Ecology

Content Area: **Science**
Course(s): **Biology**
Time Period: **Second Marking period**
Length: **6 Weeks**
Status: **Published**

Unit Overview

Ecology

Earth is a living planet on which all forms of life are linked to one another, and to land, air and water. Through those links,energy flows and matter cycles in patterns that support life, including human society.

STAGE 1- DESIRED RESULTS

Standards- 2020 New Jersey Student Learning Standards- Science

SCI.9-12.HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
SCI.9-12.HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
SCI.9-12.HS-LS2-3	Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
SCI.9-12.HS-LS2-4	Use a mathematical representation to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
SCI.9-12.HS-LS2-5	Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
SCI.9-12.HS-LS2-1	Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
SCI.9-12.HS-LS2-2	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
SCI.9-12.HS-LS2-6	Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
SCI.9-12.HS-LS2-7	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
SCI.9-12.HS-LS2-8	Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
SCI.9-12.HS-LS4-6	Create or revise a simulation to test a solution to mitigate adverse impacts of human

activity on biodiversity.

Science and Engineering Practices

- Analyzing and Interpreting Data
- Asking Questions and Defining Problems
- Constructing Explanations and Designing Solutions
- Developing and Using Models
- Engaging in Argument from Evidence
- Obtaining, Evaluating, and Communicating Information
- Planning and Carrying Out Information
- Using Mathematics and Computational Thinking

Cross Cutting Concepts

- Cause and Effect
- Energy and Matter
- Influence of Engineering, Technology, and Science on Society and the Natural World
- Interdependence of Science, Engineering, and Technology
- Patterns
- Scale, Proportion, and Quantity
- Stability and Change
- Structure and Functions
- Systems and System Models

Disciplinary Core Ideas

Life Sciences

- LS1A: Structure and Functions
- LS1B: Growth and Development of Organisms
- LS1C: Organization for Matter and Energy Flow in Organisms
- LS1D: Information Processing
- LS2A: Interdependent Relationships in Ecosystems
- LS2B: Cycles of Matter and Energy Transfer in Ecosystems

- LS2C: Ecosystems Dynamics, Functioning, and Resilience
- LS2D: Social Interactions and Group Behavior
- LS3A: Inheritance of Traits
- LS3B: Variation of traits
- LS4A: Evidence of Common Ancestry and Diversity
- LS4B: Natural Selection
- LS4C: Adaptation
- LS4D: Biodiversity and Humans

Engineering. Technology. and Applications of Science

- ETS1A: Defining and Delimiting an Engineering Problem
- ETS1B: Developing Possible Solutioins
- ETS1C: Optimizing the Design Solution

Essential Questions

How do we study life?

How do different organisms get the energy they need to survive?

How does energy move through an ecosystem?

Why is the cycling of matter important to life on Earth?

How do organisms interact with one another?

How do ecosystems change over time?

What are the characteristics of the major biomes?

How do populations grow?

What factors limit a population's growth?

Enduring Understanding

The existence of life on Earth depends on interactions among organisms and between organisms and their environment.

Students will know...

Biosphere, species, population, community, ecology, ecosystem, biome, biotic factor, abiotic factor, autotroph, primary producer, photosynthesis, chemosynthesis, heterotroph, consumer, carnivore, herbivore, scavenger, omnivore, decomposer, detritivore, food chain, phytoplankton, food web, zooplankton, trophic level, ecological pyramid, biomass, biogeochemical cycle, nutrient, nitrogen fixation, denitrification, limiting nutrient, olerance, habitat, niche, resource, competitive exclusion principle, predation, herbivory, keystone species, symbiosis, mutualism, parasitism, commensalism, ecological succession, pioneer species, primary succession, secondary succession, canopy, understory, deciduous, coniferous, humus, taiga, permafrost, population density, age structure, immigration, emigration, exponential growth, logistic growth, carrying capacity, limiting factor, density-dependent limiting factor, density-independent limiting factor

Predictable misconceptions:

Students may think that energy is formed or created.

