

Unit	Topic	Lesson	Lesson Objectives
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The Scientific Method

Scientific Inquiry and Analysis

Scientific Inquiry

- Compare and contrast scientific theories and scientific laws.
- Describe the steps involved in scientific inquiry.
- Differentiate between an observation and an inference.
- Explain the relationship between variables and controls in an experiment.

Laboratory Tools and Safety

- Describe the use of various common laboratory tools.
- Differentiate between light, dissecting, and electron microscopes.
- Explain the importance of following common lab rules and procedures.
- Identify safety equipment found in a science lab.

Scientific Measurement

- Calculate values utilizing the metric conversion process.
- Describe the use of significant figures and rounding in scientific measurement.
- Explain the purpose of utilizing the metric system in scientific measurement.
- Identify the basic SI units utilized in scientific measurement.

Scientific Models

- Describe three types of scientific models.
- Explain the purpose of scientific models.
- Identify limitations of scientific models.

Critical Thinking in Science

- Evaluate three everyday uses of critical thinking.
- Explain the importance of critical thinking to science.
- Identify components of critical thinking.

Ecology

A History of Environmental Science

Skills Lesson: Interpreting Observations

- Describe patterns and trends of an observed event or process.
- Interpret observations using trends and patterns.
- Observe an event or process.

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The Study of Environmental Science

Define the components of environmental science.

Describe the interdependence of organisms in the environment.

Discuss human impacts on the Earth.

Skills used: making logical connections, understanding cause and effect, interpreting observations

Environmental Scientists and Ecologists

Examine the contributions of environmental scientists to today's environment.

Skills used: making predictions, identifying trends

Summarize the work of famous environmental scientists of the past.

Careers in Environmental Science

Describe the job of an environmental scientist.

Discuss possible future careers and fields in environmental science.

Explore additional careers in environmental science.

Skills used: identifying trends, making predictions, compare and contrast, interpreting observations

Introduction to Ecology

Ecology 101

Compare and contrast major ecosystems found on Earth.

Describe the levels of organization in the biosphere.

Identify the major biomes found on Earth.

Skills used: create a flow chart, compare and contrast

Ecology 102

Describe changes that can occur within an ecosystem.

Evaluate the effects of different factors on ecosystem stability.

Identify factors that can cause change within an ecosystem.

Skills used: understanding cause and effect, making logical connections, interpreting observations

Trophic Levels and Food Webs

Analyze relationships between producers, consumers, and decomposers in an ecosystem.

Analyze the effects of changes in populations on food web dynamics.

Differentiate between three types of energy pyramids.

Explain how relationships between organisms in an ecosystem contribute to energy flow within a food chain.

Skills used: compare and contrast, create a structure diagram, understanding cause and effect, interpreting observations

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			<p>Adaptation</p> <ul style="list-style-type: none"> Describe the development of the theory of evolution. Explain the theory of evolution. Relate adaptations of organisms to resource competition. Skills used: create a timeline, making logical connections <p>Global Connection: Changing Migratory Patterns</p> <ul style="list-style-type: none"> Explain how migratory patterns change in response to alterations in an ecosystem.
			<p>Habitats</p> <p>Skills Lesson: Contrasting Observations or Objects</p> <ul style="list-style-type: none"> Distinguish differences between the two events or objects. List characteristics of two or more observable events or objects. Organize characteristics on a chart or graph. <p>Organismal Relationships</p> <ul style="list-style-type: none"> Compare and contrast mutualism, parasitism, and commensalism. Describe three types of interactions between organisms in an ecosystem. Explain the effects of competitive exclusion on an ecosystem. Skills used: compare and contrast, understanding cause and effect <p>Biodiversity</p> <ul style="list-style-type: none"> Analyze the effects of local evolution or migration on an ecosystem. Explain how changes in biodiversity impact an ecosystem. Predict the impact of removing or adding organisms on a food chain. Skills used: making predictions, making logical connections <p>Land Habitats</p> <ul style="list-style-type: none"> Differentiate between biotic and abiotic factors in various ecosystems. Explain the adaptations of indigenous species to their respective ecosystems. Skills used: compare and contrast <p>Aquatic Habitats</p> <ul style="list-style-type: none"> Compare and contrast the components of marine and freshwater ecosystems. Differentiate between terrestrial and aquatic energy pyramids. Skills used: compare and contrast

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Population Dynamics

Population Size

Analyze population patterns within ecosystems.

