Unit 4- Ecology and the Environment (Life, Physical, Earth and Space Science)

Content Area: **Science**
Course(s): **Science 8 Honors**
Time Period:
Length: **40 Days & Grade 8**
Status: **Published**

Unit 4

Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

Science Honors, Grade 8

Ecology and the Environment

Belleville Board of Education

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Unit Overview

Unit 4: Ecology/Ecosystems

- Interdependent Relationships in Ecosystems
- Cycles of Matter and Energy Transfer in Ecosystems
- Ecosystem Dynamics, Functioning, and Resilience

Matter and Energy in Living Systems (C)

- Matter and energy in organisms
- Photosynthesis and Cellular Respiration
- Matter and Energy in Ecosystems

Relationships in Ecosystems (C)

- Parts of an Ecosystem
- Resource Availability in Ecosystems
- Patterns of Interaction

Ecosystem Dynamics (C)

- Biodiversity in Ecosystems
- Changes in Ecosystems
- Engineer it - Maintaining Biodiversity
- Parts of an ecosystem

- Symbiotic relationships
- Matter recycling
- Resource availability
- Energy flow
- Photosynthesis/Cellular Respiration
- Sources of pollution
- Interdependence
- Roles of producer/consumer/decomposers
- Patterns of interactions
- Energy pyramid
- Human impact and habitat destruction

Enduring Understanding

- Food is broken down to provide energy for the work that cells do, and is a source of the molecular building blocks from which needed materials are assembled.
- All animals, including humans, are consumers that meet their energy needs by eating other organisms or their products.
- Symbiotic interactions among organisms of different species can be classified as producer/consumer, predator/prey, parasite/host, scavenger/prey, or decomposer, prey.
- Continual input of energy from sunlight keeps matter and energy flowing through ecosystems.
- Biological communities in ecosystems are based on stable interrelationships and interdependence of organisms.
- Stability in an ecosystem can be disrupted by natural or human interactions.

Essential Questions

- How does a system of living and non-living things operate to meet the needs of the organisms in an ecosystem?
- How do ecosystems respond to positive and negative inputs?
- How are species interdependent and interrelated?
- How does the environment regulate population size and ecosystem stability?
- How do changes in populations and communities affect the balance of an ecosystem?
- How do adaptations affect an organism's survival in an ecosystem?
- What resources are available in different environments?
- How are the matter and energy of ecosystems recycled?
- What would happen if there were no decomposers?
- How can biodiversity in ecosystems be maintained?
- What factors influence population changes?

Exit Skills

- Define Biosphere, ecosystem, population, community, habitat and niche
- Describe factors that determine population size
- Distinguish between producers, consumers, and decomposers in food webs
- Distinguish between biotic and abiotic factors in ecosystems and give examples.
- Describe cycles of important elements and compounds in ecosystems
- Describe the one-way flow of energy through ecosystems
- Explain primary and secondary succession and climax communities.
- Identify major biomes.
- Distinguish between renewable and nonrenewable resources
- Identify major sources of pollution
- Analyze and interpret data, develop models, and construct arguments and demonstrate a deeper understanding of resources and the cycling of matter and the flow of energy in ecosystems
- Examine patterns of the interactions among organisms within an ecosystem
- Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

New Jersey Student Learning Standards (NJSLS-S)

NextGen Science Standards

6-8.MS-LS2-1	Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
6-8.MS-LS2-2	Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
6-8.MS-LS2-5	Evaluate competing design solutions for maintaining biodiversity and ecosystem services.
6-8.MS-LS2-4	Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
6-8.MS-LS2-3	Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

