COURSE: Science	GRADE(S): 5th Grade
Introduction: The Processes of Science	

NATIONAL STANDARDS:

SCIENCE THEMES: Systems and interactions, ,models, patterns of change, change over time

PROCESS SKILLS: Observing, classifying, measuring, analyzing and interpreting data, formulating hypotheses, predicting, experimenting/testing, variable recognition and control

STATE STANDARDS:

3.2.7.A Explain and apply scientific and technological knowledge.

- Distinguish between a scientific theory and belief.
- Answer "What if" questions based on observation, inference or prior knowledge or experience.
- Explain how skepticism about an accepted scientific explanation led to a new understanding.
- Explain how new information may change existing theories and practice.

3.2.7.B Apply process knowledge to make and interpret observations.

- Measure materials using a variety of scales.
- Describe relationships by making inferences and predictions.
- Communicate, use space/time relationships, define operationally, raise questions, formulate hypotheses, test and experiment.
- Design controlled experiments, recognize variables, and manipulate variables.
- Interpret data, formulate models, design models, and produce solutions.

ASSESSMENT ANCHORS:

S8.A.1 Reasoning and Analysis

S8.A.1.1 Explain, interpret and apply scientific, environmental, or technological knowledge presented in a variety of formats (e.g., visuals, scenarios, graphs).

S8.A.2 Processes, Procedures and Tools of Scientific Investigations

S8.A.2.1 Use evidence, observations, or a variety of scales (e.g., time, mass, distance, volume, temperature) to describe relationships.

S8.A.2.2 Apply appropriate instruments for a specific purpose and describe the information the instrument can provide.

S8.A.3.2 Apply knowledge of models to make predictions, draw inferences, or explain technological concepts.

ELIGIBLE CONTENT:

S8.A.1.1.1 Distinguish between a scientific theory and an opinion, explaining how a theory is supported with evidence, or how

S8.A.1.1.2 Explain how certain questions can be answered through scientific inquiry and/or technological design.

S8.A.1.1.3 Use evidence, such as, observations or experimental results, to support inferences about a relationship.

S8.A.1.1.4 Develop descriptions, explanations, predictions, and models using evidence.

S8.A.2.1.1 Use evidence, observations, or a variety of scales (e.g., time, mass, distance, volume, temperature) to describe relationships.

S8.A.2.1.2 Use space/time relationships, define concepts operationally, raise testable questions, or formulate hypotheses.

S8.A.2.1.3 Design a controlled experiment by specifying how the independent variables will be manipulated, how the dependent variable will be measured, and which variables will be held constant.
S8.A.2.1.4 Interpret data/observations; develop relationships among variables based on data/observations to design models as solutions.
S8.A.2.1.5 Use evidence from investigations to clearly communicate and support conclusions.
S8.A.2.1.6 Identify a design flaw in a simple technological system and devise possible working solutions.
S8.A.2.2.1 Describe the appropriate use of instruments and scales to accurately measure time, mass, distance, volume, or temperature safely under a variety of conditions.
S8.A.2.2.2 Apply appropriate measurement systems (e.g., time, mass, distance, volume, temperature) to record and interpret observations under varying conditions.
S8.A.2.2.3 Describe ways technology extends and enhances human abilities for specific purposes (e.g., microscope, telescope, micrometer, hydraulics, and barometer).
S8.A.3.2.1 Describe how scientists use models to explore relationships in natural systems (such as, an ecosystem, river system, or the solar system).
S8.A.3.2.2 Describe how engineers use models to develop new and improved technologies to solve problems.
S8.A.3.2.3 Given a model showing simple cause and effect relationships in a natural system, predict results that can be used to test the assumptions in the model (e.g., photosynthesis, water cycle, diffusion, infiltration).

KEY CONCEPTS:

1. Inquiry, problem solving, critical thinking, measurement, communications, links to real world applications should be integrated throughout science instruction to develop an understanding of the key concepts and content. The use of technology as a tool for investigating, communicating and doing science must also be integrated throughout this instruction.
2. Systematic investigations require standard measures and consistent and reliable tools. Metric measures are a standard way to make measurements and are recognized around the world.
3. A classification key is an important tool used to help identify objects and organisms. It consists of a branching set of choices organized in levels, with most levels of the key having two choices. Each level provides more specific descriptors, eventually leading to identification.
4. Systematic investigations require organized reporting of data. The way the data are displayed can make it easier to see important patterns, trends, and relationships. Bar graphs and line graphs are useful tools for reporting discrete data and continuous data, respectively.
5. A scientific prediction is a forecast about what *may happen* in some future situation. It is based on the application of factual information and principles, and recognition of trends and patterns.

UNIT OBJECTIVES:

1. Review and post science safety rules in a prominent place in the classroom. Review safety rules with students on a regular basis.

2. Identify science inquiry or process skills used by scientists when they do research.
   - *Observation:* Using senses to gather information about objects and events.
   - *Compare:* Identify ways in which things are alike or different.
   - *Classify:* Group or organize objects or events into categories based on specific characteristics.
   - *Interpret Data:* Use data to look for patterns, to predict what will happen, or to suggest an answer to a question.
   - *Infer:* Use logical reasoning to come to a conclusion based on data and observations.
   - *Predict:* Use observations and data to form an idea of what will happen under certain conditions.

3. Recognize how science tools are used to make better observations.
   - Hand lens, magnifying boxes and microscopes are tools that are used to observe objects.
   - Ruler, thermometer, tape measure, measuring cup, balance, spring scales are tools that are used to measure solids or liquids.

4. Use the scientific method to:
   - Record observations; compare qualitative data versus quantitative data.
   - Distinguish between observations versus inference.

5. The following steps should be followed in the Scientific Method:
   - *Observe, and Ask Questions*: Use senses to make observations.
   - *Form a Hypothesis:* Write a possible answer to your question.
   - *Plan an Experiment:* Decide how to conduct a fair test of your hypothesis by controlling variables. Variables are factors that can affect the outcome of the experiment.
   - *Conduct an Experiment*: Follow the plan, observe and measure carefully, organize data so it is easy to understand
   - *Draw Conclusions/Communicate Results:* Make charts, tables or graphs to display data; analyze observations and data
   - *Write a conclusion:* Describe the evidence used to determine whether the experiment supported your hypotheses. Decide whether hypothesis was supported or not.

ACTIVITIES:	**ASSESSMENTS:**
Students will: 1. Brainstorm and record science safety rules. 2. Make plausible estimations of length, mass, and volume. 3. Select and use the appropriate instruments including centimeter rulers, meter sticks, graduated cylinders, balances, and stopwatches for making basic measurements. 4. Measure temperature, length, mass, and volume using metric measures. This includes millimeters, centimeters, meters, kilometers, grams, kilograms, milliliters, liters, and degrees Celsius. 5. Collect, record, and report data using charts and tables and translate numerical data into bar or line graphs. 6. Plan experiment by following the described steps in the Scientific Process. 7. Make predictions based on trends in data. This requires the recognition of patterns and trends, and determining what those trends may represent. 8. Analyze the variables in a simple experiment and identify the manipulated (independent) and responding (dependent) variables.	Ongoing throughout all units

9. Define/make observations and inferences. 10. Distinguish between observations and inferences. 11. Measure, record, identify, collect, and organize observations. Distinguish between qualitative and quantitative observations. **RESOURCES:** http://www.biology4kids.com/files/studies_scimethod.html http://www.gckschools.com/schools/bsic/geny/sciencefairproject/scientificmethod/	

COURSE: Science	GRADE(S): 5th Grade
UNIT: Environment and Ecology/Unit 1: Watersheds	

NATIONAL STANDARDS:

SCIENCE THEMES: Systems and interactions, models, patterns of change, change over time.

PROCESS SKILLS: Observing, classifying, analyzing and interpreting data, formulating hypotheses, predicting, experimenting/testing, variable recognition and control.

STATE STANDARDS:

4.1.7 A Explain the role of the water cycle within a watershed.
- Explain the water cycle.
- Explain the water cycle as it relates to a watershed.

4.1.7.B Understand the role of the watershed.
- Identify and explain what determines the boundaries of a watershed.
- Explain how water enters a watershed.
- Explain factors that affect water quality and flow through a watershed.

