Equations for Science and English Language Learning

Trish Conley
Adriane Geronimo
Midland Senior High School
CO₂ + H₂O → C₆H₁₂O₆ + O₂
C₆H₁₂O₆ → CO₂ + H₂O
E₂ + Ct₂ → CL + LL
Agenda

• Introduction
• Part 1: Choosing and Adapting Texts
• Part 2: Experiments and Language Experience Approach
• Part 3: Vocabulary Posters and Stop-Motion Animation
• Part 4: TELPAS Writing
• Closing
Learning Target:
• Use strategies to enable English learners to access secondary science curriculum

Essential Question:
• How can we provide effective science instruction to facilitate the success of English learners and all students?
Introduction

Midland Senior High School

- Biology (NC1)
- Environmental Systems
- NC1 Reading 1
- NC1 Practical Writing Skills
- Informal content-area support
- Singleton PLC
Choosing and Adapting Texts

- Grade-Level Content - Linguistic Complexity → Comprehensible Input
Choosing and Adapting Texts

Prentice Hall *Biology*,
Kenneth Miller and Joseph Levine

- Key information in boldface
- Study guide summarizes key concepts
- Study guide vocabulary list
- English/Spanish glossary
Choosing and Adapting Texts

Prentice Hall Biology

- Key information in boldface
Choosing and Adapting Texts

Prentice Hall *Biology*

- Study guide summarizes key concepts
- Study guide vocabulary list

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**2-3 Carbon Compounds**

- Four groups of organic compounds found in living things are carbohydrates, lipids, nucleic acids, and proteins.
- Living things use carbohydrates as their main source of energy. Plants and some animals also use carbohydrates for structural purposes.
- Lipids can be used to store energy. Some lipids are important parts of biological membranes and waterproof coverings.
- Nucleic acids store and transmit hereditary, or genetic, information.
- Some proteins control the rate of reactions and regulate cell processes. Some proteins build tissues such as bone and muscle. Others transport materials or help to fight disease.

**Vocabulary**

- monomer, p. 45 • polymer, p. 45
- carbohydrate, p. 45 • monosaccharide, p. 46
- polysaccharide, p. 46 • lipid, p. 46
- nucleic acid, p. 47 • nucleotide, p. 47
- ribonucleic acid (RNA), p. 47
- deoxyribonucleic acid (DNA), p. 47
- protein, p. 47 • amino acid, p. 47
Choosing and Adapting Texts

Prentice Hall *Biology*
- English/Spanish glossary
Choosing and Adapting Texts

McGraw-Hill Biology

- English/Spanish glossary

<table>
<thead>
<tr>
<th>English</th>
<th>Spanish</th>
</tr>
</thead>
<tbody>
<tr>
<td>B cell: (p. 1086) antibody-producing B lymphocyte.</td>
<td>célula B: (pág. 1086) linfocito B productor de antígenos.</td>
</tr>
<tr>
<td>background extinction: (p. 122) gradual process of a species becoming extinct.</td>
<td>extinción tradicional o natural: (pág. 122) proceso paulatino de extinción de una especie.</td>
</tr>
<tr>
<td>bacteria: (p. 516) microscopic prokaryotes most are beneficial to humans and to the environment, but a small percentage can cause disease.</td>
<td>bacterias: (pág. 516) procariota microscópico; la mayoría son benéficos a los humanos y al ambiente; sólo un pequeño porcentaje puede causar enfermedades.</td>
</tr>
<tr>
<td>base: (p. 164) substance that releases hydroxide ions (OH⁻) when dissolved in water; a basic solution has a pH greater than 7.</td>
<td>base: (pág. 164) sustancia que libera iones hidróxido (OH⁻) al disolverse en agua; una solución básica tiene un pH mayor que 7.</td>
</tr>
<tr>
<td>basidiocarp (buh SIH dee oh karp): (p. 586) fruiting body of basidiomycetes.</td>
<td>basidiocarpo: (pág. 586) órgano productor de esporas en los basidiomicetos.</td>
</tr>
<tr>
<td>basidiospore: (p. 586) haploid spore released by a basidium during reproduction.</td>
<td>basidiospora: (pág. 586) espora haploide liberada por un basidio durante la reproducción.</td>
</tr>
<tr>
<td>basidium: (p. 586) club-shaped, spore-producing hypha of basidiomycetes.</td>
<td>basidio: (pág. 586) hifa productora de esporas de los basidiomicetos; tiene forma de maza.</td>
</tr>
<tr>
<td>behavior: (p. 908) the way in which an animal responds to an external or internal stimulus.</td>
<td>comportamiento: (pág. 908) manera en que un animal responde a un estímulo externo o interno.</td>
</tr>
<tr>
<td>benthic zone: (p. 80) ocean-floor area consisting of sand, silt, and dead organisms.</td>
<td>zona bética: (pág. 80) zona del fondo marino formada por arena, limo y organismos muertos.</td>
</tr>
<tr>
<td>biennial: (p. 621) plant with a two-year life span.</td>
<td>bienal: (pág. 621) planta con un ciclo de vida de dos años</td>
</tr>
<tr>
<td>bilateral (bi LA tuh rul) symmetry: (p. 700) body plan that can be divided into mirror images along only one</td>
<td>simetría bilateral: (pág. 700) plan corporal que se puede dividir en imágenes especulares, a lo largo de un solo plano a través del eje central.</td>
</tr>
</tbody>
</table>
Section 1: Ecosystems: Everything Is Connected