Students may think that organisms "use up" or destroy energy.

Students may not understand that matter, like energy is conserved in the biosphere.

Students may think that succession always leads to a predetermined climax community.

Students may think that biomes are distiguished by biotic factors only.

Students will be able to...

- Describe the study of ecology and how biotic and abiotic factors influence an ecosystem and describe the methods used to study ecology.
- Define primary producers and describe how consumers obtain energy and nutrients.
- Trace the flow of energy through living systems and identify the three types of ecological pyramids.
- Describe how matter cycles among the living and nonliving parts of an ecosystem including how water cycles through the biosphere.
- Explain why nutrients are important in living systems and how the availability of nutrients affects the productivity of ecosystems.
- Differentiate between weather and climate and identify the factors that influence climate.
- Define niche and describe the role competition plays in shaping communities and the role predation and herbivory play in shaping communities.
- Identify the three types of symbiotic relationships in nature.
- Describe and compare the characteristics of the major land biomes and identify the areas that are not classified into a major biome.
- Discuss the factors that affect aquatic ecosystems.

- Describe and compare the distinct ocean zones that make up marine ecosystems.
- List the characteristics to describe a population and that affect population growth.
- Describe exponential growth and logistic growth.
- Identify factors that determine carrying capacity and the limiting factors that depend on population density.
- Discuss the trend of human population growth and explain why population growth rates differ in countries throughout the world.

STAGE 2- EVIDENCE OF LEARNING

Formative Assessment

- 3- Minute Pause
- A-B-C Summaries
- Analogy Prompt
- Choral Response
- Debriefing
- Exit Card / Ticket
- Hand Signals
- Idea Spinner
- Index Card Summaries
- Inside-Outside Circle Discussion (Fishbowl)
- Journal Entry
- Misconception Check
- Observation
- One Minute Essay
- One Word Summary
- Portfolio Check
- Questions & Answers
- Quiz
- Self-Assessment
- Student Conference
- Think-Pair-Share
- Web or Concept Map

Authentic Assessments

Students will:

follow lab procedures

collect and graph data

form conclusions

complete assignments

develop and utilize models

cooperate in groups and with partners

complete a written science journal

maintain class notes and vocabulary in MacBook Airs

complete data tables

complete and interpret graphs

complete a project

complete quizzes

Benchmark Assessments

Chapter/Unit Tests

STAGE 3- LEARNING PLAN

Instructional Map

1st Marking Period

Unit 2: Ecology

- The Biosphere
    - What is Ecology?
    - Energy, Producers, and Consumers
    - Energy Flow in Ecosystems
    - Cycles of Matter

2nd Marking Period

- Ecosystems and Communities
    - Niches and Community Interactions
    - Succession
    - Biomes
    - Populations
        - How Populations Grow
        - Limits to Growth

Modification/Differentiation of Instruction

Differentiation Strategies for Special Education Students

- Remove unnecessary material, words, etc., that can distract from the content
- Use of off-grade level materials
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Time allowed
- Level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in "chunks"
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Varied homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Ability to work at their own pace
- Present ideas using auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment

- Differentiated checklists and rubrics, if available and appropriate

Differentiation Strategies for Gifted and Talented Students

- Increase the level of complexity
- Decrease scaffolding
- Variety of finished products
- Allow for greater independence
- Learning stations, interest groups
- Varied texts and supplementary materials
- Use of technology
- Flexibility in assignments
- Varied questioning strategies
- Encourage research
- Strategy and flexible groups based on formative assessment or student choice
- Acceleration within a unit of study
- Exposure to more advanced or complex concepts, abstractions, and materials
- Encourage students to move through content areas at their own pace
- After mastery of a unit, provide students with more advanced learning activities, not more of the same activity
- Present information using a thematic, broad-based, and integrative content, rather than just single-subject areas

Differentiated Strategies for ELL Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials, including visuals
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill

- Provide cross-content application of concepts
- Allow students to work at their own pace
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Role play
- Provide graphic organizers, highlighted materials
- Strategy and flexible groups based on formative assessment

Differentiation Strategies for At Risk Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in "chunks"
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment

504 Plans

Students can qualify for 504 plans if they have physical or mental impairments that affect or limit any of their abilities to:

- walk, breathe, eat, or sleep
- communicate, see, hear, or speak
- read, concentrate, think, or learn
- stand, bend, lift, or work

Examples of accommodations in 504 plans include:

- preferential seating
- extended time on tests and assignments
- reduced homework or classwork
- verbal, visual, or technology aids
- modified textbooks or audio-video materials
- behavior management support
- adjusted class schedules or grading
- verbal testing
- excused lateness, absence, or missed classwork
- pre-approved nurse's office visits and accompaniment to visits
- occupational or physical therapy

DI = ppt/air mac, co-operative learning (mixed ability)

ESL students: speaking, reading, writing, peer tutoring

SPEDs: restating, reading aloud, quided questions, additional problems and teacher's observations

Rephrase/Clarify/Repeat Directions

Study Guides

Extended Time on Tests / Assignments

Modify Tests / Assignments

Visual Aides

Word Bank

Use a Calculator

Repeated Drill and Practice

Teacher Notes

Preferential Seating

Oral Directions

Use of Additional Reference Materials

Break Down Assignments into Smaller Tasks

Academic Ability

1. Struggling: Think--Pair-- Share with gifted students.

2. Gifted: Think-- Pair-- Share with struggling students.

Modification Strategies

- Cooperative Grouping
- Extended Time
- Frequent Breaks
- Highlighted Text
- Interactive Notebook
- Modified Test
- Oral Directions
- Peer Tutoring
- Preferential Seating
- Re-direct
- Repeated Drill and Practice

- Shortened Assisgnment
- Teacher Notes
- Tutorials
- Use of Additional Reference Materials
- Use of Audio Resources

Differentiation Strategies

High Preparation

- Alternative Assessments
- Choice Boards
- Games and Tournaments
- Group Investigations
- Guided Reading
- Independent Research / Project
- Interest Groups
- Learning Contracts
- Leveled Rubrics
- Literature Circles
- Multiple Intelligence Options
- Multiple Texts
- Personal Agendas
- Project Based Learning (PBL)
- Stations / Centers
- Think-Tac-Toe
- Tiered Activities / Assignments
- Varying Graphic Organizers

Low Preparation

- Choice of Book / Activity
- Cubing Activities
- Exploration by Interest (using interest inventories)
- Flexible Grouping
- Goal Setting With Student

- Homework Options
- Jigsaw
- Mini Workshops to Re-teach or Extend Skills
- Open-ended Activities
- Think-Pair-Share by Readiness, Interest, or Learning Style
- Use of Collaboration
- Use of Reading Buddies
- Varied Journal Prompts
- Varied Product Choice
- Varied Supplemental Materials
- Work Alone / Together

Horizontal Intergration- Interdisciplinary Connections

See Appendix

Vertical Integration- Discipline Mapping

Students will have been exposed to the Performance Expectations for Life Sciences and Engineering Design outlined in the Next Generation Science Standards (NGSS) starting in 1st grade through Biology, which is offered during the Freshman year of High School. Science classes are designed around the Performance Expectations, Science and Engineering Practices, Discplinary Core Ideas, and Croscutting Concepts in the NGSS. In grade 6, students complete a unit on "Diversity of Life". This leads into "Populations and Ecosystems" in grade 7. In grade 8 students study "Human Systems Interactions" and "Heredity and Adaptations." Biology, being a full year recquired course, will focus on having students gain a deeper understanding of the Performance Expectations outlined in the NGSS, particulary in Life Sciences and Engineering Design. Following Biology in 9th grade students will take Chemistry. After students will be able to chose from Physics, Anatomy and Physiology, Human Impact on the Environment, Forensics and Zoology.

Additional Materials

Pearson Successnet

Newsela