4.1.7.C Explain the effects of water on the life of organisms in a watershed.
- Explain how water is necessary for all life.
- Explain how the physical components of aquatic systems influence the organisms that live there in terms of size, shape and physical adaptations.
- Describe the life cycle of organisms that depend on water.
- Identify organisms that have aquatic stages of life and describe those stages.

4.1.7.D Explain and describe characteristics of a wetland.
- Identify specific characteristics of wetland plants and soils.
- Recognize the common types of plants and animals.
- Describe different types of wetlands.
- Describe the different functions of a wetland.

4.1.7.E Describe the impact of watersheds and wetlands on people.
- Explain the impact of watersheds and wetlands in flood control, wildlife habitats and pollution abatement.
- Explain the influence of flooding on wetlands.

4.2.7.A Know that raw materials come from natural resources.
- Identify resources used to provide humans with energy, food, housing and water.
- Explain how plants and animals may be classified as natural resources.
- Compare means of growing or acquiring food.
- Identify fiber and other raw materials used in clothing and shelter production.
- Identify types of minerals and fossil fuels used by humans.

4.2.7.B Examine the renewability of resources.
- Identify renewable resources and describe their uses.
- Identify nonrenewable resources and describe their uses.
- Compare finished products to their original raw material.
- Identify the waste derived from the use of renewable and non-renewable resources.
- Compare the time spans of renewability for fossil fuels and alternative fuels.

4.3.7.A Identify environmental health issues.
- Identify various examples of long-term pollution and explain their effects on environmental health.
- Identify diseases that have been associated with poor environmental quality.
- Describe different types of pest controls and their effects on the environment.
- Identify alternative products that can be used in life to reduce pollution.

4.3.7.B Describe how human actions affect the health of the environment.
- Identify land use practices and their relation to environmental health.
- Explain how natural disasters affect environmental health.

- Identify residential and industrial sources of pollution and their effects on environmental health.
- Explain the difference between point and non-point source pollution.
- Explain how non-point source pollution can affect the water supply and air quality.
- Explain how acid deposition can affect water, soil and air quality.
- Explain the relationship between resource use, reuse, recycling and environmental health.

4.3.7.C Explain biological diversity.

- Explain the complex, interactive relationships among members of an ecosystem.
- Explain how diversity affects ecological integrity of the natural resources.

4.4.7.A Explain society's standard of living in relation to agriculture.

- Compare and contrast agricultural changes that have been made to meet society's needs.
- Compare and contrast how animals and plants affect agricultural systems.
- Compare several technological advancements and their effect(s) on the historical growth of agriculture.
- Compare different environmental conditions related to agricultural production, cost and quality of the product.

4.6.7.A Explain the flows of energy and matter from organism to organism within an ecosystem.

- Identify and explain the characteristics of biotic and abiotic.
- Describe and explain the adaptations of plants and animals to their environment.
- Demonstrate the dependency of living components in the ecosystem on the nonliving components.
- Explain energy flow through a food web.
- Explain the importance of the predator/prey relationship and how it maintains the balances within ecosystems.
- Understand limiting factors and predict their effects on an organism.
- Identify niches for producers, consumers and decomposers within an ecosystem.
- Compare and contrast the major ecosystems of Pennsylvania.
- Identify the major characteristics of a biome.
- Compare and contrast different biomes and their characteristics.
- Identify the relationship of abiotic and biotic components and explain their interaction in an ecosystem.
- Explain how different soil types determine the characteristics of ecosystems.

4.6.7.B Explain the concepts of cycles.

- Identify and explain cycles within an ecosystem.
- Analyze the role of different cycles within an ecosystem.

4.6.7.C Explain how ecosystems change over time.

- Explain how ecosystems change.
- Identify the succession stages of a given ecosystem.
- Explain how specific organisms may change an ecosystem.
- Explain a change in an ecosystem that relates to humans.

4.7.7. A Describe diversity of plants and animals in ecosystems.

- Select an ecosystem and describe different plants and animals that live there.
- Identify adaptations in plants and animals.
- Recognize that adaptations are developed over long periods of time and are passed on from one generation to the next.
- Understand levels of ecosystem organizations (e.g., individuals, populations, and species).

4.7.7.B Explain how species of living organisms adapt to their environment.

- Explain the role of individual variations in natural selection.
- Explain how an adaptation is an inherited structure or behavior that helps an organism survive and reproduce.
- Describe how a particular trait may be selected over time and account for a species' adaptation.
- Compare and contrast animals and plants that have very specific survival requirements with those that have more general requirements for survival.
- Explain how one species may survive an environmental change while another might not.

ASSESSMENT ANCHORS:

S8.A.1 Reasoning and Analysis:
S8.A.1.3 Identify evidence that certain variables may have caused measurable changes in natural or human-made systems.

S8.A.3 Systems, Model and Patterns:
S8.A.3.1 Explain the parts of a simple system, their roles, and their relationships to the system as a whole.

S8.B.3 Ecological Behavior and Systems:
S8.B.3.1 Explain the relationships among and between organisms in different ecosystems and their abiotic and biotic components.
S8.B.3.2 Identify evidence of change to infer and explain the ways different variables may affect change in natural or human-made systems.
S8.B.3.3 Explain how renewable and nonrenewable resources provide for human needs or how these needs impact the environment.

S8.D.1 Earth Features and Processes that Change Earth and Its Resources:
S8.D.1.3 Describe characteristic features of Earth's water systems or their impact on resources.

ELIGIBLE CONTENT:

S8.A.1.2.2 Identify environmental issues and explain their potential long-term health effects (e.g., pollution, pest controls, vaccinations).
S8.A.3.1.1 Describe a system (e.g., watershed, circulatory system, heating system, agricultural system) as a group of related parts with specific roles that works together to achieve an observed result.
S8.A.3.1.3 Distinguish between system inputs, system processes, system outputs, and feedback (e.g., physical, ecological, biological and informational).
S8.A.3.1.5 Explain how components of natural and human-made system play different roles in a working system.

S8.A.3.2.3 Given a model showing simple cause and effect relationships in a natural system, predict results that can be used to test the assumptions in the model. (e.g., photosynthesis, water cycle, diffusion, infiltration).
S8.B.1.1.1 Describe the structures of living things that help them function affectively in specific ways (e.g., adaptations and characteristics).
S8.B.3.1.1 Explain the flow of energy through an ecosystem (e.g., food chains, food webs).
S8.B.3.1.2 Identify major biomes and describe abiotic and biotic components (e.g., abiotic: different soil types, air, water, sunlight).
S8.B.3.1.3 Explain relationships among organisms (e.g., producers/consumers, predator/prey, in an ecosystem).
S8.B.3.2.1 Use evidence to explain factors that affect changes in populations (e.g., deforestation, disease, land use, natural disaster, invasive species).
S8.B.3.2.2 Use evidence to explain how diversity affects the ecological integrity of natural systems.
S8.B.3.2.3 Describe the response of organisms to environmental changes (e.g., changes in climate, hibernation, migration, coloration) and how those changes affect survival.
S8.B.3.3.1 Explain how human activities may affect local, regional, and global environments.
S8.B.3.3.2 Explain how renewable and nonrenewable resources provide for human needs (e.g., energy, food, water, clothing, and shelter).
S8.B.3.3.3 Describe how waste management affects the environment (e.g., recycling, composting, landfills, incineration, sewage treatment).
S8.D.1.3.1 Describe the water cycle and the physical processes on which it depends (i.e., evaporation, condensation, precipitation, transpiration, runoff, infiltration, energy inputs, and phase changes).

S8.D.1.3.3 Distinguish among different water systems (e.g., wetland systems, ocean systems, river systems, watersheds) and describe their relationships to each other, as well as, to landforms.

S8.D.1.3.4 Identify the physical characteristics of a stream and how these characteristics determine the types of organisms found in an aquatic environment (e.g., biological diversity, water quality, flow rate, tributaries, surrounding watershed).

KEY CONCEPTS:

1. A watershed, also called a drainage basin, is the area in which all water, sediments, and dissolved materials drain from the land into a common body of water, such as, a river, lake, or ocean. A watershed encompasses not only the water but the surrounding land from which the water drains.
2. Water that is not evaporated or absorbed into the soil will drain from the land by way of watersheds. Watersheds are the natural sloping land that water follows as it drains off of the land.
3. Water quality is critically impacted from everything that goes on within a watershed. Mining, forestry, agriculture, and construction practices, urban runoff from streets, parking lots, chemically treated lawns, and gardens, failing septic systems, and improperly treated municipal discharges
4. There are six major watersheds in Pennsylvania: Lake Erie, Ohio, Susquehanna, Potomac, Genesee, and the Delaware.
5. Pennsylvania watersheds connect with much larger watersheds elsewhere in the United States to empty into the oceans.