Interdisciplinary Connections

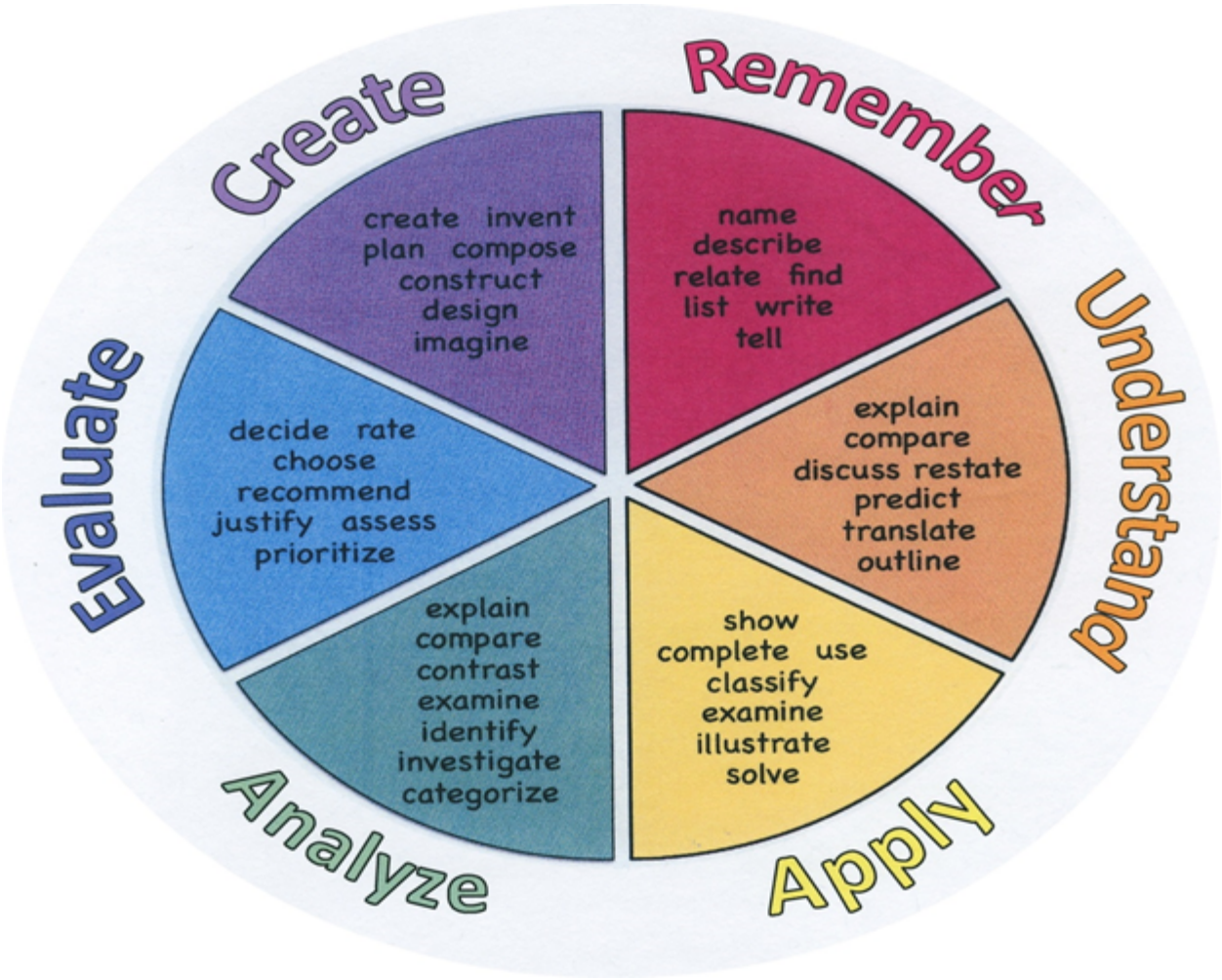
LA.RH.6-8.1	Cite specific textual evidence to support analysis of primary and secondary sources.
MA.6.RP.A.3	Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.
LA.RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
LA.WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research.
MA.6.SP.B.5	Summarize numerical data sets in relation to their context, such as by:

Learning Objectives

Students will demonstrate ability to:

- independently use their learning to analyze how the interactions of biotic and abiotic factors affect the natural balance of an ecosystem to determine how, as humans, our actions have an effect on the natural balance of ecosystems.
- model and analyze how different organisms get matter and energy in various ways and use examples to explain that matter and energy are neither created nor destroyed among organizing and nonliving things
- use models to explain how matter and energy are transferred between organisms, analyze diagrams to show that matter such as water and carbon cycles through an ecosystem, and they identify that energy drives these cycles
- explain how the living elements of an ecosystem are organized into levels and rely on other organisms and abiotic factors for survival
- construct and explanation about how limited resources can result in competition and reduce the growth of populations and analyze how abundant resources can negatively or positively affect populations
- explore complex feeding relationships between organisms, investigate how individual organisms work with and against each other, and analyze patterns in data to predict how these interactions result in population changes
- explain how biodiversity affects the health of an ecosystem, explore how changes in one part of an ecosystem can result in changes to another part, and examine ways in which humans impact ecosystems
- explore how changes in biodiversity can influence the availability of natural resources and cause changes to ecosystems

Remember	Understand	Apply	Analyze	Evaluate	Create
Choose	Classify	Choose	Categorize	Appraise	Combine
Describe	Defend	Dramatize	Classify	Judge	Compose
Define	Demonstrate	Explain	Compare	Criticize	Construct
Label	Distinguish	Generalize	Differentiate	Defend	Design
List	Explain	Judge	Distinguish	Compare	Develop
Locate	Express	Organize	Identify	Assess	Formulate
Match	Extend	Paint	Infer	Conclude	Hypothesize
Memorize	Give Examples	Prepare	Point out	Contrast	Invent
Name	Illustrate	Produce	Select	Critique	Make
Omit	Indicate	Select	Subdivide	Determine	Originate
Recite	Interrelate	Show	Survey	Grade	Organize
Select	Interpret	Sketch	Arrange	Justify	Plan
State	Infer	Solve	Breakdown	Measure	Produce
Count	Match	Use	Combine	Rank	Role Play
Draw	Paraphrase	Add	Detect	Rate	Drive
Outline	Represent	Calculate	Diagram	Support	Devise
Point	Restate	Change	Discriminate	Test	Generate
Quote	Rewrite	Classify	Illustrate		Integrate
Recall	Select	Complete	Outline		Prescribe
Recognize	Show	Compute	Point out		Propose
Repeat	Summarize	Discover	Separate		Reconstruct
Reproduce	Tell	Divide			Revise
	Translate	Examine			Rewrite
	Associate	Graph			Transform
	Compute	Interpolate			
	Convert	Manipulate			
	Discuss	Modify			
	Estimate	Operate			
	Extrapolate	Subtract			
	Generalize				
	Predict				



Suggested Activities & Best Practices

Research Ecology topic Students will pick from topics such as Highlands Act, Offshore Oil Drilling, Passaic River Clean-up, Pineland Reservation, NJ Invasive Species etc.

- SW identify the problem, research possible solutions, how this topic affects the student, and what the student can do to help.
- All will be presented in a method of their choosing: 3d display, brochure, powerpoint, prezi, poster, etc.

Defined Stem- Refuge Ranger

The Brazoria National Wildlife Refuge is located on the gulf coast of Texas. This refuge is home to hundreds of species of birds during the year. Refuges like this one are funded by the federal government. However, sometimes funding runs short and these locations are in danger of closing. In this task, the U.S. Fish and Wildlife Service, which oversees Brazoria, has been asked by the federal government to look at national wildlife refuges and determine if any can be closed. You have been asked to conduct research on a species of bird that uses the wildlife refuge and present your findings about the importance of keeping the refuge open.

- Students will present with a method of their choosing: brochure, powerpoint, prezi, poster, etc.
- What is the Brazoria Wildlife Refuge?
- What benefits does the refuge provide to migratory birds?

- How can wildlife managers tell if a refuge is successful?
- How are all the animal species living in Brazoria connected in a food web

Assessment Evidence - Checking for Understanding (CFU)

Exit ticket: Explain the difference between a herbivore, omnivore, and carnivore. (Formative)
Module C Google Assessment Test (Summative)

• Admit Tickets (Formative)

• Compare & Contrast.(Formative)

• Create a Multimedia Poster.(Alternate)

• Define.(Formative)

• Describe.(Formative)

• Evaluate.(Formative)

• Evaluation rubrics.(Alternate)

• Exit Tickets. (Formative)

• Explaining. (Formative)

• Fist- to-Five or Thumb-Ometer. (Formative)

