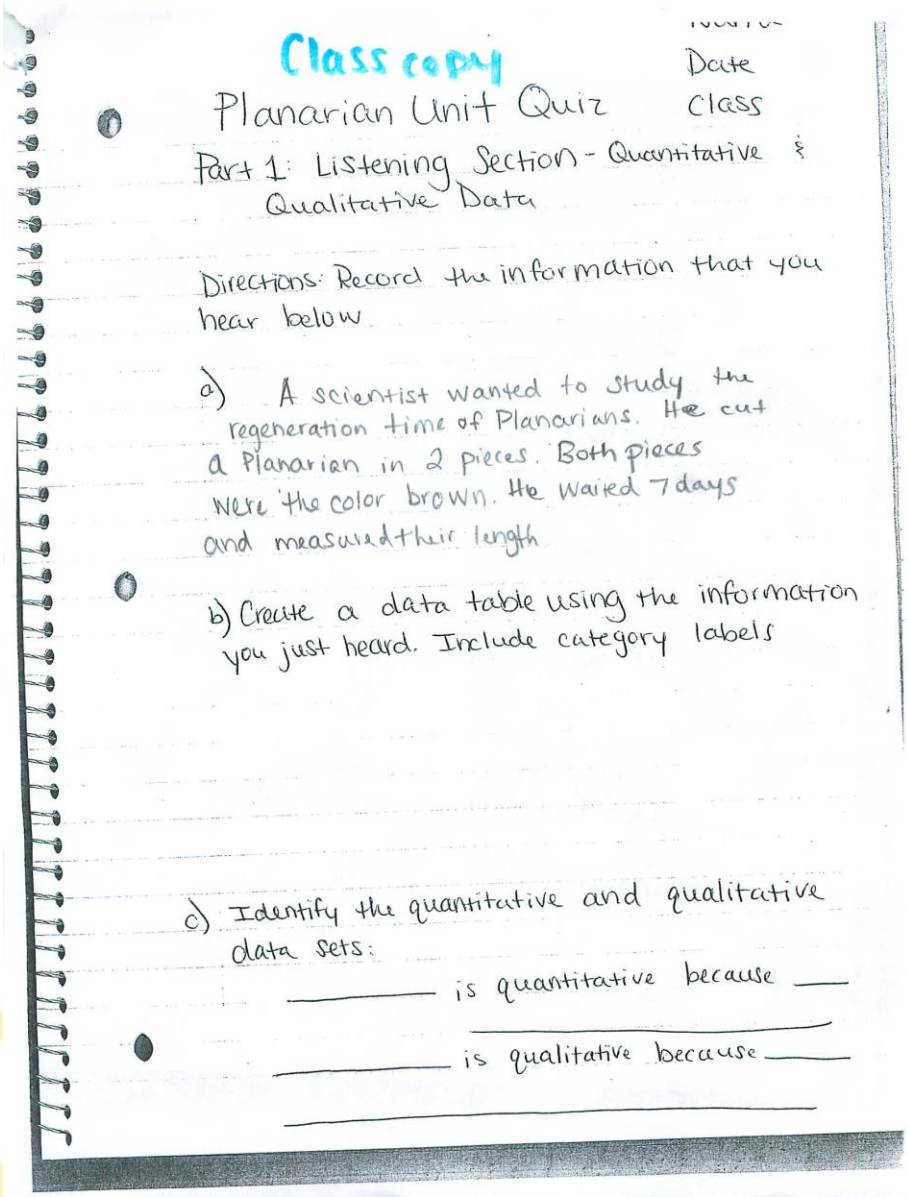
SIOP Feature 22: Integrate All Language Skills

Your Task:

Think of a current science unit you teach. How could you create assessment items that evaluate students' mastery of all four language skills?