Evaluate the effect of various factors on population size.

Identify biotic and abiotic factors that limit population growth.

Skills used: interpreting data, understanding cause and effect, making logical connections

Population Genetics

Describe the effect of genetics on the growth rate and carrying capacity of a population.

Evaluate the effects of events on gene flow.

Skills used: interpreting data, understanding cause and effect

Determining Population Size

Compare and contrast various methods of determining population size.

Compute population density.

Discriminate between major population growth models.

Skills used: interpreting data, compare and contrast, calculating data

Measuring Populations

Compare and contrast various types of population distribution.

Differentiate between stabilizing, disruptive, and directional selection utilizing a graph.

Illustrate the structure of a given population demographic.

Skills used: compare and contrast, create a structure diagram, interpreting data

Global Connection: Human Impact on Population Size

Evaluate human impact on wildlife population size.

Arid and Semi-Arid Biomes

Skills Lesson: Making Comparisons

Contrast unlike characteristics of two or more phenomena.

Group characteristics by similarities and differences.

Identify like systems or events to be compared and contrasted.

List characteristics of the compared systems or events.

Characteristics of Biomes

Compare and contrast artificial and natural changes within a biome.

Describe the impact of humanity on Earth's biomes.

Identify the characteristics used to define all biomes.

Skills used: compare and contrast, understanding cause and effect, identifying trends

Summarize the history of biomes on Earth.

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Desert and Desert-Scrub Biomes

Evaluate ways organisms have adapted to desert and desert-scrub environments.

Identify the characteristics of desert and desert-scrub biomes.

Skills used: making logical connections, compare and contrast

The Chaparral

Evaluate ways organisms have adapted to chaparral.

Identify the characteristics of chaparral biomes.

Skills used: making logical connections

Alpine and Taiga Biomes

Evaluate ways organisms have adapted to the alpine and taiga biomes.

Identify the characteristics of the alpine and taiga biomes.

Skills used: making logical connections, compare and contrast

The Tundra

Evaluate ways organisms have adapted to the tundra.

Identify the characteristics of the tundra.

Skills used: making logical connections

Temperate, Wet, and Aquatic Biomes

Savanna and Grassland Biomes

Evaluate ways organisms have adapted to the savanna and grasslands.

Identify the characteristics of the savanna and grassland biomes.

Skills used: making logical connections, compare and contrast

Deciduous Forests

Evaluate ways organisms have adapted to deciduous forests.

Identify the characteristics of deciduous forests.

Skills used: making logical connections

The Rainforest

Evaluate ways organisms have adapted to the rainforest.

Identify the characteristics of the rainforest.

Skills used: making logical connections

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Freshwater and Marine Biomes

Compare and contrast the adaptations of organisms in the aquatic biomes to their respective environments.

Describe how humans utilize resources from each of the aquatic biomes.

Explain how human understanding of aquatic ecosystems has changed throughout history.

Identify characteristics that are unique to each of the aquatic biomes.

Skills used: compare and contrast, identifying trends

Global Connection: Why Invasive Species Thrive

Relate the ability of invasive species to thrive in their new habitat to resource competition.

The Biosphere

Earth's Systems

Skills Lesson: Modeling Systems and Cycles

Determine the main parts or processes of the system or cycle.

Identify a system or cycle to be modeled.

Model the main parts or processes of the system or cycle.

Organize the parts or processes sequentially.

Systems of the Biosphere

Describe Earth's systems in terms of energy, matter, time, and space.

Explain the interactions between Earth's systems.

Patterns in Systems

Describe various patterns found in the Earth system.

Identify methods of measuring constancy and change in a system.

Earth's Cycles

The Cycles of Matter

Describe various cycles of matter that take place on Earth.

