Unit #3: Towards Sustainability

Science
Human Impact on the Environment
Second Marking period
7 Weeks
Published

Unit Overview

In recent years people have been gathering more and more evidence of the effects of climate change on our planet. The strong dependance on fossil fuels is one contributor to Climate Change. In addition a growing population that is also demanding a higher standard of living is producing more and more waste. This unit examines the causes and effects of these issues and the role that renewable energy alternatives play in solving the issues.

STAGE 1- DESIRED RESULTS

Standards- 2020 New Jersey Student Learning Standards- Science

SCI.9-12.HS-ESS3-5	Analyze geoscience data and the results from global climate models to make an evidence based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.
SCI.9-12.HS-ESS3-1	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
SCI.9-12.HS-ESS2-4	Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
SCI.9-12.HS-ESS3-2	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
SCI.9-12.HS-ESS3-3	Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
SCI.9-12.HS-ESS3-4	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
SCI.9-12.HS-ESS3-6	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

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

Earth and Space Sciences

- ESS1A: The Universe and its Stars
- ESS1B: Earth and the Solar System
- ESS1C: The History of Planet Earth
- ESS2A: Earth Materials and Systems
- ESS2B: Plate Tectonics and Large-Scale Systems
- ESS2C: The Role of Water in Earth's Surface Processes
- ESS2D: Weather and Climate
- ESS2E: Biogeology
- ESS3A: Natural Resources
- ESS3B: Natural Hazards
- ESS3C: Human Impacts on Earth Systems
- ESS3D: Global Climate Change

Engineering. Technology. and Applications of Science

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

Essential Questions

What are the causes and consequences of a warming earth?

Can we depend upon nonrenewable energy sources to meet our needs?

What are the potential uses and limitiations of renewable energy sources?

How do our choices as consumers and waster producers affect our environment?

Enduring Understanding

Todays decisions define our future environment.

Students will know...

Greenhouse effect, El Nino, global climate change, climate model, carbon footprint, Kyoto protocol, combustion, energy efficiency, renewable energy, nonrenewable energy, oil sands, oil shale, acid drainage, nuclear energy, nuclear fusion, biomass energy, biofuel, geothermal, hydropower, tidal energy, passive solar heating, active solar heating, wind turbine, fuel cell, municipal solid waste, hazardous waste, biodegradable, recycling, composting, radioactive waste, superfund.

Predictable misconceptions

Many students believe that anything natural is not pollution; biodegradable materials are not pollutants; solid waste in dumps is safe; and the human race is indestructible as a species.

Confusion between ozone layer depletion and the greenhouse effect is common.

Students of all ages may confuse the ozone layer with the greenhouse effect, and may have a tendency to imagine that all environmentally friendly actions help to solve all environmental problems.

Students will be able to...

Describe factors that affect how the Sun warms Earth.

Discuss the role of wind patterns in determining climate.

Explain how the oceans affect climate.

Describe how climate is affected by topography, volcanoes, regional vegetation, and periodic changes in Earth's orbit.

Identify evidence of global warming.

State the probable cause of global climate change.

State ways in which the warming atmosphere affects ecosystems and organisms.

Explain how climate change is affecting people now.

Predict future effects of climate change on people.

List ways to reduce greenhouse gases related to the use and generation of electricity. Describe some of the ways of reducing greenhouse gases related to transportation. Describe other strategies for reducing greenhouse gases. Explain how nations are working together to try to address climate change. Describe how human society uses energy resources. Explain how fossil fuels formed. Describe the uses of coal and how it is removed from the ground. Describe the uses of oil and how it is extracted. Explain the characteristics and uses of natural gas. Predict the future of fossil fuels. Explain how pollutants released by fossil fuels damage health and the environment. Describe the environmental and health effects of mining and drilling. Explain the implications of dependence on foreign countries for fossil fuels. Explain why energy conservation is important. Relate nuclear fission to the production of energy. Describe how a nuclear power plant generates electricity. Identify the advantages and disadvantages of nuclear power. Contrast nuclear fusion with nuclear fission, and explain the issues related to nuclear fusion. Explain how pollutants released by fossil fuels damage health and the environment. Describe the environmental and health effects of mining and drilling. Explain the implications of dependence on foreign countries for fossil fuels. Explain why energy conservation is important. Relate nuclear fission to the production of energy. Describe how a nuclear power plant generates electricity. Identify the advantages and disadvantages of nuclear power. Contrast nuclear fusion with nuclear fission, and explain the issues related to nuclear fusion. Explain the benefits and current status of renewable energy resources. Define biomass energy and explain how it is used. Describe how geothermal energy is harnessed and used. Describe techniques for using solar energy to heat buildings and generate electricity. Analyze the benefits and costs of solar energy. Explain how wind energy can be used to produce electricity. Analyze the benefits and costs of wind energy. Describe how hydrogen fuel can be produced. Explain the way fuel cells work and how they are used. Identify the three categories of waste. Describe conventional waste disposal methods. Discuss the importance of reducing waste. Describe how composting and recycling help reduce the amount of waste. Define hazardous waste. Describe some of the sources of hazardous wastes. Describe current methods for hazardous waste disposal. Describe the danger of radioactive wastes.

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

Unit Test

STAGE 3- LEARNING PLAN

Instructional Map

2nd Marking Period

Unit 3 Toward a Sustainable Future

-Global Climate Change

-Effects of Climate Change

-Responding to Climate Change

-Nonrenewable energy

-Fossil fuels and Their Consequences

- Nuclear Power

-Renewable Energy

-Biomass

-Solar

-Hydropower

-Wind

-Waste Management

- -Minimizing Solid Waste
- Hazardous Waste

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 singlesubject 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

- 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

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 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 "Earth History, Human Systems Interactions, and Heredity and Adaptations." In High School, students take Biology in 9th grade and then Chemistry in 10th grade. After students will be able to chose from Physics, Anatomy and Physiology, Human Impact on the Environment, Forensics and Zoology. Humans Impact on the Environment, being a half-year science elective course, will focus on having students gain a deeper understanding of the Performance Expectations outlined in the NGSS, particulary in Earth and Space Sciences and Engineering Design.

Additional Materials

Newsela

Pearson Successnet plus