Example Feature 22 Assessment



Class copy

Planarian Unit Quiz

Date

Class

Part 1: Listening Section - Quantitative & Qualitative Data

Directions: Record the information that you hear below

a) A scientist wanted to study the regeneration time of Planarians. He cut a Planarian in 2 pieces. Both pieces were the color brown. He waited 7 days and measured their length

b) Create a data table using the information you just heard. Include category labels

c) Identify the quantitative and qualitative data sets:

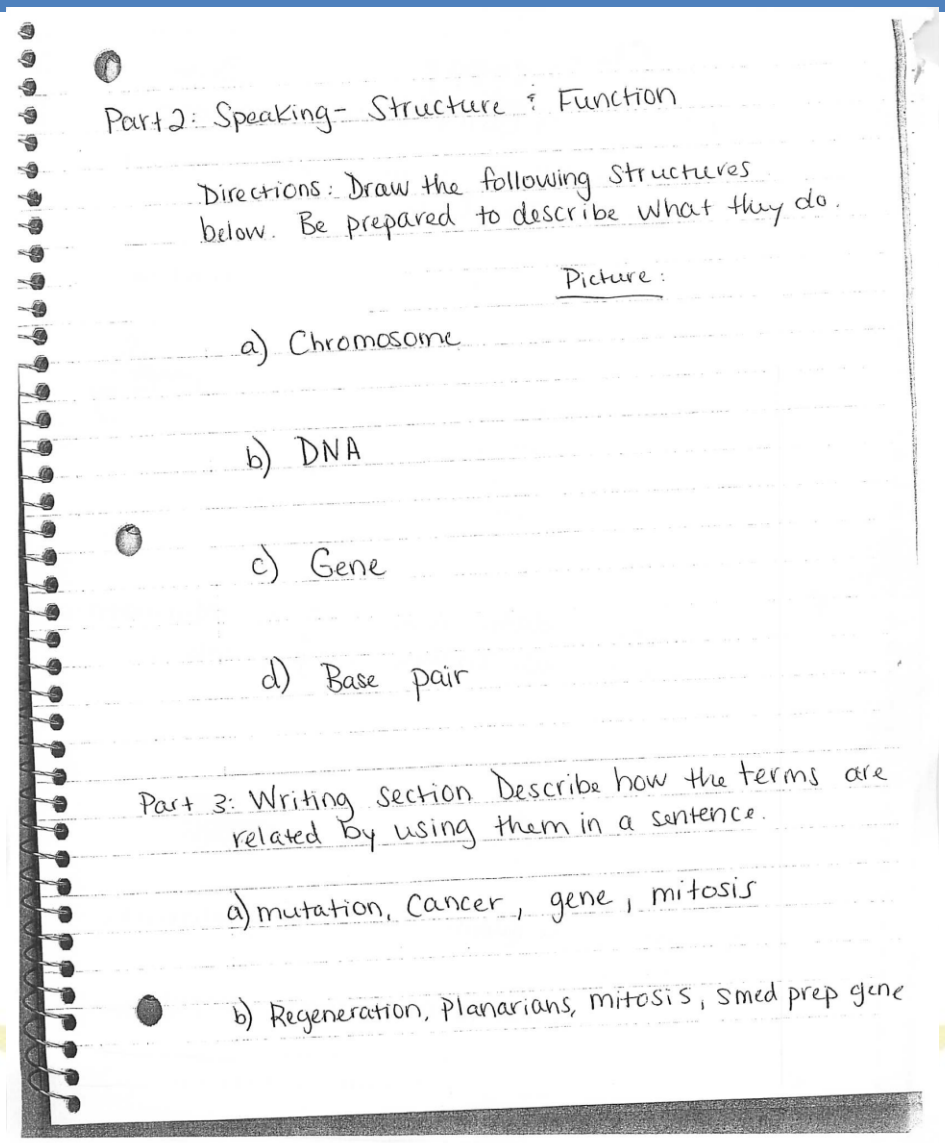
_____ is quantitative because _____

_____

_____ is qualitative because _____

_____

Example Feature 22 Assessment



Part 2: Speaking- Structure & Function

Directions: Draw the following structures below. Be prepared to describe what they do.

