Strategies to Support ELLs in the Science Classroom

Veronica Burnett, Regional Trainer
Veronica Burnett

- STEM advocate, Coach, and PD provider
- 18 years experience in STEM education
- Her mission is to improve the quality of teacher and student experiences in STEM
- Regional STEM Specialist
  Accelerate Learning
Navigate the 5-E Model of Instruction through the lense of a Bilingual Teacher

Show strategies to support English Language Learners

Identify ELL supports embedded in STEMscopes
What bad habits have you acquired during this pandemic?

- Binge-watching Netflix
- Online Shopping!
- Overeating!
- Going to bed super late!
There are over 4,800,000 English Learners (ELs) enrolled in K-12 Public Schools.

ELs make up 10% of Public School Students K-12.

Most ELs were born in the US and are US Citizens.

High school graduation rates for English learners in California is 68%.

The 3 States with highest ELs are California, Texas and Florida.

Source: ncela.ed.gov
Let's start with the first set of slides.

**5-E Model**

**Explore**
- Present the Content – Help learner understand concepts, process/procedures, facts or principles

**Engage**
- Establish Relevancy – Help learner determine need of learning new concepts

**Explain**
- Improve Understanding – Help learner to express new learning and provide guidance

**Elaborate**
- Construct New Learning – Help learner apply prior learning and acquire new

**Evaluate**
- Assess Learning – Help learner measure learning against its corresponding goals
Q - S-S-S-A

(Seidlitz & Perryman, 2011)

- **Question** – open ended, interesting
- **Signal** – when everyone is ready
- **Stem** - add structure to the talk
- **Share** – random selection
- **Assess** – Identify misconceptions
  - ask more questions

Nancy Motley, Author
What is your favorite strategy to support English Learners in your classroom?
My favorite strategy to support English Learners is...

Padlet.com
My favorite strategy to support English Learners is...

Anonymous 23h
My favorite strategy to support English Learners is think, pair, share. I really enjoy using Flipgrid. The children respond to each other using accountable talk.

Heart: 0
Add comment

Anonymous 22h
Lots of pictures, labeling and coloring pictures

Heart: 0
Add comment

Anonymous 23h
I am thankful for...

Anonymous 22h
Love waterfall strategy

Heart: 1
Add comment

Anonymous 23h
My favorite hobby is...

Anonymous 23h
Reading

Heart: 0
Add comment

Anonymous 22h
Swimming in open water

Heart: 0
Add comment

Anonymous 22h
This ELL presentation

Heart: 1
Add comment
**STRATEGIES TO SUPPORT ELs**

- **Make it visual:** use diagrams, pictures, realia, modeling, word walls
- **Scaffolding:** allow your student to use some of their first language.
- **Sentence frames:** allow your student to practice with academic language.
- **Use body language and gestures**
- **Speak slowly & clearly (avoid raising your voice)**
- **Teach Vocabulary during every lesson.**
- **Honor students' cultural background**
- **Avoid idioms**
- **Set high expectations**
- **Be aware of your student's social & emotional needs.**
- **Build in GROUP WORK:** less teacher-led instruction, more peer interaction.
- **Learn how to correctly pronounce your students' names.**
- **ALLOW MORE WAIT TIME**
Investigative Phenomena

- **A video or an image** with discussion guidelines to provide students experience Interpreting visual depictions of scientific phenomena and data as they figure out why or how something happens.

- Investigative Phenomena table: **graphic organizer** to organize student learning throughout the lesson; also available in Spanish.
Think of a tree...

- Put it on a piece of paper

Use visuals to support content!

maple tree
What do you notice?  What do you wonder?
The water cycle is...
When solar energy heats up water, it evaporates
The water vapor goes up and forms clouds
Condensation are water droplets making clouds
Precipitation can be rain, snow, sleet or hail
Common Misconception on food chains: Use arrows to clarify!