Read the passage below and answer the questions that follow.

An ecosystem is made up of both living and nonliving things. Biotic factors are the living and once-living parts of an ecosystem, including all of the plants and animals. Biotic factors include dead organisms, dead parts of organisms, such as leaves, and the organisms’ waste products. The biotic parts of an ecosystem interact with each other in various ways. They also interact with the abiotic (ay bie AHT ik) factors, the nonliving parts of the ecosystem. Abiotic factors include air, water, rocks, sand, light, and temperature.
Choosing and Adapting Texts

• Microsoft Word
  • Spelling & Grammar → Readability Statistics

An ecosystem is made up of both living and nonliving things. Biotic factors are the living and once-living parts of an ecosystem, including all of the plants and animals. Biotic factors include dead organisms, dead parts of organisms, such as leaves, and the organisms’ waste products. The biotic parts of an ecosystem interact with each other in various ways. They also interact with the abiotic factors, the nonliving parts of the ecosystem. Abiotic factors include air, water, rocks, sand, light, and temperature.
Choosing and Adapting Texts

- Microsoft Word
  - Spelling & Grammar → Readability Statistics
Choosing and Adapting Texts

- lead4ward Content Builder
- Academic Vocabulary → Bio

### Academic Vocabulary Analysis | Biology

#### Organism Behavior

**B.12 Science concepts.** The student knows that interdependence and interactions occur within an environmental system.

<table>
<thead>
<tr>
<th>subcluster</th>
<th>standards</th>
<th>new to grade level</th>
<th>previously introduced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interdependence</td>
<td>B.12(A)</td>
<td>commensalism*</td>
<td>competition for resources</td>
</tr>
<tr>
<td></td>
<td></td>
<td>parasitism*</td>
<td>symbiotic relationship</td>
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<td></td>
<td></td>
<td>predation*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>mutualism*</td>
<td></td>
</tr>
<tr>
<td>Matter and Energy Flow in</td>
<td>B.12(C),</td>
<td>10% Energy Rule</td>
<td></td>
</tr>
<tr>
<td>Ecosystems</td>
<td>B.12(D)</td>
<td>atmospheric nitrogen*</td>
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<tr>
<td></td>
<td></td>
<td>autotroph</td>
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<td></td>
<td></td>
<td>carbon cycle</td>
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<td></td>
<td></td>
<td>detrivore*</td>
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<tr>
<td></td>
<td></td>
<td>heterotroph</td>
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<tr>
<td>Ecosystem Stability</td>
<td>B.12(E)</td>
<td>diversity-stability</td>
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<td></td>
<td></td>
<td>relationship</td>
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<td>dynamic equilibrium</td>
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<td>environmental resistance</td>
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<td>invasive species</td>
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<td></td>
<td></td>
<td>reduction factor</td>
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<td></td>
<td></td>
<td>ecosystem*</td>
<td></td>
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<td></td>
<td></td>
<td>ecosystem instability*</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>ecosystem stability</td>
<td></td>
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<td></td>
<td></td>
<td>environmental change</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>impact*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>organism*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>resistance*</td>
<td></td>
</tr>
</tbody>
</table>
Choosing and Adapting Texts

• lead4ward Content Builder

An ecosystem is made up of both living and nonliving things. Biotic factors are the living and once-living parts of an ecosystem, including all of the plants and animals. Biotic factors include dead organisms, dead parts of organisms, such as leaves, and the organisms’ waste products. The biotic parts of an ecosystem interact with each other in various ways. They also interact with the abiotic factors, the nonliving parts of the ecosystem. Abiotic factors include air, water, rocks, sand, light, and temperature. (10.6)
Choosing and Adapting Texts