Picture:

a) Chromosome

b) DNA

c) Gene

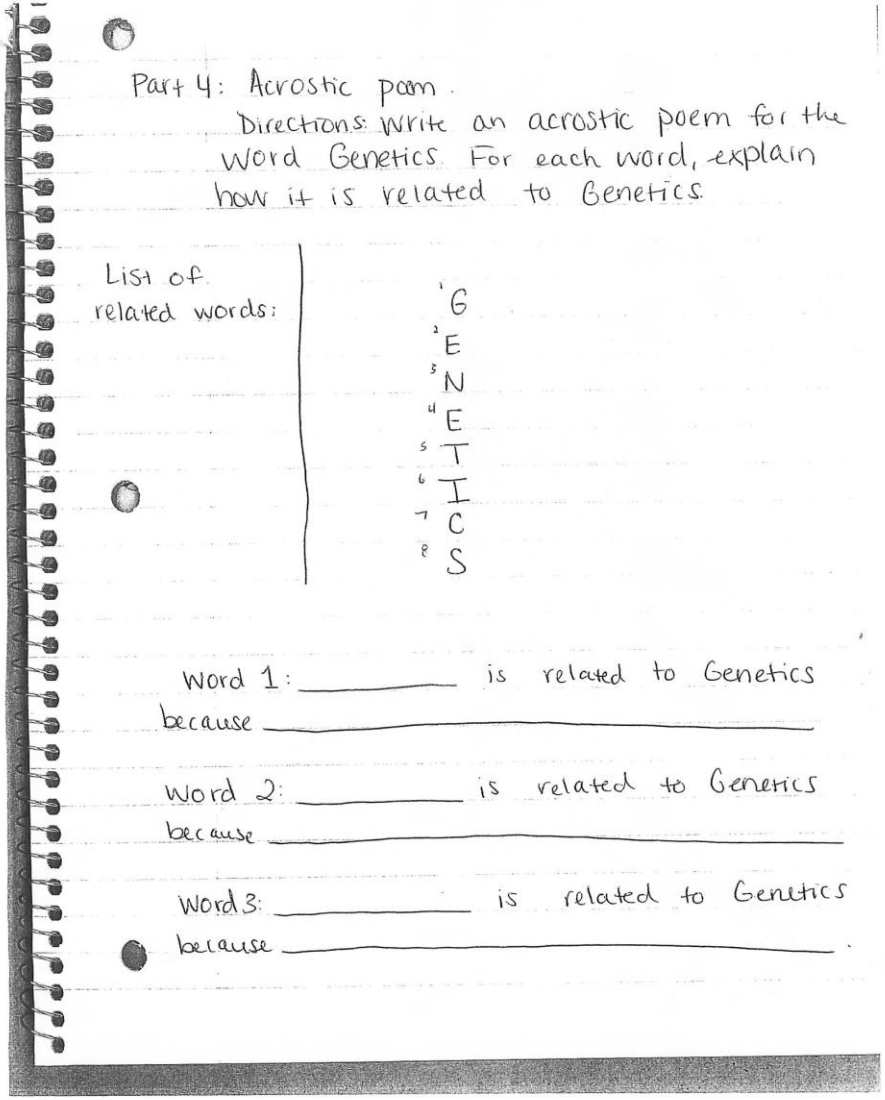
d) Base pair

Part 3: Writing section Describe how the terms are related by using them in a sentence.

a) mutation, Cancer, gene, mitosis

b) Regeneration, Planarians, mitosis, smed prep gene

Example Feature 22 Assessment



Part 4: Acrostic poem.

Directions: Write an acrostic poem for the word Genetics. For each word, explain how it is related to Genetics.

List of related words:

1 G
2 E
3 N
4 E
5 T
6 I
7 C
8 S

Word 1: _____ is related to Genetics because _____

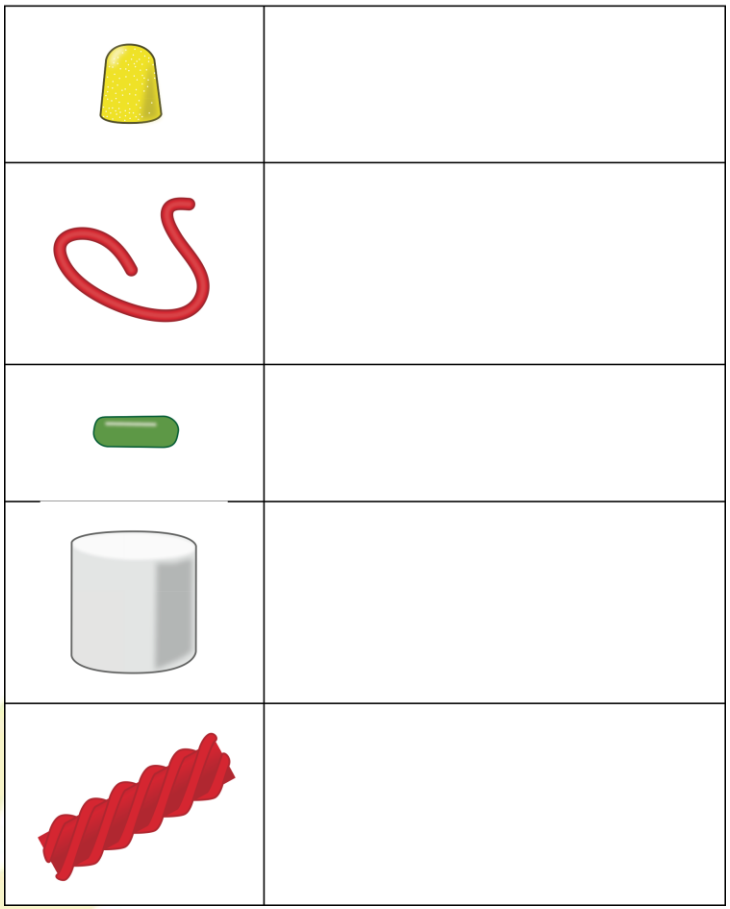
Word 2: _____ is related to Genetics because _____

Word 3: _____ is related to Genetics because _____.

Planarian Lesson 4 Overview

- Discuss stages of mitosis in connection with planarians' regenerative stem cells
  - Students illustrate the cycle of mitosis and model mitosis using candy
- Story format using "Planarian Paolo"

Candy key



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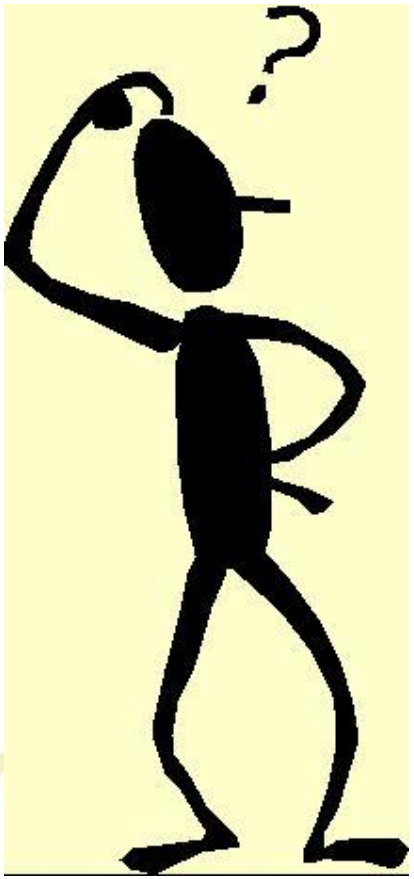
SIOP Feature 13: Provide Ample Opportunities to use Learning Strategies

Student-Centered Learning Strategies

- Mental Imagery: Students practice visualizing scenes created from text
- Clustering: Discussing words related to a central vocabulary word
- Creating Analogies: Comparing science terms to real-world examples
- Mnemonics: Memory system using acronyms
- Comprehension Strategies
  - Prediction
  - Self-questioning
  - Determining importance
  - Summarizing

Creating Opportunities to Practice Comprehension Strategies

How do we practice literacy strategies and master biology content at the same time?



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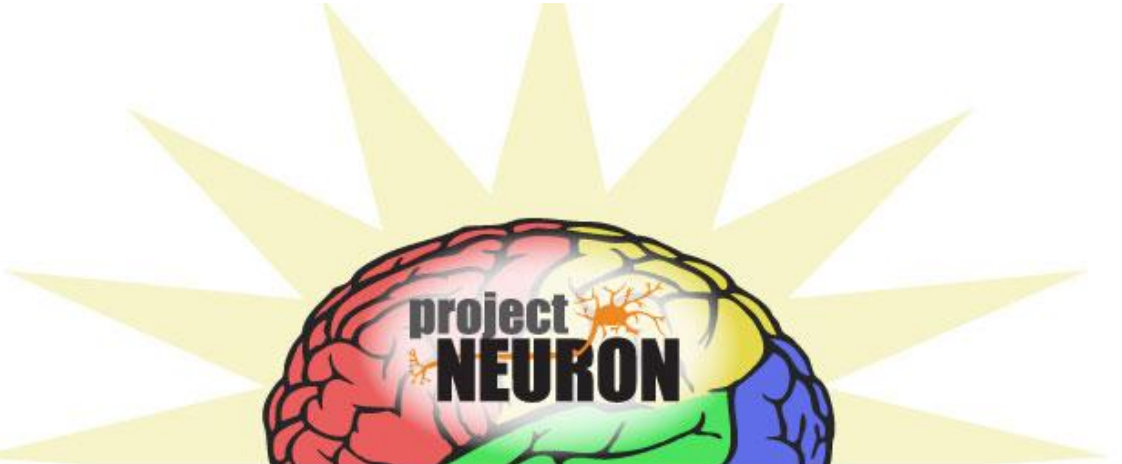
SIOP Feature 13: Provide Opportunities to use Learning Strategies