UNIT OBJECTIVES:

1. *Explain the water cycle and how it relates to a watershed.*

    - The water cycle is the process by which water renews itself. Water is the ultimate example of recycling. Water constantly renews its purity by cycling itself from a liquid (or a solid) into vapor and back again. The change to a vapor removes most impurities and allows water to return to Earth in its clean form. (Exception Acid Rain)
    - The water cycle is continuous, it does not have a beginning, but a convenient place to start studying it is with precipitation.
    - When precipitation falls to earth, several things can happen. It can be absorbed into the soil. This is called infiltration. This process allows water to seep into the earth and be stored underground as groundwater.
    - Precipitation can also become runoff, flowing into rivers and streams.
    - Water can evaporate, or it can be returned to the atmosphere by transpiration through plants.
    - Precipitation can also be stored. An ice cap is a form of storage.
    - A number of factors such as soil type, slope, moisture conditions, and intensity of storm event effect how water travels through this cycle. For example, when rain falls some will be absorbed into the ground, but the rate of infiltration may be slow or fast. If the soil is already wet and saturated, much of the rain will become runoff.
    - Human-made structures can reduce infiltration even further. Virtually no water infiltrates through paved roads and parking lots, so almost all of it becomes runoff. This affects the entire water cycle.

2. *Comprehend and apply the following basic terminology related to watersheds.*

    - *Boundary:* The limit or border of an area.
    - *Political:* A political boundary is artificially determined.

- *Natural:* A natural boundary is marked by a landform, such as, a river.
- *Channel:* The bed of a stream or river, the path of ground through which a river flows.
- *Confluence*: The point where two rivers flow together.
- *Contour line*: A line on a topographic map that shows elevation above sea level.
- *Features:* The recognizable attributes of an area including landforms, vegetation, structures, and bodies of water.
- *Landforms:* A natural feature of a land surface.
- Meander: A curve in a river.
- *Natural Features:* The attributes of an area that are not created by human power including landforms, vegetation, and bodies of water.
- *Non-point source:* Pollution that enters the water from a variety of sources including homes, farms, streets, and construction sites.
- *Point source:* Pollution that enters the water from a single location as a concentrated source.
- River mouth: The point where a smaller body of water enters a larger body of water.
- River source: The point of origin of a stream or river.
- Structure: Something that is made by human power, something that is constructed.
- Symbol: Something that stands for or suggests something else by reason of relationship, association, convention, or accidental resemblance.
- *Topographical Map:* A map that shows elevation of a land area through the use of contour lines.
- *Tributaries:* A stream feeding a larger stream or lake.
- *Watershed:* region or area draining ultimately to a particular watercourse or body of water.

3. *Explain the concept of a watershed and how water is drained from the land.*
    - A watershed is the land that captures water in any form, such as, rain, snow, dew, sleet or hail. All the land whose water drains into a particular stream system or lake is the watershed for that body.
    - When water seeps into the ground it is stored for a while before being released slowly into the streams by way of springs and seeps. Some of the water stored in the ground may be tapped by wells and pumped out of the ground to be used by people.
    - Some water that falls on the watershed runs off, carving the land into hills and valleys.
    - A watershed is a sort of hydraulic "commons" we all live, work, and play in watersheds, and what we do affects everything and everyone else in the watershed.
4. *Students will be able to identify the 6 major watersheds of Pennsylvania and use topographic maps to determine their location and approximate size.*
    - The six major watersheds are:
        - Lake Erie
        - Ohio
        - Susquehanna

- Potomac
- Genesee
- Delaware

5. *Students will identify in which watershed they reside.*

   - Our school district is located in the Delaware Basin watershed.

SUGGESTED ACTIVITIES:

Students will:

1. Propose ways to maintain water quality within a watershed.
2. Write a persuasive letter explaining the importance of maintaining water quality within a watershed.
3. Explain the factors that affect water quality in a watershed and how those factors can affect an ecosystem.
4. Forecast potential water-related issues that may become important in the future.
5. Estimate and calculate the percent of available fresh water on Earth and do an oral presentation explaining why water is a limited resource.
6. Locate and critique a media article or editorial (print or electronic) concerning water use or water quality.
7. Argue for and against commercially developing a parcel of land containing a large wetland area.
8. Design and defend a land-use model that minimizes negative impact.
9. Measure, record, and analyze a variety of water quality indicators and describe what they mean.
10. Develop and maintain a vocabulary booklet containing illustrations and definitions of watershed vocabulary.
11. Use watershed maps (available through GIS system) to review elevation contour lines and discuss the information provided on each map.

RESOURCES:

- Harcourt Science Teacher Resources
- The Study of Water: Background Notes for teachers
- Watershed Seasons (Science and Children)
- Water As A Natural Resource: Unitedstreaming supplemental student activities.
- Project Wet –Watershed Activity Guides
  - The Pucker Effect
  - Sparkling Water
  - A Grave Mistake
  - A Drop in the Bucket
- Activities Guides from the EPA

ASSESSMENTS:

- ✧ Text review questions
- ✧ Text review worksheets
- ✧ Homework assignments
- ✧ Observation checklist
- ✧ Interviews and dialogue
- ✧ Learning logs or notebooks
- ✧ Teacher-made tests and quizzes
- ✧ Products and projects
- ✧ Performance tasks
- ✧ Portfolios

REMEDIATION:

- ✧ Peer support
- ✧ Cooperative learning
- ✧ Individualized instruction
- ✧ Small group instruction
- ✧ Computer generated visuals and simulations.

ENRICHMENT:

- ✧ Research paper
- ✧ Class presentation of research
- ✧ WebQuest activities
- ✧ Design an experiment to test local water sources.

- All the Water in the World
- Deep Subjects-Wells and Ground Water
- Excuse me, is this the way to the drainpipe?
- The Case of the Mysterious Renters
- The Case of the Disappearing Water

Websites:

www.dep.state.pa.us
This website provides links for lesson plans, student activities, and teacher resources.
http://water.cas.psu.edu/193.htm
This website offers a wide variety of PowerPoint presentations for both students and teachers
http://sftrc.cas.psu.edu
This websites provides lesson plans and reproducible content background informational notes.

http://www.unitedstreaming.com/search/assetDetail.cfm?guidAssetID=3832B29E-A46D-47EC-9A0B-7062296E8C12

Water smart: Water as a natural resource
Description:
Take away water from Earth and what do you have? Not much! That's the focus behind Water as a Natural Resource. This program raises awareness to the value of clean water on Earth. Concepts of non-point source pollution and wastewater are revealed to students. Kids see how the water cycle links and provides a life source for all creatures. We examine how wetlands, watersheds and ecosystems are affected by poor water quality. Different forms of water pollution are presented. Most importantly, a long list of examples is shown so that kids can take an active role in preserving good water quality and reducing water waste. A true/false quiz at the program conclusion provides instant measurement of learning. A dozen unique Internet links provide ample opportunity for kids to learn more about their local water resources. Teachers will use the Internet resources to go beyond material presented and elaborate on water safety. The substantial written materials will strengthen vocabulary with words like turbid, pesticide, potable, and solvent. Numerous experiments and demonstrations not only demonstrate water resource principles but they offer opportunity for graphing, calculating, and charting data. © 2004 United Learning

COURSE: Science	GRADE(S): 5th Grade
UNIT: Environment and Ecology - Unit 2: Natural Resources	

NATIONAL STANDARDS:

SCIENCE THEMES: Systems and interactions, models, patterns of change, change over time.

PROCESS SKILLS: Observing, classifying, analyzing and interpreting data, formulating hypotheses, predicting, experimenting/testing, variable recognition and control.

STATE STANDARDS:

4.1.7.C Explain the effects of water on the life of organisms in a watershed.
- Explain how water is necessary for all life.
- Explain how the physical components of aquatic systems influence the organisms that live there in terms of size, shape and physical adaptations.
- Describe the life cycle of organisms that depend on water.
- Identify organisms that have aquatic stages of life and describe those stages.