Evaluate the role played by cycles in sustaining life.

Explain the change in energy that occurs between each cycle in an ecosystem.

The Water Cycle

Describe the steps of the water cycle.

Explain the relationship between living organisms and the water cycle.

Identify possible sources of water contamination.

Effects of Cycles on Ecosystems

Describe the effects of abiotic cycles on local ecosystems.

Describe the movement of carbon compounds through a food web.

Explain how fluctuations in abiotic cycles influence populations.

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Global Connection: Recycling on Earth

Compare human recycling techniques to similar cycles in nature.

The Air

Skills Lesson: Evaluating Explanations

Categorize researched information as being factual or biased.

Evaluate the given explanation based on researched data.

Identify a given explanation for an event or process.

Research data relating to the explanation.

Atmospheric Pollution

Differentiate between primary and secondary pollutants.

Examine the effects of pollution on health.

Identify various common atmospheric pollutants.

Overview the composition and function of each layer of the atmosphere.

Skills used: evaluate the validity of an explanation

Ozone

Analyze the importance of the ozone layer in sustaining life.

Compare and contrast various factors that cause ozone depletion.

Explain how the ozone layer is formed.

Relate fluctuations in ozone to human health and the environment.

Air Quality

Assess the methods that can be utilized to improve air quality.

Explain the impact of air pollution on the environment.

Identify various causes of air pollution.

Propose alternative methods of improving air quality.

Skills used: compare and contrast support and opposition

Climate

Succession

Differentiate between primary and secondary succession in ecosystems.

Explain the importance of succession in maintaining ecosystems.

Identify various causes of succession in ecosystems.

Climate and Change in Ecosystems

Compare and contrast the benefits and disadvantages of natural change to ecosystems.

Describe environmental factors that can cause changes in ecosystems.

Identify various effects of climate changes on an ecosystem.

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Global Change

- Analyze environment changes and their connection to global warming.
- Assess current theories regarding global climate change.
- Predict future changes in the global climate.
- Skills used: making predictions based on data

A History of Global Climate Change

- Analyze various theories related to global warming.
- Compare current and past global climate trends.
- Describe the effects of greenhouse gases on the atmosphere.
- Explain how long-term global climate shifts impact Earth's ecosystems.
- Skills used: compare and contrast support and opposition

Global Connection: Algal Blooms

- Connect the formation of algal blooms to climate change.

The Land

Shaping Earth

Skills Lesson: Plotting Trends and Patterns

- Categorize recorded observations based on similarities and differences.
- Interpret trends and patterns within the recorded data.
- Record observations of an event or process.

Life and Earth's Crust

- Describe the composition of each layer of the Earth.
- Evaluate the interdependence of Earth's crust and its organisms.
- Explain the structure and function of the Earth's crust.
- Skills used: create graph, map, chart

Plate Tectonics

- Describe the impact of continental shifting on local environments.
- Explain the theory of plate tectonics.
- Relate the movement of the continents to changes in weather patterns.
- Skills used: create graph, map, chart

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Weathering and Erosion

- Compare and contrast weathering and erosion.
- Describe the effects of natural erosion on the environment.
- Distinguish between chemical and physical weathering.
- Explain the impact of artificial erosion on the environment.
- Skills used: create graph, map, chart

Land Use and Management

Human Use of Land

- Assess the effects of human land usage on ecosystems.
- Compare and contrast ways humans are working to reduce the impact of land use on the environment.
- Describe possible future consequences of land use to the environment.
- Skills used: determine the cause and predict the effect

Minerals and Mining

- Compare and contrast various mineral extraction methods.
- Describe the long-term consequences of large scale mineral extraction to the Earth.
- Explain the impact of mining on local populations.
- Identify uses of minerals.
- Skills used: determine the cause and predict the effect

Urban Growth

- Compare and contrast various urban and suburban migration patterns seen on the Earth.
- Describe the effects of upward growth on local environments.
- Describe the effects of urban sprawl on local environments.
- Skills used: determine the cause and predict the effect

Land Management and Planning

- Describe differences in the use of public land and private land.
- Describe large-scale land management methods implemented by governments and corporations.
- Determine possible impacts of land management methods on the environment.
- Skills used: determine the cause and predict the effect

Global Connection: Deforestation in Haiti

- Assess how deforestation in Haiti impacts the environment.