Your Task:

Think of a current science unit you teach. How could you create/modify a reading that allows students to explicitly practice student-centered learning strategies?



Example Feature 13 Reading

Name_____ Date_____ Class_____

Meet Planarian Paolo

Part 1: **Planarian Visualization**- Use information from the story to summarize what's happening to Paolo in the lab.

(1) It's an early morning at the local high school. Planarian Paolo senses that it is going to be a good day; he was just fed a few days ago and he is content with swimming in the plastic container his caretakers placed him in.

(2)As the students file into the classroom, the teacher begins to speak about "cutting" and "using proper technique" when using a coverslip. Paolo has no idea what these words mean, mostly because he doesn't have ears!

(3) One group of students, two boys and two girls, pick Paolo up with a plastic pipette and place him on a very cold, icy surface. The frigid temperature against Paolo's body causes him to slow down and stretch out—he is not a fan of swimming when it is so cold!

(4) The students begin cutting Paolo into separate pieces. Paolo is worried! What will happen to him??

(1)	(2)
Caption:	Caption:
(3)	(4)
Caption:	Caption:

Part 2-Your goal: Explain to Paolo that he doesn't need to worry because he is a Planarian! Describe what makes him different from other organisms and explain what's happening inside his body. Underline the vocabulary words that you use.

SIOP Feature 27: Comprehensive Review of Vocabulary

- Emphasis on key vocabulary that will be used throughout a unit
- Careful consideration of which vocabulary is necessary for students to succeed in the classroom
- Returning to key vocabulary multiple times throughout unit

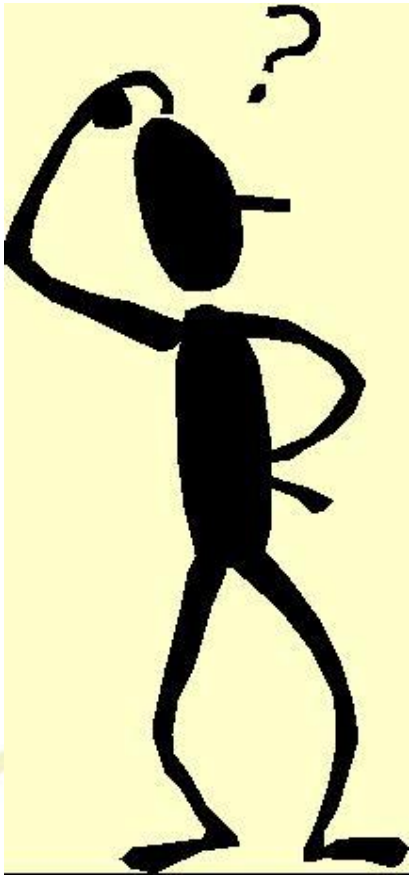
How do we emphasize and teach key vocabulary?

- Word Study Book: Student written book with word definitions, examples, and pictures
- Word Roots: Discussing prefixes and suffixes of words
- Cloze Sentences: Removing key vocabulary word within a strong contextual supported sentence, students discuss which word belongs in the sentence
- Word Generation: Brainstorm words with common root
- Vocabulary Self-Assessment

Creating Opportunities to Use and Review Vocabulary

Your Task:

Thinking of a science unit you currently teach, how can we teach and review vocabulary in meaningful ways for ELLs?



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Thank You!

For more information, check out our website
http://neuron.illinois.edu

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