4.2.7.A Know that raw materials come from natural resources.
- Identify resources used to provide humans with energy, food, housing and water.
- Explain how plants and animals may be classified as natural resources.
- Compare means of growing or acquiring food.
- Identify fiber and other raw materials used in clothing and shelter production.
- Identify types of minerals and fossil fuels used by humans.

4.2.7.B Examine the renewability of resources.
- Identify renewable resources and describe their uses.
- Identify nonrenewable resources and describe their uses.
- Compare finished products to their original raw material.
- Identify the waste derived from the use of renewable and nonrenewable resources.
- Determine how consumption may impact the availability of resources.
- Compare the time spans of renewability for fossil fuels and alternative fuels.

4.2.7.C Explain natural resource distribution.
- Distinguish between readily available and less accessible resources.
- Identify the locations of different concentrations of fossil fuels and mineral resources.
- Analyze the effects of management practices on air, land and water in forestry, agriculture, fisheries, wildlife, mining and food and fiber production that is unique to different climates.

4.2.7.D Describe the role of recycling and waste management.
- Identify materials that can be recycled in the community.
- Explain the process of closing the loop in recycling.
- Compare the decomposition rates of different organic materials.
- Describe methods that could be used to reuse materials for new products.
- Evaluate the costs and benefits of disposable products.

4.3.7.A Identify environmental health issues.
- Identify various examples of long-term pollution and explain their effects on environmental health.
- Identify diseases that have been associated with poor environmental quality.
- Describe different types of pest controls and their effects on the environment.
- Identify alternative products that can be used in life to reduce pollution.

4.3.7.B Describe how human actions affect the health of the environment.
- Identify land use practices and their relation to environmental health.
- Explain how natural disasters affect environmental health.
- Identify residential and industrial sources of pollution and their effects on environmental health.

- Explain the difference between point and non-point source pollution.
- Explain how non-point source pollution can affect the water supply and air quality.
- Explain how acid deposition can affect water, soil and air quality.
- Explain the relationship between resource use, reuse, recycling and environmental health.

4.3.7.C Explain biological diversity.

- Explain the complex, interactive relationships among members of an ecosystem.
- Explain how diversity affects ecological integrity of the natural resources.

4.4.7.A Explain society's standard of living in relation to agriculture.

- Compare and contrast agricultural changes that have been made to meet society's needs.
- Compare and contrast how animals and plants affect agricultural systems.
- Compare several technological advancements and their effect(s) on the historical growth of agriculture.
- Compare different environmental conditions related to agricultural production, cost and quality of the product.

4.4.7.B Investigate how agricultural science has recognized the various soil types found in Pennsylvania.

- Explain the importance of particle sizes in different soil types.
- Determine how water has influenced the development of Pennsylvania soil types.
- Investigate how soil types have influenced the plant types used on Pennsylvania farms.
- Analyze how soil types and geographic regions have impacted the profitability of Pennsylvania farms.

4.4.7.C Explain agricultural systems' use of natural and human resources.

- Analyze the needs of plants and animals as they relate to climate and soil conditions.
- Identify the plants and animals that can be raised in the area and explain why.
- Identify natural resources necessary for agricultural systems.
- Compare the need for crop production to the need for animal production.
- Define issues associated with food and fiber production.

4.4.7.D Explain the improvement of agricultural production through technology.

- Compare the technologies that have advanced agricultural production.
- Explain how energy sources have changed to meet agricultural technology.

4.6.7.A Explain the flows of energy and matter from organism to organism within an ecosystem.

- Identify and explain the characteristics of biotic and abiotic.
- Describe and explain the adaptations of plants and animals to their environment.
- Demonstrate the dependency of living components in the ecosystem on the nonliving components.
- Explain energy flow through a food web.
- Explain the importance of the predator/prey relationship and how it maintains the balances within ecosystems.
- Understand limiting factors and predict their effects on an organism.
- Identify niches for producers, consumers and decomposers within an ecosystem.
- Compare and contrast the major ecosystems of Pennsylvania.
- Identify the major characteristics of a biome.
- Compare and contrast different biomes and their characteristics.
- Identify the relationship of abiotic and biotic components and explain their interaction in an ecosystem.
- Explain how different soil types determine the characteristics of ecosystems.

4.6.7.B Explain the concepts of cycles.

- Identify and explain cycles within an ecosystem.
- Analyze the role of different cycles within an ecosystem.

4.6.7.C Explain how ecosystems change over time.

- Explain how ecosystems change.
- Identify the succession stages of a given ecosystem.
- Explain how specific organisms may change an ecosystem.
- Explain a change in an ecosystem that relates to humans.

4.7.7. A Describe diversity of plants and animals in ecosystems.

- Select an ecosystem and describe different plants and animals that live there.
- Identify adaptations in plants and animals.
- Recognize that adaptations are developed over long periods of time and are passed on from one generation to the next.
- Understand levels of ecosystem organizations (e.g., individuals, populations, and species).

4.7.7.B Explain how species of living organisms adapt to their environment.

- Explain the role of individual variations in natural selection.
- Explain how an adaptation is an inherited structure or behavior that helps an organism survive and reproduce.
- Describe how a particular trait may be selected over time and account for a species' adaptation.
- Compare and contrast animals and plants that have very specific survival requirements with those that have more general requirements for survival.
- Explain how one species may survive an environmental change while another might not.

ASSESSMENT ANCHORS:

S8.A.1 Reasoning and Analysis:

S8.A.1.3 Identify evidence that certain variables may have caused measurable changes in natural or human-made systems.

S8.A.3 Systems, Model and Patterns:

S8.A.3.1 Explain the parts of a simple system, their roles, and their relationships to the system as a whole.

S8.B.3 Ecological Behavior and Systems:

S8.B.3.1 Explain the relationships among and between organisms in different ecosystems and their abiotic and biotic components.

S8.B.3.2 Identify evidence of change to infer and explain the ways different variables may affect change in natural or human-made systems.

S8.B.3.3 Explain how renewable and nonrenewable resources provide for human needs or how these needs impact the environment.

S8.D.1 Earth Features and Processes that Change Earth and Its Resources:

S8.D.1.3 Describe characteristic features of Earth's water systems or their impact on resources.

ELIGIBLE CONTENT:

S8.A.1.2.2 Identify environmental issues and explain their potential long-term health effects (e.g., pollution, pest controls, vaccinations).

S8.A.3.1.1 Describe a system (e.g., watershed, circulatory system, heating system, agricultural system) as a group of related parts with specific roles that works together to achieve an observed result.

S8.A.3.1.3 Distinguish between system inputs, system processes, system outputs, and feedback (e.g., physical, ecological, biological and informational).

S8.A.3.1.5 Explain how components of natural and human-made system play different roles in a working system.

S8.A.3.2.3 Given a model showing simple cause and effect relationships in a natural system, predict results that can be used to test the assumptions in the model. (e.g., photosynthesis, water cycle, diffusion, infiltration).

S8.B.1.1.1 Describe the structures of living things that help them function affectively in specific ways (e.g., adaptations and characteristics).

S8.B.3.1.1 Explain the flow of energy through an ecosystem (e.g., food chains, food webs).

S8.B.3.1.2 Identify major biomes and describe abiotic and biotic components (e.g., abiotic: different soil types, air, water, sunlight).

S8.B.3.1.3 Explain relationships among organisms (e.g., producers/consumers, predator/prey, in an

ecosystem).

S8.B.3.2.1 Use evidence to explain factors that affect changes in populations (e.g., deforestation, disease, land use, natural disaster, invasive species).
S8.B.3.2.2 Use evidence to explain how diversity affects the ecological integrity of natural systems.
S8.B.3.2.3 Describe the response of organisms to environmental changes (e.g., changes in climate, hibernation, migration, coloration) and how those changes affect survival.
S8.B.3.3.1 Explain how human activities may affect local, regional, and global environments.
S8.B.3.3.2 Explain how renewable and nonrenewable resources provide for human needs (e.g., energy, food, water, clothing, and shelter).
S8.B.3.3.3 Describe how waste management affects the environment (e.g., recycling, composting, landfills, incineration, sewage treatment).
S8.D.1.3.1 Describe the water cycle and the physical processes on which it depends (i.e., evaporation, condensation, precipitation, transpiration, runoff, infiltration, energy inputs, and phase changes).
S8.D.1.3.3 Distinguish among different water systems (e.g., wetland systems, ocean systems, river systems, watersheds) and describe their relationships to each other, as well as, to landforms.
S8.D.1.3.4 Identify the physical characteristics of a stream and how these characteristics determine the types of organisms found in an aquatic environment (e.g., biological diversity, water quality, flow rate, tributaries, surrounding watershed).