• Illustration. (Formative)

• Kahoot. (Formative)

• KWL Chart. (Formative)

• Question Stems. (Formative)

• Quickwrite.(Formative)

• Quizzes.(Summative)

• Self- assessments. (Alternate)

• Study Guide. (Formative)

• Teacher Observation Checklist. (Alternate

• Think, Pair, Share. (Formative)

• Unit test. (Summative)

- Admit Tickets
- Anticipation Guide
- Common Benchmarks
- Compare & Contrast
- Create a Multimedia Poster
- DBQ's
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Fist- to-Five or Thumb-Ometer
- Illustration
- Journals
- KWL Chart
- Learning Center Activities
- Multimedia Reports
- Newspaper Headline
- Outline
- Question Stems
- Quickwrite
- Quizzes
- Red Light, Green Light
- Self- assessments
- Socratic Seminar
- Study Guide
- Surveys
- Teacher Observation Checklist
- Think, Pair, Share

- Think, Write, Pair, Share
- Top 10 List
- Unit review/Test prep
- Unit tests
- Web-Based Assessments
- Written Reports

Primary Resources & Materials

1. HMH Dimensions Textbook Module C, and Glencoe supplementary materials
2. Internet resources
3. Science Department video DVD library
4. Laboratory materials

Ancillary Resources

- Outdoor area of school
- Computer carts for research when available

Technology Infusion

https://create.kahoot.it/details/4566821f-3a12-41ed-bd41-a544b43da058

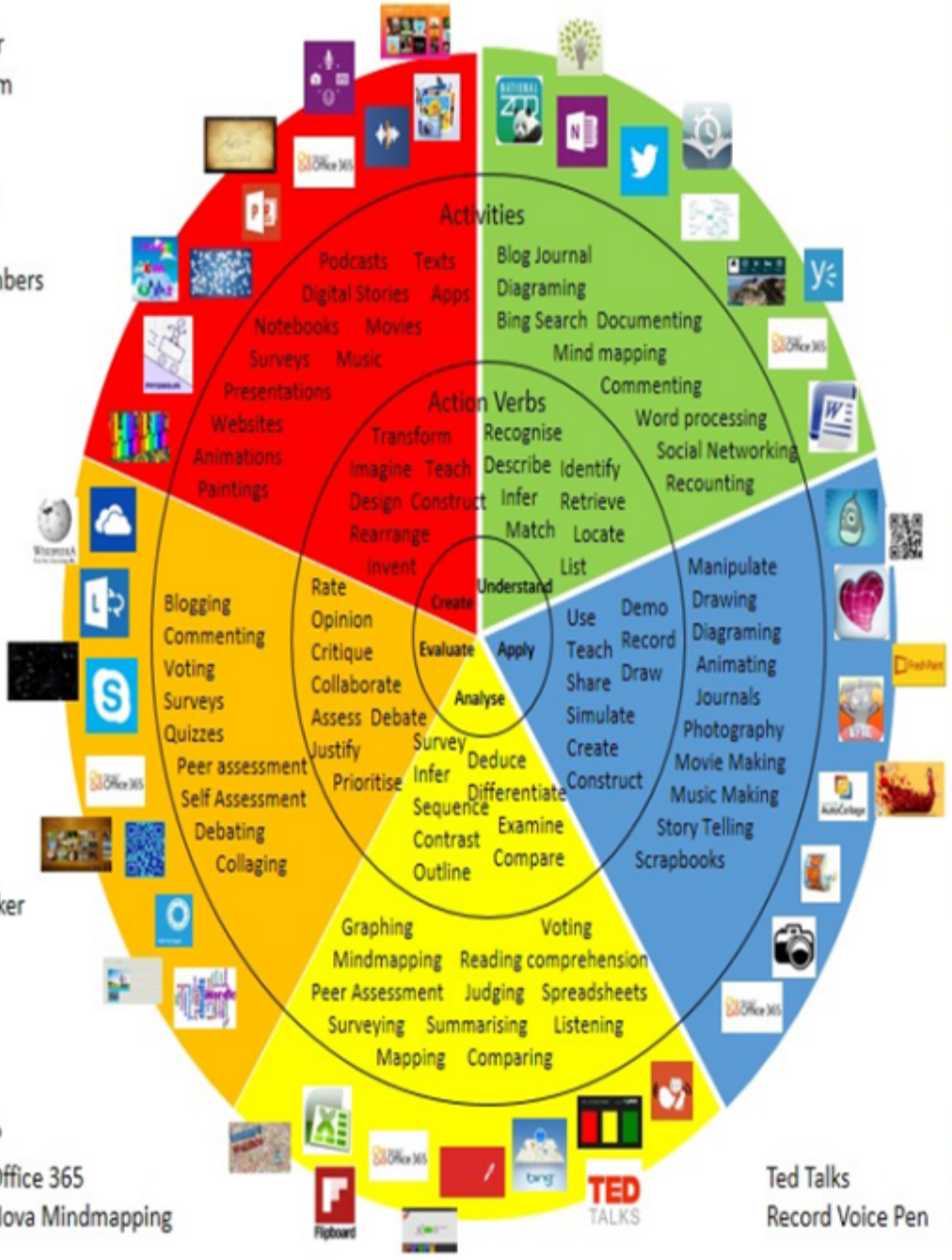
https://www.brainpop.com/science/ecologyandbehavior/ecosystems/