Arrows show **Flow of Energy NOT** who eats what!
Use Hands-on Activities

Rigorous **Hands-on activities** giving students many opportunities to interact with the phenomena and relate it to their personal experiences. (Spanish handouts included, embedded PD and EL strategies)
Adaptations for DISTANCE LEARNING

- Do a live teacher demonstration
- Record a video of yourself showing the activity
- Use a Video about the Content
- Use PhET Simulations
MAKING A VIDEO

- 6 minutes or less!
- Use essential question
- Only 1 Concept or skill
- Include a notes page
- Speak enthusiastically
- Ok to make mistakes!

More equitable
Students can re-watch at any time
Keep parents more in-the-loop

4-Part Video Series with Whitney Dove from National Institute of STEM Education

Video One: Creating your teaching space
https://www.youtube.com/watch?v=1RBHR2xRtGM&feature=youtu.be

Video Two: Predict, Observe, Retain Model
https://www.youtube.com/watch?v=iScCcjoNeg0&feature=youtu.be

Video Three: Facilitation Tips
https://www.youtube.com/watch?v=o0WrCEqiOCk&feature=youtu.be

Video Four: Lesson Demonstration
https://www.youtube.com/watch?v=pUWPooe2qd8&feature=youtu.be
EXPLORE

LIVE DEMONSTRATION

- 15 minutes or less!
- Use guiding question
- Include a notes page - before session
- Materials needed - before session
- Speak slowly and clearly
- Stop and check for understanding
Newton's Second Law of Motion

When the sum of forces is not zero, the net force is equal to the product of mass and acceleration, which is Newton's second law of motion. When objects do not have a zero net force, this indicates that the objects are either speeding up, slowing down, or changing directions. Figure 4 shows the result of a tug-of-war game where the net force was not zero.

Friction

Friction, the force that acts against the movement of an object, may play a role in applying Newton's second law. In some instances, friction must be overcome before motion occurs. Figure 3 shows an apple being pulled. Friction is the force that prevents the apple from moving, maintaining a net force of zero. The force needed to overcome friction is not a component of the force being exerted on the object. Therefore, subtracting the force of friction from the input force allows us to find the net force on the object.

Sliding Friction

In everyday life, friction is a common occurrence. Figure 6 depicts what is known as sliding friction. This is the force that opposes two surfaces that are sliding past one another. As the box is being moved, the surface of the box slides across the surface of the floor. Another example would be rubbing your hands together. The two objects are sliding across each other, and the heat produced is due to sliding friction.

Static Friction

Friction may also be static. Static friction is the friction that prevents a stationary object from moving against the surface it is resting on. An example could be a stationary box on a ramp (Figure 7). The static friction prevents the box from sliding down the ramp. Another example of static friction is walking. As you take a step, your sole comes into contact with the ground and exerts a force. The static friction prevents the sole from sliding, allowing you to move forward. Does static friction exist on ice?
Highlighting +

Highlighting Tool

STEMscopes Includes Highlighting Tool!

Give students a FOCUS:
“Highlight one sentence about each of the following terms:
1. Refraction
2. Reflection

Require students to add annotations to anything they highlight
They will become very selective!

Properties of Visible Light

Reflect

A rainbow is a perfect example of how visible light is composed of a spectrum of colors. To see a rainbow, your back must be to the sun as you look up at about a 45-degree angle to where the air has suspended droplets of water. Each droplet of water acts as a tiny prism that transmits, refracts, and reflects light to your eye.

- **visible light**: the range of wavelengths of electromagnetic radiation that our eyes can detect
- **spectrum**: the band of colors produced when light is separated into its component wavelengths
- **transmit**: to pass through a medium
- **refract**: to bend or change direction
- **reflect**: to bounce back

Electromagnetic Waves

Light is made of electromagnetic waves that do not need a medium in which to travel. Waves are a combination of electric and magnetic energy that travel as particles called photons. These photons have different wavelengths along the electromagnetic spectrum. In order, decreasing wavelengths, they are the following: radio waves (lowest-energy photons), infrared, visible light, ultraviolet, X-rays, and gamma rays (highest-energy photons). Notice that visible light is only a small portion of the entire electromagnetic spectrum.