- Microsoft Word

An **ecosystem** is made of **living** and **nonliving** things. Biotic **factors** are the living and once-living parts of an ecosystem. This includes plants and animals. Biotic **factors** include dead **organisms**, dead parts of organisms, such as leaves, and the organisms’ waste products. The biotic parts of an ecosystem **interact** with each other in different ways. They also interact with the **abiotic factors**. These are the nonliving parts of the ecosystem. Abiotic factors include air, water, rocks, sand, light, and temperature. (9.1)
Choosing and Adapting Texts

• Microsoft Word

An ecosystem has living things.
An ecosystem has nonliving things.
Biotic factors are the living parts of an ecosystem.
Biotic factors are also the once-living parts of an ecosystem.
This includes plants and animals.
Biotic factors include dead organisms.
Biotic factors include dead parts of organisms.
Leaves are one dead part of an organism.
Biotic factors include the waste products of organisms.
The biotic parts of an ecosystem interact with other biotic parts.
They also interact with the abiotic factors.
These are the nonliving parts of the ecosystem.
Abiotic factors include air, water, rocks, and sand.
Abiotic factors also include light and temperature. (8.8)
Choosing and Adapting Texts

- Microsoft Word

Skills Worksheet

Active Reading

Section 1: Ecosystems: Everything Is Connected

Read the passage below and answer the questions that follow.

An ecosystem has **living** things.
An ecosystem has **nonliving** things.
**Biotic factors** are the living parts of an ecosystem.
**Biotic factors** are also the once-living parts of an ecosystem.
This includes plants and animals.
**Biotic factors** include dead **organisms**.
**Biotic factors** include dead parts of organisms.
Leaves are one dead part of an organism.
**Biotic factors** include the waste products of organisms.
The biotic parts of an ecosystem **interact** with other biotic parts.
They also interact with the **abiotic factors**.
These are the nonliving parts of the ecosystem.
**Abiotic factors** include air, water, rocks, and sand.
**Abiotic factors** also include light and temperature.
Choosing and Adapting Texts

• Microsoft Word

Resistance is the ability of one or more organisms to tolerate a particular chemical designed to kill it. An organism may be resistant to a chemical when it contains a gene that allows it to break the chemical down into harmless substances. By trying to control pests and bacteria with chemicals, humans promote the evolution of resistant populations.

Consider the evolution of pesticide resistance among corn pests. A pesticide is sprayed on corn to kill grasshoppers. Most of the grasshoppers die, but a few survive. The survivors happen to have a gene that protects them from the pesticide. The surviving insects pass on the gene to their offspring. Each time the corn is sprayed, insects that are resistant to the pesticide will have a greater chance of survival and reproduction. As a result, the insect population will evolve to include more and more resistant members. (9.3)

Resistance is the ability of organisms to tolerate a chemical designed to kill it. An organism may be resistant to a chemical. It contains a gene that allows it to make the chemical harmless. Humans try to control pests and bacteria with chemicals. Humans promote the evolution of resistant populations.

Consider the evolution of pesticide resistance among corn pests. A pesticide is sprayed on corn. The pesticide kills grasshoppers. Most grasshoppers die. A few survive. The survivors have a gene that protects them from the pesticide. The surviving insects pass on the gene to their offspring. When the corn is sprayed, insects that are resistant to the pesticide have a greater chance of survival and reproduction. As a result, the insect population evolves to include more resistant members. (7.9)

Resistance is the ability of plants or animals to tolerate chemicals made to kill them. An organism can be resistant to a chemical. The organism has a gene that makes the chemical harmless. Humans use chemicals to control pests and bacteria. Humans help the evolution of resistant populations.

Look at the evolution of pesticide resistance in corn pests. A pesticide is sprayed on corn. The pesticide kills grasshoppers. Most grasshoppers die. A few survive. The grasshoppers that survive have a gene. The gene protects them. They are protected from the pesticide. The surviving insects pass on the gene to their offspring. Insects that are resistant to the pesticide can survive and reproduce. The insect population evolves. The insect population has more resistant insects. (7.2)
Choosing and Adapting Texts

- Microsoft Word
- Rewordify.com
- Lexile.com
  → Free Lexile Analyzer® (Free Registration)
Choosing and Adapting Texts

• Grade-level content - Linguistic complexity → Comprehensible input

• ELPS 4E Read linguistically accommodated content area material with a decreasing need for linguistic accommodations as more English is learned.