- Smart board
- Document Camera
- Pod-casts video streams
- Discovery Education video streams
- You Tube video streams
- Brain-pop video streams
- Laptops
- Power Point presentation
- MS Word

Win 8.1 Apps/Tools Pedagogy Wheel

Podcasts
Photostory 3
Kid Story Builder
Music Maker Jam
Paint A Story
Office 365
MS PowerPoint
Stack 'Em Up
NqSquared Numbers
Physamajig
Xylophone 8

Wikipedia
Skydrive
Lync
SkyMap
Skype
Office 365
Puzzle Touch
Easy QR
Memorylage
Life Moments
Word Cloud Maker



Where's Waldo?
MS Excel Office 365
Flipboard Nova Mindmapping

Ted Talks
Record Voice Pen

Originally taken from http://www.coetail.com/vzimmer/files/2013/02/iPadagogy-Wheel.001.jpg
And adapted for Windows 8.1 devices by Charlotte Beckhurst @CharBeckhurst

Alignment to 21st Century Skills & Technology

- English, reading or language arts
- World languages
- Arts
- Mathematics
- Economics
- Science
- Geography
- History
- Government and Civics

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP11	Use technology to enhance productivity.
CAEP.9.2.8.B.2	Develop a Personalized Student Learning Plan with the assistance of an adult mentor that includes information about career areas of interest, goals and an educational plan.
CAEP.9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.
TECH.8.1.8	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.8.C	Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
TECH.8.2.8.B	Technology and Society: Knowledge and understanding of human, cultural and society values are fundamental when designing technology systems and products in the global society.
TECH.8.2.8.B.CS2	The effects of technology on the environment.

21st Century Skills/Interdisciplinary Themes

- Environmental Literacy.
- Financial, Economic, Business and Entrepreneurial Literacy.
- Global Awareness.
- Health Literacy
- Civic Literacy

- Communication and Collaboration
- Creativity and Innovation
- Critical thinking and Problem Solving
- ICT (Information, Communications and Technology) Literacy
- Information Literacy
- Life and Career Skills
- Media Literacy

21st Century Skills

- Communication and Collaboration
- Creativity and Innovation
- Critical thinking and Problem Solving.
- ICT (Information, Communications and Technology) Literacy
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- Civic Literacy
- Environmental Literacy
- Financial, Economic, Business and Entrepreneurial Literacy
- Global Awareness
- Health Literacy

Differentiation

Use a model to analyze the intricate workings of a food web. Layout the organisms from producer to consumer to predator.

Select 1 local environmental problem and with a partner create a presentation discussing the details, cause, and possible solutions. May present via brochure, poster, prezi, powerpoint, video.