In a vacuum, all wavelengths travel at the same speed of 300,000,000 meters/second, which is 186,000 miles/second. Frequency refers to the number of waves that pass a given point in a given period of time (usually 1 second). Electromagnetic waves with longer wavelengths have lower frequencies; in other words, fewer waves pass a given point each second. Electromagnetic waves with shorter wavelengths have higher frequencies, which means more waves pass a given point each second.
Chunking Content with Graphic Organizers

- **Graphic Organizers** to help students connect English Language Arts to the Science content.

Teach Students that **Shapes are for Fragments**
Use Graphic Organizers

P-A-T List

- Pay
- Attention
- To

Nancy Motley
Graphic Organizers

**Claim and Evidence**

<table>
<thead>
<tr>
<th>Evidence</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light travels in a straight line until it strikes an object, it will either reflect or refract</td>
<td>Light travels in a straight line until it strikes an object, it will either reflect or refract</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Name: ___________________________  Date: __________
EXPLAIN

Claim, Evidence, Reasoning
Use Sentence Stems

- Help our students answer in complete sentences
- Provide Scaffolding - help students get started in speaking & writing without the added pressure of formulating a response
- Model language and grammatical structures
- Give practice of new vocabulary
- Facilitate Conversations
- Increase English language proficiency
Sentence Stems

Example of Differentiated Sentence Stems:

Using the information regarding ________ found in ______, I can infer ___________ because_____________

Using the information regarding ________, I can infer _______ because________

I can infer ___________ because________

I can infer ___________ because________

I can infer ____________
**Sentence Frames** are fill in the blank statements:

- My name is _________ and I am _________ years old.
- Based on the experiment, I can infer that
  the ______ will increase and the _____
  will decrease.

**Sentence Stems** are the beginning of a sentence:

- Based on the data, I infer...___________
- Today I learned... _____________
- I think that... _____________
EXPLAIN

Give Explicit Directions

Clear EXPLANATION

➢ **Purpose:** to teach information to someone else on paper
➢ Be concise, make it easy to understand
➢ Provide facts, details, steps, examples, non-examples, definitions/descriptions, assumptions

MAKING A CLAIM with Evidence

➢ **Purpose:** to convince the reader to think the same way as you
➢ Argue one side of the issue and provide 3 pieces of evidence
➢ Provide facts, specific details, data, statistics, examples, expert opinions
Start with an engaging picture
Have children describe the picture using all their five senses:

- It looks like…
- It smells like..
- It sounds like...
- It feels like…
- It tastes like...
Use Picture Vocabulary

- Vocabulary Cards with picture/word/definition may be used as a slideshow, in a word wall or to do vocabulary strategies with your students

- Vocabulary strategies included
I see 3 types of energy: __________, __________ and __________.
Graphic Organizers to help students make connections with Vocabulary:

**Putting It All Together**

Make as many word connections as possible using arrows. Describe the connection using one or two words along the arrows.

- 
- 
- 
- 
- 
- 
- 
- 
- 
-
Revisit the content in different ways

Connections to world/other content areas
(math, reading, career connections)

Career Connections — NASA Engineer

This Career Connections video is meant to be a tool that introduces your students to STEM careers and the 21st century skills needed to succeed in those fields. These include, but aren't limited to, creativity and innovation, critical thinking, problem solving, and technology skills.

Watch the career video with your students and then facilitate a discussion using the guiding questions below. Your students will think like a STEM professional in no time!
Multiple Choice, CER & Open-ended Response Assessments

- **Multiple choice & open ended assessments**
- **Editable** assessments allow for differentiation
- Available in Spanish
How will your students show what they learned?