KEY CONCEPTS:

1. Local, state, and federal government officials have significant roles in managing and protecting air, water, plant, and wildlife resources.

2. Regulations, incentives, and voluntary efforts help conserve resources and protect environmental quality.

3. Conservation of resources and environmental protection begin with the individual.

4. Use of renewable and nonrenewable resources must be considered in terms of their cost/benefit tradeoffs.

5. Preventive measures, such as pollution prevention or thoughtfully planned and enforced land-use restrictions can reduce the impact of potential problems in the future.

6. Renewable resources should be managed so they produce continuously. Sustainable development makes decisions about long-term use of the land and natural resources for maximum community benefits, for the longest time, with the least environmental damage.

UNIT OBJECTIVES:

1. *Identify natural resources: Living and nonliving components that support life on earth.*
   - *Sunlight:* The energy derived from the sun is used by green plants to carry on photosynthesis. That energy is transferred to animals through the food chain. The sun powers the water cycle by evaporating the water from land and water surfaces and creates wind energy through alternate heating and cooling of the atmosphere.

   - *Air:* Animals obtain oxygen by breathing, and plants use carbon dioxide in the process of photosynthesis. Air also provides nitrogen gas, which is converted by bacteria into a mineral form that plants can use. The earth's atmosphere deeps the keeps the temperature on earth relatively constant and protects living things from harmful ultraviolet rays.

   - *Water:* Fresh water on land is replenished by the water cycle and is essential to all living

things. Plants use water when manufacturing their food. Animals drink or absorb water to maintain body functions- water dissolves and distributes nourishment, flushes out poisons and keeps the body from overheating when it is using energy. Some animals live in water, and use it as a source of food, for protection or to cool off.

- *Soil:* Soil is a mixture of minerals from weathered rock and decaying plant and animal matter. Most terrestrial (land) plants need soil in which to grow. Soil provides water and nutrients to plants. Many animals live on or in soil.

- *Minerals:* Minerals are naturally occurring inorganic substances that originally came from rock. Examples include phosphorus, calcium, sulfur, salt and potassium. Many minerals are essential for the healthy growth of plants and animals. Plants absorb minerals that are dissolved in water; Animals must obtain needed minerals by eating plants or by eating other animals that have eaten plants.

- *Plant:* Plants are living things that can produce their own food and have cell walls composed of cellulose, and these cells contain chloroplasts. Trees, vines, shrubs, herbs, grasses, marine algae (seaweed) and some microscopic algae are examples of plants. Green plants produce oxygen. Plants are eaten by herbivores (animals that eat plants), which are in turn eaten by carnivores (animals that eat other animals). In this way animals receive energy to grow and reproduce.

- *Animals:* Most animals can be defined as living things that rely on other organisms for nourishment, that can usually move on their own and that have a nervous system. Examples of animals are: mammals, birds, reptiles, amphibians, fish, and invertebrates (such as insects, spiders, and worms). Some microscopic living things are also classified as animals.

2. *Demonstrate knowledge that raw materials come from renewable and nonrenewable natural resources.*
   - Resources such as trees, fish, oxygen, and fresh water are generally considered to be renewable resources as they can be continually reproduced. Fresh water from the Earth's recycling process, fresh air from the oxygen produced by plants and trees, and trees and fish which can reproduce themselves.

   - Renewable natural resources have limits and human activities can an impact on the sustainability of renewable resources. (Habitat destruction, over hunting, environmental problems, pesticide/herbicide use)
   - Nonrenewable natural resources such as minerals and fossils may be replenished over time by natural processes but the time span is enormously long (coal, oil).
   - Gasoline, synthetic clothing, and plastics are examples of products produced from nonrenewable resources.

3. *Describe a product's transformation process from production to consumption and explain the process's potential impacts on Earth.*
   - Process

4. *Describe the role of local and state conservation professionals in managing natural resources. Monroe County Conservation District- Conservation districts provide the departments of Environmental Protection (DEP), Agriculture (PDA) and Conservation and Natural Resources (DCNR) a way to implement a wide variety of environmental programs, including educational programs that best serve the agricultural, suburban and urban interests of their counties.*
   - Pennsylvania Department of Environmental Protection-The EPA has a mission to protect Pennsylvania's air, land and water from pollution and provide for the health and safety of

its citizens through a cleaner environment.

- The Pennsylvania Department of Agriculture encourages, protects and promotes agriculture and related industries throughout the commonwealth. Pennsylvania is a significant exporter of food, agricultural, and forest products, exporting over $1.5 billion annually.

- The Pennsylvania Department of Conservation and Natural Resources is charged with maintaining and preserving the 117 state parks; managing the 2.1 million acres of state forest land; providing information on the state's ecological and geologic resources; and establishing community conservation partnerships with grants and technical assistance to benefit rivers, trails, greenways, local parks and recreation, regional heritage parks, open space and natural areas.
- The Game Commission has managed the Commonwealth's wildlife resources for all Pennsylvanians. The Commission is responsible for managing all of Pennsylvania's wild birds and mammals.

5. *Analyze resource-use options in everyday activities, and determine how personal choices have costs and benefits related to the generation of waste.*
   - Each year, people in the United States produce hundreds of millions of tons of solid waste, including paper, plastics, and metals.
   - By recycling and by using smaller amounts of resources, people can help make sure that important resources will be there for people to use in the future.

6. *Analyze how renewable and nonrenewable resources are used and managed within the home, school, and community.*
   - There are three main ways to conserve resources: reduce, reuse and recycle. People call these the three R's of conservation.

7. *Local, state, and federal laws are designed and implemented to protect renewable resources.*
   - Local zoning regulations mandate land development standards.
   - State laws protect our area watersheds.
   - Hunting and fishing in Pennsylvania is regulated to promote a healthy and balanced ecosystem.
   - The Clean Air Act, Clean Water Act, Recycling and Waste Reduction Act are examples of federal environmental law and regulations.
   - Incentives such as tax credits are used to encourage conservation of natural resources. For example: the purchase of a hybrid car, home insulation and energy efficient windows/doors, qualifies buyer to an income tax credit. Dedicating land for open space (non-development) can result in lower property taxes.

SUGGESTED ACTIVITIES:

Students will:

1. Create a "Seven Wonders of the World" booklet, each page containing a natural resource picture and a description of how it can be useful or important to the ecosystem.
2. Place students in groups and assign one natural resource to each group. Students should prepare a persuasive paragraph explaining why their resource is the most important.
3. Summarize relationships between natural resources.
4. Summarize the effects of natural resources on humans.
5. Research and present information on local,

ASSESSMENTS:

- ✧ Text review questions
- ✧ Text review worksheets
- ✧ Homework assignments
- ✧ Observation checklist
- ✧ Interviews and dialogue
- ✧ Learning logs or notebooks
- ✧ Teacher-made tests and quizzes
- ✧ Products and projects
- ✧ Performance tasks
- ✧ Portfolios

REMEDIATION:

- ✧ Peer support
- ✧ Cooperative learning
- ✧ Individualized instruction

state and federal agencies responsible for managing natural resources.

6. Ask students to bring in examples of products that have been recycled. Set the products on a table and have students list other products that could be made with the recycled materials. (See Closing the Loop Activity Sheet)
7. Review one lunch period's garbage content by emptying a garbage container onto a plastic table cloth. Sort trash that is biodegradable, reusable, and recyclable and draw conclusions to the daily waste in the school community.
8. Develop and implement a strategy to promote the reuse, reduce, recycle message to schoolmates.
9. Write a brief report on an environmental law or regulation designed to protect natural resources.