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Forests and Soil

Vanishing Forests

Skills Lesson: Constructing Valid Criticisms

- Analyze data to determine reliability and bias.
- Construct a valid criticism of the possible outcome based on the data.
- Identify factors contributing to the possible outcome of a process.
- Research data relating to the contributing factors.

The Importance of Trees

- Analyze the consequences of human use of trees.
- Describe the relationship between trees and other organisms.
- Explain the impact of trees on air quality.
- Identify methods in which trees are utilized by humans.
- Skills used: constructing valid criticism

Rainforest Loss

- Compare and contrast the effectiveness of current rainforest conservation efforts.
- Evaluate the impact of rainforest loss over the last 100 years.
- Explain how rainforest resources are utilized throughout the globe.
- Identify the locations of the world's rainforests.
- Skills used: constructing valid criticism

Modern Forestry

- Analyze the role of forests as carbon sinks.
- Compare and contrast current methods of forest management.
- Describe the main roles of a forester.
- Skills used: constructing valid criticism

Fire and Nature

- Analyze methods of fire utilization within various environments.
- Evaluate ways that wildfire benefits ecosystems.
- Predict how fire can be used to further benefit the environment.
- Skills used: constructing valid criticism

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Soil

What is Soil?

- Characterize the major horizons in soil.
- Compare processes of soil formation in various environments.
- Describe the composition of soil.
- Skills used: selecting valid resources

Soil Formation

- Assess the role of microorganisms in soil.
- Explain the relationship between microorganisms, humus, and soil health.
- Identify the properties of soil.
- Skills used: selecting valid resources

Soil Around the World

- Compare and contrast the soil composition of different ecosystems.
- Describe ways in which humans impact soil.
- Explain the relationships between organisms and soil of different ecosystems.

Soil and Agriculture

- Compare and contrast various agricultural practices around the world.
- Evaluate various methods used in agriculture to minimize soil depletion and erosion.
- Skills used: selecting valid resources

Global Connection: Microflora and Microfauna

- Evaluate how agricultural practices affect microflora and microfauna.

The Water

Marine Ecosystems

Skills Lesson: Proposing Solutions

- Determine the desired outcome of the identified problem.
- Identify an unresolved problem or dilemma.
- Propose a possible solution.

Ocean Exploration

- Discuss possible applications of recent discoveries within the ocean.
- Examine how recent discoveries in abyssal zones have impacted scientific theories.
- Explore the relationship between technology and new developments in oceanography.

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Salt Marshes and Mangroves

- Explain how utilization of mangrove and salt marshes has changed over time.
- Identify characteristics of salt marsh and mangrove habitats.
- Propose alternative ways to utilize resources in mangroves and salt marshes.
- Skills used: forming a valid hypothesis

Coral Reefs

- Analyze the effectiveness of current efforts to preserve coral reefs.
- Describe the characteristics of a coral reef.
- Examine causes of coral reef loss.
- Explain the relationship between aquatic organisms and the coral reef.
- Skills used: forming a valid hypothesis

Issues Affecting Marine Ecosystems

- Describe how fisheries and ocean bottom trawling impact marine ecosystems.
- Evaluate methods humans are using to reduce their impact on marine ecosystems.
- Identify the impacts of floating refuse on marine ecosystems.

Freshwater Ecosystems

Pools, Ponds, and Lakes

- Assess the relationships between organisms that live in pools, ponds, and lakes.
- Compare and contrast the characteristics of pools, ponds, and lakes.
- Describe the cause of eutrophication and its effects on the environment.
- Differentiate littoral and riparian areas.

Streams and Rivers

- Assess the relationships between organisms that live in streams and rivers.
- Compare and contrast the characteristics of streams and rivers.
- Describe the impact of current and oxygen content on biodiversity in streams and rivers.
- Explain various ways humans impact rivers and streams.