Differentiations:

- Additional activities and research projects will be incorporated when deemed appropriate
- Example: Observe species in the field outside at BMS. Complete a survey for the school.
- Example: Participate in a presentation on Macroinvertebrates by Americorps volunteers and sort live species.
- Small group instruction
- Extra time to complete assignments
- Pairing oral instruction with visuals
- Repeat directions
- Use manipulatives
- Center-based instruction
- Study guides
- Teacher reads assessments allowed

- Rephrase written directions
- Multisensory approaches
- Additional time
- Highlight text

Lo-Prep Differentiations

- Exploration by interest
- Flexible grouping
- Goal setting with students
- Jigsaw
- Mini workshops to re-teach or extend skills
- Open-ended activities
- Think-Pair-Share

Hi-Prep Differentiations:

- Alternative formative and summative assessments
- Games and tournaments
- Group investigations
- Guided Reading
- Independent research and projects
- Interest groups
- Multiple texts
- Project-based learning
- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments
- Tiered products

Special Education Learning (IEP's & 504's)

Use a model to analyze the intricate workings of a food web. Layout the organisms from producer to consumer to predator.

Select 1 local environmental problem and with a partner create a presentation discussing the details, cause, and possible solutions. May present via brochure, poster, prezi, powerpoint, video.

• printed copy of board work/notes provided

• additional time for skill mastery.

• assistive technology

• behavior management plan.

• Center-Based Instruction

• check work frequently for understanding

• computer or electronic device utilizes

• extended time on tests/ quizzes

• have student repeat directions to check for understanding

• highlighted text visual presentation

• modified assignment format

• modified test content

• modified test format

• modified test length.

• multiple test sessions.

• multi-sensory presentation

• preferential seating

• preview of content, concepts, and vocabulary.

• reduced/shortened reading assignments

• Reduced/shortened written assignments.

• secure attention before giving instruction/directions

• shortened assignments

• student working with an assigned partner.

• teacher initiated weekly assignment sheet.

• Use open book, study guides, test prototype

- printed copy of board work/notes provided
- additional time for skill mastery
- assistive technology
- behavior management plan
- Center-Based Instruction
- check work frequently for understanding
- computer or electronic device utilizes

- extended time on tests/ quizzes
- have student repeat directions to check for understanding
- highlighted text visual presentation
- modified assignment format
- modified test content
- modified test format
- modified test length
- multi-sensory presentation
- multiple test sessions
- preferential seating
- preview of content, concepts, and vocabulary
- Provide modifications as dictated in the student's IEP/504 plan
- reduced/shortened reading assignments
- Reduced/shortened written assignments
- secure attention before giving instruction/directions
- shortened assignments
- student working with an assigned partner
- teacher initiated weekly assignment sheet
- Use open book, study guides, test prototypes

English Language Learning (ELL)

Use a model to analyze the intricate workings of a food web. Layout the organisms from producer to consumer to predator.

Select 1 local environmental problem and with a partner create a presentation discussing the details, cause, and possible solutions. May present via brochure, poster, prezi, powerpoint, video.

• reducing the number of answer choices on a multiple choice test

• tutoring by peers

• using computer word processing spell check and grammar check features

• using true/false, matching, or fill in the blank tests in lieu of essay teaching key aspects of a topic. Eliminate nonessential information.

• using videos, illustrations, pictures, and drawings to explain or clarify.

• allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student’s learning

• allowing students to correct errors (looking for understanding)

• allowing the use of note cards or open-book during testing

• decreasing the amount of work presented or required

• modifying tests to reflect selected objectives

• providing study guides

• reducing or omitting lengthy outside reading assignments

- teaching key aspects of a topic. Eliminate nonessential information
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- allowing students to correct errors (looking for understanding)
- allowing the use of note cards or open-book during testing
- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using computer word processing spell check and grammar check features
- using true/false, matching, or fill in the blank tests in lieu of essay tests

At Risk

Use a model to analyze the intricate workings of a food web. Layout the organisms from producer to consumer to predator.

Select 1 local environmental problem and with a partner create a presentation discussing the details, cause, and possible solutions. May present via brochure, poster, prezi, powerpoint, video.