Allow a variety of choices

Examples:

- Make a 3D model of…
- One example from the experience
- One example from the reading or a video
- Writing a paragraph about...
- Draw a picture of...
### Work in Pairs or Small groups

<table>
<thead>
<tr>
<th>JOB: Materials Manager</th>
<th>JOB: Safety Director</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Role:</strong> Make sure all team members are using materials</td>
<td><strong>Role:</strong> Make sure all team members are following safety procedures</td>
</tr>
<tr>
<td><strong>Tasks:</strong></td>
<td><strong>Tasks:</strong></td>
</tr>
<tr>
<td>- Pick up materials</td>
<td>- Pick up tools and safety equipment</td>
</tr>
<tr>
<td>- Replenish materials</td>
<td>- Lab safety reports/ rubric</td>
</tr>
<tr>
<td>- Verify measurements</td>
<td>- Clean and return tools and safety equipment</td>
</tr>
<tr>
<td>- Clean and return materials</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>JOB: Lead Investigator</th>
<th>JOB: Recorder Reporter</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Role:</strong> Make sure all team members participate in all stages</td>
<td><strong>Role:</strong> Make sure all team members complete written assignments</td>
</tr>
<tr>
<td><strong>Tasks:</strong></td>
<td><strong>Tasks:</strong></td>
</tr>
<tr>
<td>- Pick up additional lab documents/ devices</td>
<td>- Pick up student docs</td>
</tr>
<tr>
<td>- Read directions and procedures out loud</td>
<td>- Record group data/ info and report conclusions</td>
</tr>
<tr>
<td>- Return lab docs and devices</td>
<td>- Turn in student documents</td>
</tr>
</tbody>
</table>
Language Acquisition Strategies

Student Stems:
1. ___ is an example of ... 
2. First ___, and then ... 
3. Due to ___, I think ... 
4. I can infer that ... 

Examples:
1. "Two lions fighting over food" is an example of "competition."
2. First "the igneous rock must be weathered and eroded," and then "it must be deposited in a different location, where more sediments will accumulate over time."
3. Due to "the reaction being endothermic," I think "it will not release any heat and feel cold."
4. I can infer that "the properties of the unknown material would most likely be similar to that of a metal."

© Accelerate Learning Inc. - All Rights Reserved
Text to Speech  read-aloud function in English or Spanish to support literacy development and student comprehension. Can be changed to read at different speeds!

Dictionary

Highlighting & Annotating tools  allows students to embed notes -- increasing student-to-text interactivity
Use Formative Assessments

**VENN DIAGRAM**

Name: __________________ Date: __________

Complete the Venn diagram by adding terms and phrases to compare the two concepts.

**EXIT TICKET**

Name: ___________ Date: __________

Today I learned

________________________________________

________________________________________

________________________________________

Tomorrow I need

________________________________________

________________________________________

**MY TOP FIVE LIST**

Name: ______________ Date: __________

List the five most important ideas, concepts, terms, or facts from today’s lesson. Then rank each from 1 - 5, with 1 being the most important.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Concept, Idea, Fact, or Term</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**1 - 2 - 3**

Name: ______________ Date: __________

The most important thing I learned today was . . .

________________________________________

________________________________________

________________________________________

Two reasons why this is important are . . .

Three examples of this are . . .

________________________________________

________________________________________

________________________________________
THREE THINGS

Name: ______________________________ Date: ______________

List three things that a classmate might not understand about today’s learning. For each example, explain why you think this information might be difficult for some students.

1. Type your answer here

2. Type your answer here

3. Type your answer here
ELD SUPPORT

STEMscopes Activities Available in Spanish

Picture Vocabulary
Explores – Handouts
Linking Literacy
STEMscopedia
Communicate Science
Concept Review Game
Science Rock
Independent Practice
Concept Attainment Quizzes
Assessments
Claim Evidence Reasoning
Science Art
What supports embedded in STEMscopes did you discover today?

What is 1 new idea from today that you will try with your students?
Questions?
Thank you!

Veronica Burnett
STEMscopes Regional Trainer
vburnett@acceleratelearning.com

STEMscopes Resources
https://stemscopes.com/distance-learning

Resources Folder
https://tinyurl.com/NSTA-2020-STEMscopes
Have a Wonderful SCHOOL YEAR!