Wetlands

- Assess the biodiversity of organisms found in wetlands.
- Differentiate various types of wetlands.
- Distinguish between the main types of water found in wetlands.
- Explain how the wetlands filter and clean water.

Global Connection: Water Management and Katrina

- Analyze the effect of canals and levees on wetlands.

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Water Ecology

Skills Lesson: Proposing Logical Alternatives

- Compare the positive and negative effects of previously enacted resolutions to a problem.
- Identify an unresolved problem.
- Propose a logical alternative to an unresolved problem or question.
- Utilize scientific data and research to establish cause and effect.

Nonnative Species In Aquatic Ecosystems

- Describe how invasive species impact an aquatic ecosystem.
- Examine various methods of addressing environmental problems that were traditionally solved by utilizing nonnative species.
- Identify ways that invasive species are introduced into an aquatic ecosystem.

Changing Waterways

- Describe naturally occurring changes to waterways.
- Evaluate ways humans impact waterways.
- Propose alternative practices to reduce human impact on waterways.

The Water We Use

- Assess the impact of water consumption and diminishing supplies on human activities.
- Describe the availability of water across the globe.
- Identify sources of potable and non-potable water.

Water Pollution

- Describe the effects of water pollution on local populations.
- Explain ways that humans can reduce water pollution.
- Identify sources of water pollution.

Groundwater

- Assess the consequences of overuse and contamination of groundwater.
- Describe the location and importance of the water table.
- Explain how human use of groundwater has changed over time.
- Skills used: determining independent and dependent variables

Water Policy

- Compare and contrast the processes of water reclamation, greywater use, and desalination.
- Identify laws and regulations in the United States that address water use and management.
- Propose possible consequences of failing to conserve water.

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Energy and Resources

Energy in Ecosystems

Energy Transformation

- Describe the impact of energy transformations on ecosystems.
- Discuss the main forms of energy in an ecosystem.
- Explain how energy is transformed and conserved as it changes from one form to another.
- Skills used: making logical connections, creating diagrams, compare and contrast

Energy Transfer

- Describe how the amount of available energy changes between trophic levels in a food chain.
- Explain the relationship between entropy and usable energy in a food chain.
- Outline the flow of energy in an ecosystem.
- Skills used: making logical connections, creating a flow chart

Photosynthesis in Plants

- Distinguish between the main types of carbon fixation.
- Explain the process of photosynthesis in plants.
- Skills used: proposing logical alternatives

Global Connection: Deep Sea Ecologies

- Explain the process of energy transfer in deep sea ecologies.

Resources

Skills Lesson: Conducting Valid Internet Research

- Analyze gathered information for bias.
- Identify a topic to be researched.
- Select valid internet data based on analysis.
- Utilize internet search engines to gather information regarding the topic.

What Are Natural Resources?

- Explain how fossil fuels are formed.
- Explain how natural resources are produced.
- Explain how resource availability is limited by rates of use and renewal.
- Skills used: making predictions, compare and contrast, researching with technology, making logical connections

Nuclear Power

- Compare and contrast the processes of nuclear fission and nuclear fusion.
- Describe uses of nuclear energy.
- Examine possible consequences of using nuclear energy.
- Skills used: researching with technology, modeling systems, compare and contrast, making logical connections

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Resource Conservation

- Assess the availability and allocation of resources.
- Compare and contrast uses of renewable and nonrenewable resources.
- Discuss problems associated with the use of non-local resources.
- Propose alternatives to using nonrenewable resources.
- Skills used: compare and contrast, proposing alternative solutions, researching with technology

The Social Costs of Resource Use

- Compare and contrast the costs and benefits of using renewable and nonrenewable resources.
- Evaluate the consequences of world dependence on fuels.
- Explain how technology can be utilized in resource conservation efforts.
- Skills used: making logical connections, evaluating explanations, compare and contrast