- Allowing students to correct errors (looking for understanding).
- teaching key aspects of a topic. Eliminate nonessential information.
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards
- charts, graphs, slide shows, videos, etc.) to demonstrate student's learning
- allowing students to select from given choices
- allowing the use of note cards or open-book during testing.
- collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to
- reflect objectives for the student, eliminate sections of the test, and determine how the grade will be
- determined prior to giving the test.
- decreasing the amount of work presented or required
- having peers take notes or providing a copy of the teacher's notes

- marking students' correct and acceptable work, not the mistakes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments.
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using authentic assessments with real-life problem-solving
- using true/false, matching, or fill in the blank tests in lieu of essay tests
- using videos, illustrations, pictures, and drawings to explain

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Talented and Gifted Learning (T&G)

Defined Stem- Refuge Ranger

The Brazoria National Wildlife Refuge is located on the gulf coast of Texas. This refuge is home to hundreds of species of birds during the year. Refuges like this one are funded by the federal government. However, sometimes funding runs short and these locations are in danger of closing. In this task, the U.S. Fish and Wildlife Service, which oversees Brazoria, has been asked by the federal government to look at national wildlife refuges and determine if any can be closed. You have been asked to conduct research on a species of bird that uses the wildlife refuge and present your findings about the importance of keeping the refuge open.

- Students will present with a method of their choosing: brochure, powerpoint, prezi, poster, etc.
- What is the Brazoria Wildlife Refuge?
- What benefits does the refuge provide to migratory birds?

- How can wildlife managers tell if a refuge is successful?
- How are all the animal species living in Brazoria connected in a food web

Create a complex food chain complete with diagrams of a Food web.

- Allowing students to chose their own method of representation, i.e. brochure, poster, powerpoint, youtube video, etc.
- Teaching explorations sections of workbook
- Allowing students to apply concepts to real-life scenarios and how they would be affected
- Higher order, critical & creative thinking skills, and discovery
- Flexible skill grouping within a class or across grade level for rigor
- Cluster grouping
- Project-based learning for greater depth of knowledge
- Utilize exploratory connections
- Teacher-selected instructional strategies that are focused to provide challenge, engagement, and growth opportunities
- Allow students to work at a faster pace
- Multi-disciplinary unit and/or project

- Above grade level placement option for qualified students
- Advanced problem-solving
- Allow students to work at a faster pace
- Cluster grouping
- Complete activities aligned with above grade level text using Benchmark results
- Create a blog or social media page about their unit
- Create a plan to solve an issue presented in the class or in a text
- Debate issues with research to support arguments
- Flexible skill grouping within a class or across grade level for rigor
- Higher order, critical & creative thinking skills, and discovery
- Multi-disciplinary unit and/or project
- Teacher-selected instructional strategies that are focused to provide challenge, engagement, and growth opportunities
- Utilize exploratory connections to higher-grade concepts
- Utilize project-based learning for greater depth of knowledge

Sample Lesson

Unit Name: Ecology and the Environment

NJSLS: See Link

Interdisciplinary Connection: See Link

Statement of Objective: SWDAT analyze how different organisms get matter and energy in various ways also observe and explore how soil conditions affect the rate of plant decomposition.

Anticipatory Set/Do Now: Hot Seat

Anticipatory Set YouTube video on decomposition. https://www.youtube.com/watch?v=uB61rfeeAsM

Learning Activity:
1. Do Now/Anticipatory set.
2. SW prepare three different plastic bags with the materials necessary to complete Hands-On Lab on page 14-15. SW record their observations under Day 1 on their data chart.
3. TW display Unit 1 Lesson 1 from workbook pages 6-18 in module C SW highlight important ideas and complete all questions

Student Assessment/CFU's: Hot Seat, Students' workbook.

Materials: HMH workbook, Laptops, Interactive TV, Ziploc Bags, Sand, Potting Soil, Mixture of fruits and vegetables. Graduated cylinders distilled water.

21st Century Themes and Skills: See Link

Differentiation: See Link

Integration of Technology: Google Classroom, HMH curriculum, YouTube video

6-8.MS-LS1-6.LS1.C.1	Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use.
6-8.MS-LS2-2.LS2.A.1	Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared.
6-8.MS-LS2-3.LS2.B.1	Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.