• Accessibility Feature → Bilingual Dictionary

• Designated Supports → Content and Language Supports → Simplified Language
Handwashing

- Put some “germs” on your hands.
- Look at your hands under the UV light.
- Clean your hands.
- Make a prediction:
  - What will we see under the UV light?
- Look at your hands under the UV light.
Experiments and Language Experience Approach

• Hands-on Learning + Language Support → Content Retention
Experiments and Language Experience Approach

- Eco-bottle
  - Observe
  - Make measurements
  - Test water
  - Collect and organize data
  - Graph data
  - Analyze data
Experiments and Language Experience Approach

Glencoe Science *Biology: The Dynamics of Life*

- Laboratory Manual
- How Does Detergent Affect Seed Germination?
Experiments and Language Experience Approach

Glencoe Science Biology: The Dynamics of Life

• How Does Detergent Affect Seed Germination?
Experiments and Language Experience Approach

How Does Detergent Affect Seed Germination?

- Hypothesize
- Measure
- Observe
- Record
- Determine effects of concentration
- Graph data
Experiments and Language Experience Approach

Glencoe Science *Biology: The Dynamics of Life*

- How Does Detergent Affect Seed Germination?
Experiments and Language Experience Approach

Handwashing

• Canvas MOOC - Content-Based Instruction
  • American English (AE) E-Teacher Program sponsored by the U.S. Department of State
• Open Educational Resources
Experiments and Language Experience Approach

Handwashing: Your Best Defense Against Illness

Why Is Handwashing Important?
According to the Centers for Disease Control and Prevention, "Frequent handwashing is one of the best ways to prevent the spread of infectious diseases." Microbes are everywhere. They are on surfaces in your home, in your school, at your work, and as on your body, including your hands. While many microbes are not harmful, there are some that can make you sick. These disease-causing microbes, or germs, can cause colds, diarrhea, and serious illnesses such as hepatitis A, meningitis, and the flu. Handwashing helps rid your hands of germs, greatly decreasing the chances of you, or someone else, getting sick.

When Should I Wash My Hands?
You should wash your hands frequently throughout the day, especially at the following times:

- After:
  - Using the bathroom
  - Sneezing or coughing
  - Petting animals
  - Handling raw foods, especially meats, poultry, fish
  - Handling any soiled or potentially contaminated items

Can I Use Hand Sanitizer Instead of Soap and Water?
Hand sanitizers should not be used in place of proper handwashing, unless handwashing facilities are not available.

- Frequent use of hand sanitizers can strip the outer layer of oil from your hands, leading to cracking and dryness, which can trap germs and bacteria.
- Hand sanitizers can be used in addition to good handwashing, but not as a substitute.

Proper Handwashing Techniques

1. Have a paper towel ready.
2. Wet hands under warm water.
3. Apply soap.
4. Scrub backs of hands, wrists, under fingernails, and between fingers for 10 to 15 seconds.
5. Rinse hands under warm water.
6. Dry hands with a paper towel.
7. Turn faucet off with a paper towel.

For additional resources, visit the Pennsylvania Department of Agriculture and Environmental Protection's website: handwashing.psu.edu/.

Prepared by Mary Shattuck, extension educator, Luzerne County. For more information, contact your local Cooperative Extension office.

Mission: All students will graduate prepared and ready for college or career.
Experiments and Language Experience Approach

• Hands-on Learning + Language Support → Content Retention
  • **ELPS 4F** Use visual and contextual support and support from peers and teachers to read grade-appropriate content area text, enhance and confirm understanding, and develop vocabulary, grasp of language structures, and background knowledge needed to comprehend increasingly challenging language.

• Designated Supports → Content and Language Supports → Visual Representation, Define and Clarify Language
Happy Meal
Vocabulary Posters and Stop-Motion Animation

- Content Knowledge + Opportunities for Output
  → Deeper Content Knowledge + Enhanced Language Skills
Vocabulary Posters and Stop-Motion Animation

<table>
<thead>
<tr>
<th>POINTS</th>
<th>4 pts. Excellent</th>
<th>3 pts. Very Good</th>
<th>2 pts good</th>
<th>1 pt. Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word is prominent on the poster</td>
<td>Excellent</td>
<td>Very Good</td>
<td>Good</td>
<td>Poor</td>
</tr>
<tr>
<td>Definition appears below the word</td>
<td>Excellent</td>
<td>Very Good</td>
<td>Good</td>
<td>Poor</td>
</tr>
<tr>
<td>Definition is accurate &amp; edited to 6 or less words</td>
<td>Excellent</td>
<td>Very Good</td>
<td>Good</td>
<td>Poor</td>
</tr>
<tr>
<td>3-D component/s Relate/s supports the definition</td>
<td>Excellent</td>
<td>Very Good</td>
<td>Good</td>
<td>Poor</td>
</tr>
</tbody>
</table>
# Vocabulary Posters and Stop-Motion Animation