Societies and Policy

Ethics and Policy

Governments and Business

- Assess the impact of government and business on energy efficiency.
- Compare the effects of government sanctioned activities on ecosystems.
- Illustrate how conservation efforts have positively impacted ecosystems.
- Skills used: making logical connections, interpreting observations, supporting claims, making predictions, compare and contrast

Informed Policy

- Describe the influence that scientific knowledge has on society.
- Evaluate the benefits of monitoring environmental parameters when making policy regarding resource use.
- Identify contributing factors to environmental policy decisions.
- Skills used: compare and contrast, making logical connections, supporting claims, understanding cause and effect

Impact of Policy

- Assess the potential environmental consequences of policies that address social problems.
- Evaluate the effects of policies on global and local ecosystems.
- Propose possible effects of policies regarding sustainable land use.
- Skills used: supporting claims, plotting trends, making predictions, interpreting observations, compare and contrast

Milestones and Turning Points

- Describe the efforts of various countries to reduce resource and ecological depletion.
- Illustrate the impact of major milestones in environmental science.
- Predict possible milestones in environmental policy.
- Skills used: making valid criticisms, understanding cause and effect, researching with technology, making predictions, identifying trends

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Global Connection: Newfoundland Cod Fishery Collapse

Assess the societal and environmental consequences of government policy.

The Environment and Society

Skills Lesson: Forming a Valid Hypothesis

Create an explanation based on the determined relationships.

Determine relationships between contributing factors utilizing prior knowledge and research.

Identify contributing factors of an observed event or process.

Utilize the explanation to form a valid hypothesis.

Limiting Factors and Humans

Describe factors that can impact the stability of a society.

Explain the impact of limiting factors on human society.

Identify the influences of environment on behavior.

Skills used: making logical connections, supporting claims, understanding cause and effect, making valid criticisms

Humans and the Energy Cycle

Describe the relationship between energy consumption and quality of living.

Explain the impact of energy flow and cycles of matter on society.

Skills used: creating a flow chart, making predictions, making logical connections, identifying trends and patterns

Societal Consequences

Determine the impact of biotechnology on society and the environment.

Explain the benefits and disadvantages of scientific and medical advancements to society.

Skills used: supporting claims, researching with technology, making valid criticisms, understanding cause and effect

The Environment and the Individual

Describe the relationship between the environment and personal health.

Identify synthetic environmental health hazards.

Skills used: making logical connections, interpreting observations, understanding cause and effect, compare and contrast

Other Influences on Personal Health

Compare and contrast the impact of genetic and environmental factors on individual and public health.

Describe the relationship between heredity and personal health.

Skills used: compare and contrast, understanding cause and effect, making predictions

The Environmental Impact of Humans and Technology

Natural Events and the Environment

Describe the impact of natural disasters on local populations.

Explain how human activities impact the effects of natural disasters.

Skills used: understanding cause and effect, graphing projections, making logical connections, supporting claims

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			<p>Human Events and the Environment</p> <p>Describe the effects of large-scale environmental catastrophes.</p> <p>Evaluate the impact of different agricultural techniques on the environment.</p> <p>Skills used: making predictions, identifying trends, understanding cause and effect, graphing projections, compare and contrast, making valid criticisms, supporting claims</p> <p>Sustainability</p> <p>Compare and contrast the impact of differing human lifestyles on sustainability.</p> <p>Describe future sustainability utilizing graphs and current data.</p> <p>Skills used: making predictions, identifying trends, understanding cause and effect, compare and contrast, graphing projections</p> <p>Effects of Technology</p> <p>Describe the impact of energy producing technologies on the environment and the acquisition of natural resources.</p> <p>Explain how energy producing technologies impact land fertility and aquatic viability.</p> <p>Skills used: making predictions, identifying trends, researching with technology, understanding cause and effect, interpreting observations, evaluating explanations, making valid criticisms</p> <p>Success Stories</p> <p>Describe various ways communities are attempting to restore and protect ecosystems.</p> <p>Give examples of emerging efforts designed to successfully address environmental issues.</p> <p>Skills used: understanding cause and effect</p> <p>Global Connection: Nuclear Fuel</p> <p>Evaluate the environmental impact of using nuclear fuel.</p>