RESOURCES:

Pennsylvania Department of Education- Division of Curriculum and Instruction "Conserving for the Future" Renewable and Nonrenewable Standards Based Activity Guide (Standards 5-7)

Reducing, Reusing, and Recycling Environmental Concerns: Teacher's Guide

Local Agencies:
Monroe County Conservation District
http://mcconservation.org/
Monroe County Soil and Water Conservation District
http://www.monroecountyswcd.org/

State Agencies
Pa Department of Environmental Protection
http://www.depweb.state.pa.us
Pa Game Commission
http://www.pgc.state.pa.us/
Pa Department of Agriculture
http://www.agriculture.state.pa.us/
Pa Department of Conservation and Natural Resources
http://www.dcnr.state.pa.us/
Pa Fish and Boat Commission
http://www.fish.state.pa.us/mpag1.htm

Federal Agencies
Government made Easy- Listing of Federal Environment, Energy and Agriculture websites
http://www.usa.gov/Citizen/Topics/Environment_Agriculture.shtml

- ✧ Small group instruction
- ✧ Computer generated visuals and simulations

ENRICHMENT:

- ✧ Research paper
- ✧ Class presentation of research
- ✧ WebQuest activities
- ✧ Interview local conservation officials to discuss changes in environment due to increased growth/population.

United Streaming Video
http://www.unitedstreaming.com/search/assetDetail.cfm?guidAssetID=02367DDD-177F-4B41-9AAB-00F2F28ACEDD

Taking Care of Our Earth
Description:
Students learn to care about their environment with the help of four animated characters as they take a tour of a landfill. Natural resources are identified and shown as students learn how important it is to conserve them. They also discover how reducing, reusing, and recycling benefit our environment, and how air and water pollution can hurt it.

http://www.unitedstreaming.com/search/assetDetail.cfm?guidAssetID=427F2D1C-A09D-4D8D-858C-9D62514D3D3F
Reducing, Reusing, and Recycling: Environmental Concerns
Description:
Solid waste is almost anything a person throws away, including trash and garbage. This program will focus on the problems created by solid waste and offer ways to help alleviate these problems. Students will be made aware of the fact that natural resources are often the base for products that become solid waste and that many such resources are non-renewable, such as the aluminum in a soda can. Even renewable resources, such as trees that are cut down to make paper, are being depleted at a faster rate than we can renew them. Pollution problems like toxic substances get into the surrounding soil when garbage is disposed of in dumps. Landfill sites are filling up and new sites are difficult to find. Improper disposal of waste affects our land, water and air. It is past time to Reduce, Reuse and Recycle. Students in this video will demonstrate the "Three Rs" approach and we will see that we are, indeed, responsible for our environment and for the future of our planet.

COURSE: Science	GRADE(S): 5th Grade

UNIT: Biology/Unit 1: Structure, Function and Classification of Organisms

NATIONAL STANDARDS:

SCIENCE THEMES: Systems and interactions, models, patterns of change, change over time, energy

PROCESS SKILLS: Observing, classifying, measuring, analyzing and interpreting data, formulating hypotheses, predicting, experimenting/testing, variable recognition and control.

STATE STANDARDS:

3.2.7.A Explain and apply scientific and technological knowledge.
- Distinguish between a scientific theory and a belief.
- Answer "What if" questions based on observation, inference or prior knowledge or experience.
- Explain how skepticism about an accepted scientific explanation led to a new understanding.
- Explain how new information may change existing theories and practice.

3.2.7.B Apply process knowledge to make and interpret observations.
- Measure materials using a variety of scales.
- Describe relationships by making inferences and predictions.
- Communicate, use space / time relationships, define operationally, raise questions, formulate hypotheses, test and experiment,
- Design controlled experiments, recognize variables, and manipulate variables.
- Interpret data, formulate models, design models, and produce solutions.

3.3.7.A Describe the similarities and differences that characterize diverse living things.
- Describe how the structures of living things help them function in unique ways.
- Explain how to use a dichotomous key to identify plants and animals.
- Account for adaptations among organisms that live in a particular environment.

3.3.7.B Describe the cell as the basic structural and functional unit of living things.
- Identify the levels of organization from cell to organism.
- Compare life processes at the organism level with life processes at the cell level.
- Explain that cells and organisms have particular structures that underlie their functions.
- Describe and distinguish among cell cycles, reproductive cycles and life cycles.
- Explain disease effects on structures or functions of an organism.

3.3.7.D Explain basic concepts of natural selection.
- Identify adaptations that allow organisms to survive in their environment.
- Describe how an environmental change can affect the survival of organisms and entire species.
- Know that differences in individuals of the same species may give some advantage in surviving and reproducing.
- Recognize that populations of organisms can increase rapidly.
- Describe the role that fossils play in studying the past.
- Explain how biologic extinction is a natural process.

ASSESSMENT ANCHORS:

S8.A.1 Reasoning and Analysis:

S8.A.1.1 Explain, interpret and apply scientific, environmental or technological knowledge presented in a variety of formats (e.g. visuals, scenarios, graphs).

S8.A.1.3 Identify evidence that certain variables may have caused measurable changes in natural or human-made systems.

S8.A.2 Processes, Procedures and Tools of Scientific Investigations:

S8.A.2.1 Apply knowledge of scientific investigation or technological design in different contexts

to make inferences to solve problems.

S8.A.2.2 Apply appropriate instruments for a specific purpose and describe the information the instrument can provide.

S8.A.3 Systems, Models and Patterns:

S8.A.3.1 Explain the parts of a simple system, their roles, and their relationships to the system as a whole.

S8.A.3.2 Apply knowledge of models to make predictions, draw inferences, or explain technological concepts.

S8.A.3.2 Apply knowledge of models to make predictions, draw references, or explain technological concepts.

S8.A.3.3 Describe repeated processes or recurring elements in scientific and technological patterns.

S8.B.1 Structure and Function of Organisms:

S8.B.1.1 Describe and compare structural and functional similarities and differences that characterize diverse living things.

S8.B.2 Continuity of Life:

S8.B.2.1 Explain the basic concepts of natural selection.

S8.B.2.2 Explain how a set of genetic instructions determines inherited traits of organisms.

ELIGIBLE CONTENT:

S8.A.1.1.1 Distinguish between a scientific theory and an opinion, explaining how a theory is supported with evidence, or how new data/information may change existing theories and practice.

S8.A.1.1.2 Explain how certain questions can be answered through scientific inquiry and/or technological design.

S8.A.1.1.3 Use evidence, such as, observations or experimental results to support inferences about a relationship.

S8.A.1.1.4 Develop descriptions, explanations, predictions, and models using evidence.

S8.A.2.1.1 Use evidence, observations, or a variety of scales (e.g., time, mass, distance, volume, temperature) to describe relationships.

S8.A.2.1.2 Use space/time relationships, define concepts operationally, raise testable questions, or formulate hypotheses.

S8.A.2.1.3 Design a controlled experiment by specifying how the independent variables will be manipulated, how the dependent variable will be measured, and which variables will be held constant.

S8.A.2.1.4 Interpret data/observations; develop relationships among variables based on data/observations to design models as solutions.

S8.A.2.1.5 Use evidence from investigations to clearly communicate and support conclusions.

S8.A.2.1.6 Identify a design flaw in a simple technological system and devise possible solutions.

S8.A.2.2.1 Describe the appropriate use of instruments and scales to accurately measure time, mass, distance, volume, or temperature safely under a variety of conditions.

S8.A.2.2.2 Apply appropriate measurement systems (e.g., time, mass, distance, volume, temperature) to record and interpret observations under varying conditions.

S8.A.2.2.3 Describe ways technology extends and enhances human abilities for specific purposes (e.g., microscope, telescope, micrometer, hydraulics, barometer).

S8.A.3.1.1 Describe a system (e.g., watershed, circulatory system, heating system, agricultural system) as a group of related parts with specific roles that works together to achieve an observed result.

S8.A.3.1.2 Explain the concept of order in a system (e.g., first to last-manufacturing steps; trophic levels; simple to complex-cell, tissue, organ, organ system).

S8.A.3.2.1 Describe how scientists use models to explore relationships in natural systems; such as, an ecosystem, river system, or the solar system.

S8.A.3.2.3 Given a model showing simple cause and effect relationships in a natural system, predict results that can be used to test the assumptions in the model. (e.g., photosynthesis, water cycle, diffusion, infiltration.

S8.A.3.2.2 Describe how engineers use models to develop new and improved technologies to solve problems.