<table>
<thead>
<tr>
<th>Description</th>
<th>Excellent</th>
<th>Very Good</th>
<th>Good</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Art/pictures around border frames the poster</td>
<td>Excellent</td>
<td>Very Good</td>
<td>Good</td>
<td>Poor</td>
</tr>
<tr>
<td>Art/pictures around border were creative &amp; thoughtful</td>
<td>Excellent</td>
<td>Very Good</td>
<td>Good</td>
<td>Poor</td>
</tr>
<tr>
<td>Art/pictures helps students remember the definition</td>
<td>Excellent</td>
<td>Very good</td>
<td>Good</td>
<td>Poor</td>
</tr>
<tr>
<td>Teamwork was obvious during the construction of poster</td>
<td>Excellent</td>
<td>Very Good</td>
<td>Good</td>
<td>Poor</td>
</tr>
<tr>
<td>Teamwork was obvious during presentation</td>
<td>Excellent</td>
<td>Very Good</td>
<td>Good</td>
<td>Poor</td>
</tr>
<tr>
<td>Vocabulary test was passed</td>
<td>Excellent</td>
<td>Very Good</td>
<td>Good</td>
<td>Poor</td>
</tr>
</tbody>
</table>
Vocabulary Posters and Stop-Motion Animation

• Stop-Motion Animation
  • Life Cycles and Genetic Modification

• ELA: Analyze the use of common expository text structures such as ... cause/effect.
Experiments and Language Experience Approach

• Life Cycles and Genetic Modification
• “Investigation 2: Isolate DNA”
• Peoples Education *Measuring Up to the Biology End-of-Course Exam*
Vocabulary Posters and Stop-Motion Animation

• Storyboard
Vocabulary Posters and Stop-Motion Animation

- Storyboard
- Art
  - Make art for each scene and character in your story
Vocabulary Posters and Stop-Motion Animation

- Storyboard
- Art
  - Make art for each scene and character in your story
- Download
  - StikBot Studio on your phone
  - Stop Motion Animator on a Chromebook
- Animation
  - “The Life Cycle of a Genetically Modified _____”
Vocabulary Posters and Stop-Motion Animation

- Content Knowledge + Opportunities for Output → Deeper Content Knowledge + Enhanced Language Skills
- ELPS 5G Narrate, describe, and explain with increasing specificity and detail to fulfill content area writing needs as more English is acquired.
- Designated Supports → Content and Language Supports → Visual Representation
HIV Transmission
TEL PAS Writing

• Content Knowledge + Language Proficiency → Academic Writing
TELPAS Writing

- HIV Transmission
TELPAS Writing

• Handwashing
TELPAS Writing

• Write an essay explaining the importance of handwashing.
• Use evidence from the article we read yesterday, our experiment today, and the data on the graph.
TELPAŚ Writing

• Life Cycles
TELPAS Writing

• Life Cycles
  • Use sticky notes to show the life cycle of:
    • Apples
    • Corn
    • Soybeans
    • Cattle
    • Pigs
    • Chicken
    • Salmon
  • Write in pencil!
TELPAS Writing

• Life Cycles
  • Modify your life cycle to show the effects of genetic engineering
TELPAS Writing

• Life Cycles
  • Write an essay in paragraphs. In your essay, you should:
    • Describe the life cycle of your plant or animal
    • Tell how scientists or farmers cause genetic modification or selective breeding
    • Describe the effect genetic modification or selective breeding has on your plant or animal
    • Describe the effect this has on the food we eat

You may use your sticky notes.
You may use the word wall.
You may not use a dictionary.
TELPAS Writing

• Content Knowledge + Opportunities for Output → Deeper Content Knowledge + Enhanced Language Skills

• ELPS 5G Narrate, describe, and explain with increasing specificity and detail to fulfill content area writing needs as more English is acquired.

• Designated Supports → Content and Language Supports → Language and Vocabulary Support
Closing

• Support English learners’ language acquisition while maintaining content-area rigor

• Provide multiple opportunities for supported input (listening and reading) and output (speaking and writing)
Learning Target:

• Use strategies to enable English learners to access secondary science curriculum

Essential Question:

• How can we provide effective science instruction to facilitate the success of English learners and all students?
Contact

Midland Senior High School

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