S8.A.3.3.2 Describe repeating structure patterns in nature (e.g., veins in a leaf, tree rings, crystals, water waves) or periodic patterns (e.g., daily, monthly, annually).
S8.B.1.1.1 Describe the structures of living things that help them function affectively in specific ways (e.g., adaptations and characteristics).
S8.B.1.1.2 Compare similarities or differences in both internal structures (e.g., invertebrate/vertebrate, vascular/nonvascular, single-celled/multi-celled, and external structures (e.g., appendages, body segments, type of covering, size, shape) or organisms.
S8.B.1.1.3 Apply knowledge of characteristic structures to identify or categorize organisms (i.e., plants, animals, fungi, bacteria, and protista).
S8.B.1.1.4 Identify the levels of organization from cell to organism and describe how specific structures (parts), which underlie larger systems, enable the system to function as a whole.
S8.B.2.1.1 Explain how inherited structures or behaviors help organisms survive and reproduce in different environments.
S8.B.2.1.2 Explain how different adaptations in individuals of the same species may affect survivability or reproduction success.
S8.B.2.1.5 Explain that adaptations are developed over long periods of time and are passed from one generation to another.
S8.B.2.2.1 Identify and explain differences between inherited and acquired traits.

KEY CONCEPTS:

1. Inquiry, problem solving, critical thinking, measurement, communications, links to real world applications should be integrated throughout science instruction to develop an understanding of the key concepts and content. The use of technology as a tool for investigating, communicating and doing science must also be integrated throughout this instruction.
2. Living things are made of cells. Cells carry out all life processes. New cells come from existing cells. Cells are too small to be seen with the eye alone. Using a microscope many parts of a cell can be seen.
3. Though plant and animal cells are similar, they are also different in shape and in some of their parts. Plant cells tend to be rectangular. Animal cells tend to be spherical and at times irregular.
4. Organisms that share similar characteristics can be organized into groups in order to help understand similarities and differences.
5. Living things can be categorized into kingdoms: monerans, protists, fungi, plants, and animals.
6. Plants can be categorized as vascular (which have special tissues to transport food and water, such as, trees and flowering plants) and nonvascular (which do not have tissues to transport food and water such as moss). Most plants are vascular.
7. Animals can be categorized as vertebrates (with backbones) or invertebrates (without backbones).
8. Variations acted upon by natural selection change living things (adaptations).

UNIT OBJECTIVES:

1. *Compare and contrast types of cells: plant vs. animal.*
   - Cells are the basic unit of structure and function in living things.
   - Some common cell parts of plant and animal cells include the nucleus, mitochondria, cell membrane, vacuole, and cytoplasm.
   - Plant cells contain chloroplasts (to gather sunlight for photosynthesis) and a cell wall, cell parts not found in animal cells.
   - A cell's nucleus is its control center; its mitochondria are energy producers; the cytoplasm holds smaller parts in the cell; the vacuole provides storage; and the cell membrane holds the contents of the cell together and controls what passes into and out of the cell.

2. *Explain photosynthesis*
   - In photosynthesis plants use energy from sunlight to change carbon dioxide and water into glucose and oxygen.

3. *Classify plants according to vascular and nonvascular.*
   - Vascular plants have specialized tissues called xylem and phloem for transporting water and nutrients.
   - Nonvascular plants do not have vessels to transport water and nutrients.

4. *Animals can be classified as vertebrates or invertebrates.*
   - Almost all animals do not have backbones. Those that do are classified as vertebrates. There are five classes of vertebrates: fish, amphibians, reptiles, birds, and mammals.
   - Invertebrates are by far the most numerous animals on Earth. Invertebrates are animals that do not have backbones. Scientists have named more than a million species of invertebrates. Examples of invertebrates would include clams, earthworms, jellyfish, and moths.

5. *Recognize that organisms are classified based on their structure.*
   - Organisms that share similar characteristics can be organized into groups in order to help understand similarities and differences.

6. *Describe how living things can be categorized into kingdoms: monerans protists, fungi, plants, and animals.*
   - Monerans- Consists of two kingdoms, eubacteria and archaebacteria. Both live as single celled organisms.
   - Potists- Most protests are microscopic single cells organisms, but some have many cells. Some must find food, some make food.
   - Fungi kingdom- Most organisms in the fungi kingdom are multicellular and feed on decaying matter or living organisms.
   - Plant kingdom- Plants have many cells and make their own sugar for food.
   - Animal kingdom- Animals have many cells and get their food by eating other organisms.

7. *Explain how and why a dichotomous key would be used. A dichotomous key is an organized series of questions designed to lead to the identification of an unknown organism.*

SUGGESTED ACTIVITIES:

Students will:

1. Draw, label, and describe the essential structures and functions of plant and animal cells. (For plants include the nucleus, cell wall, cell membrane, vacuole, chloroplasts, and cytoplasm. For animals include the nucleus, cell membrane, vacuole, and cytoplasm.)
2. Design an investigation to make observations of cells.
3. Compare and contrast plant and animal cells, and identify their major parts and functions.
4. Compare and contrast the distinguishing characteristics of the kingdoms of organisms.
5. Apply knowledge of characteristic structures to identify or categorize organisms (i.e., plants, animals, fungi, bacteria, and protist).
6. Group organisms into categories using their characteristics: living things (kingdoms), plants (vascular and nonvascular plants), and animals (vertebrates or invertebrates). Name

ASSESSMENTS:

- ✧ Text review questions
- ✧ Text review worksheets
- ✧ Homework assignments
- ✧ Observation checklist
- ✧ Interviews and dialogue
- ✧ Learning logs or notebooks
- ✧ Teacher-made tests and quizzes
- ✧ Products and projects
- ✧ Performance tasks
- ✧ Portfolios

REMEDIATION:

- ✧ Peer support
- ✧ Cooperative learning
- ✧ Individualized instruction
- ✧ Small group instruction
- ✧ Computer generated visuals and simulations

ENRICHMENT:

- ✧ Research paper
- ✧ Class presentation of research

and describe two common examples of each group.

7. Use a dichotomous key to identify plants or animals.

RESOURCES:

- Natural Scope – National Wildlife Federation
- Animal Kingdom – McGraw Hill
- Harcourt Science Teacher Resources
- Houghton Mifflin Science Teacher Resources

INTERNET RESOURCES:

- www.biology4kids.com
- www.cellsalive.com
- www.captionedmedia.org/guides/10467.pdf (classification of living things)
- www.urbanext.uiuc.edu/gpe/ (The Great Plant Escape)
- www.enchantedlearning.com
- www.emints.org/ethemes/search.shtml
- http://www.pgc.state.pa.us/pgc/cwp/browse.asp?A=3
- http://jellieszone.com/
- http://www.ncforestry.org/docs/Trees/PartsOfTree/
- http://www.dcnr.state.pa.us/

Educational Videos through Unitedstreaming:
http://www.unitedstreaming.com/search/assetDetail.cfm?guidAssetID=902F8724-B78E-4E18-9D24-A5E6B4D743B4

Classification System Video

Description:

A routine castle tour turns enchanting when King Philip shows up to teach a lesson in classification. Using examples from his castle, mnemonics for memorizing the 7 levels of classification, microscopic footage, and animation, King Philip makes sense of difficult concepts. From simple examples to an exploration of each of the five kingdoms, this tour provides a concrete foundation for a complex subject.

- ✧ WebQuest activities
- ✧ Present a PowerPoint presentation of examples of organisms within the 5 kingdoms.

COURSE: Science	GRADE(S): 5th Grade
UNIT: Biology - Unit 2: Continuity of Life	

NATIONAL STANDARDS:

SCIENCE THEMES: Systems and interactions, models, patterns of change, change over time, energy.

PROCESS SKILLS: Observing, classifying, measuring, analyzing and interpreting data, formulating hypotheses, predicting, experimenting/testing. Variable recognition and control.

STATE STANDARDS:

3.4.7.D Know and use the technological design process to solve problems.

- Define different types of problems.
- Define all aspects of the problem, necessary information and questions that must be answered.
- Propose the best solution.
- Design and propose alternative methods to achieve solutions.
- Apply a solution.
- Explain the results, present improvements, identify and infer the impacts of the solution.

4.7.7.A Describe diversity of plants and animals in ecosystems.

- Select an ecosystem and describe different plants and animals that live there.
- Identify adaptations in plants and animals.
- Recognize that adaptations are developed over long periods of time and are passed on from one generation to the next.
- Understand levels of ecosystem organization (e.g., individuals, populations, and species).

4.7.7.B Explain how species of living organisms adapt to their environment.

- Explain the role of individual variations in natural selection.
- Explain how an adaptation is an inherited structure or behavior that helps an organism survive and reproduce.
- Describe how a particular trait may be selected over time and account for a species' adaptation.
- Compare and contrast animals and plants that have very specific survival requirements with those that have more general requirements for survival.
- Explain how living things respond to changes in their environment.
- Explain how one species may survive an environmental change while another might not.

ASSESSMENT ANCHORS:

S8.B.2 Continuity of Life:

S8.B.2.1 Explain the basic concepts of natural selection.

ELIGIBLE CONTENT:

S8.B.2.1.1 Explain how inherited structures or behaviors help organisms survive and reproduce in different environments.

S8.B.2.1.2 Explain how different adaptations in individuals of the same species may affect survivability or reproduction success.

S8.B.2.1.3 Explain that mutations can alter a gene and are the original source of new variations.

S8.B.2.1.4 Describe how selective breeding or biotechnology can change the genetic makeup of organisms.

S8.B.2.1.5 Explain that adaptations are developed over long periods of time and are passed from one generation to another.

KEY CONCEPTS:

1. Inquiry, problem solving, critical thinking, measurement, communications, links to real world applications should be integrated throughout science instruction to develop an understanding of the key concepts and content. The use of technology as a tool for investigating, communicating and doing science must also be integrated throughout this instruction.
2. Adaptations are structures, functions, or behaviors that enable a species to survive.
3. Natural selection is the survival and reproduction of the individuals in a population that exhibit the traits that best enable them to survive in their environment.

UNIT OBJECTIVES:

1. *Describe how characteristics are inherited while other traits are acquired.*
   - An inherited trait is a characteristic passed from parents to their offspring. (ex: eye or hair color, dimples, freckles, earlobe shape).
   - Behavior is the response of an organism to its surroundings.
   - Behavior may be inherited- passed from parent to offspring-or learned.
   - Instincts are behaviors that are inherited responses to stimuli and do not require learning. For example, a dog wagging its tail, cats purring, babies crying, swallowing food…
   - Learned behaviors are acquired completely as a result of experience. For example, a dog sitting on command, babies clapping, students reading.

2. *Explain how some species develop favorable traits call adaptations that help them to survive and reproduce in their environment.*
   - Any trait that helps and individual to survive in its environment is called adaptation. (ex: porcupine quills)
   - A favorable trait in one environment may not be favorable in another. (ex: polar bear fur in Florida)
   - Camouflage, warning coloration and mimicry are different forms of adaptations.

4. *Describe how selective breeding can change the genetic makeup of organisms.*
   - In selective breeding, humans choose plants and animals with desirable traits to reproduce.

5. *Describe how natural selection can change the genetic makeup of organisms.*
   - In natural selection, the organisms that are best adapted to their environments reproduce most successfully.

ACTIVITIES:

SUGGESTED ACTIVITIES:

1. Distinguish between learned and inherited traits.
2. Explain how traits can result from an organism's interaction with the environment.
3. Classify behaviors as inherited or learned.
4. Investigate a specific species and indicate its learned and inherited behaviors. Explain what adaptations help the organism to survive in its natural environment.
5. Explain the advantages of using selective

ASSESSMENTS:

- ✧ Text review questions
- ✧ Text review worksheets
- ✧ Homework assignments
- ✧ Observation checklist
- ✧ Interviews and dialogue
- ✧ Learning logs or notebooks
- ✧ Teacher-made tests and quizzes
- ✧ Products and projects
- ✧ Performance tasks
- ✧ Portfolios

REMEDIATION:

- ✧ Peer support
- ✧ Cooperative learning
- ✧ Individualized Instruction
- ✧ Small group instruction
- ✧ Computer generated visuals and simulations.

breeding in agriculture.

RESOURCES:

- Natural Scope – National Wildlife Federation
- Animal Kingdom – McGraw Hill
- Harcourt Science Teacher Resources
- Houghton Mifflin Science Teacher Resources
- Life Cycles: Teacher's Guide

INTERNET RESOURCES:

The Natural Selection of Plants and Animals

http://www.unitedstreaming.com/search/assetDetail.cfm?guidAssetID=8601EDA4-5636-4BA8-B0EB-AB930F7B7DA6

This program uses beautiful nature footage and graphics to illustrate the fascinating process of natural selection. It compares natural selection---where only the strong survive and reproduce---with the process animal breeders and farmers use to produce animals and plants with desired characteristics. In a section covering genetics, the program explains how living things get their characteristics from the gene material present in all living cells and that offspring get half of their genes from one parent and half from the other. It also looks at the role of mutation in evolution, explaining that a gene which is damaged or altered may result in offspring with characteristics significantly different from those of their predecessors. It points out that because some mutations prove to be an asset they can become prevalent, even predominant in subsequent generations. © 1993 AIMS Multimedia

TLC: Elementary School: Life Cycles

http://www.unitedstreaming.com/search/assetDetail.cfm?guidAssetID=74AE57B9-C6B7-495F-A6DB-A2ED3829BDB7

Description:
Humans, animals, and plants reproduce so their species will survive. Segments cover types of reproduction, inherited and learned characteristics, and the role of cells.

- *Life Cycles:* Explains the difference between sexual and asexual reproduction.
- *Heredity*: Discusses how genes and mutations are passed to offspring during the reproduction process.
- *Behavior:* Focuses on traits that are learned as organisms make adaptations in order to survive.

ENRICHMENT:

- ✧ Research Paper
- ✧ Class Presentation of Research
- ✧ WebQuest Activities
- ✧ Prepare a report on the medical advances due to DNA technology.

• Cell Structure: Explores the biology and function of the building blocks of life. ➤ Life Cycles (6 min.) ➤ Heredity (5 min.) ➤ Behavior (6 min.) ➤ Cell Structure (6 min.) © 2004 Discovery Channel School http://www.usda.gov/wps/portal/!ut/p/_s.7_0_A/7_0_1OB?navtype=SU&navid=EDUCATION_OUTREACH This is the Department of Agriculture website. Many student activities have been designed to highlight the importance of planning for America's agricultural needs.	

COURSE: Science	GRADE(S): 5th Grade
UNIT: Earth and Space Science - Unit 1: Composition and Structure of the Universe	

NATIONAL STANDARDS:

SCIENCE THEMES: Systems and interactions, models, patterns of change, stability (constancy), energy, scale, change over time

PROCESS SKILLS: Observing, classifying, measuring, analyzing and interpreting data, formulating hypotheses, predicting, experimenting/testing

STATE STANDARDS:

3.4.7.D Describe essential ideas about the composition and structure of the universe and the earth's place in it.

- Compare various planets' characteristics.
- Describe basic star types and identify the sun as a star type.
- Describe and differentiate comets, asteroids and meteors.
- Identify gravity as the force that keeps planets in orbit around the sun and governs the rest of the movement of the solar system and the universe.
- Illustrate how the positions of stars and constellations change in relation to the Earth during an evening and from month to month.
- Identify equipment and instruments that explore the universe.
- Identify the accomplishments and contributions provided by selected past and present scientists in the field of astronomy.
- Identify and articulate space program efforts to investigate possibilities of living in space and on other planets.

3.5.7A Describe earth features and processes.

- Describe major layers of the earth.
- Describe the processes involved in the creation of geologic features (e.g., folding, faulting, volcanism, sedimentation) and that these processes seen today (e.g., erosion, weathering crustal plate movement) are similar to those in the past.
- Describe the processes that formed Pennsylvania geologic structures and resources including mountains, glacial formations, water gaps and ridges.
- Explain how the rock cycle affected rock formations in the state of Pennsylvania.
- Distinguish between examples of rapid surface changes (e.g., landslides, earthquakes) and slow surface changes (e.g., weathering).
- Identify living plants and animals that are similar to fossil forms.

3.5.7B Recognize earth resources and how they affect everyday life.

- Identify and locate significant earth resources (e.g., rock types, oil, gas, coal deposits) in Pennsylvania.
- Explain the processes involved in the formation of oil and coal in Pennsylvania.
- Explain the value and uses of different earth resources (e.g., selected minerals, ores, fuel sources, agricultural uses).
- Compare the locations of human settlements as related to available resources.

ASSESSMENT ANCHORS:

S8.A.1 Reasoning and Analysis:

S8.A.1.3 Identify evidence that certain variables may have caused measurable changes in natural or human-made systems.

S8.A.2 Processes, Procedures and Tools of Scientific Investigations.

S8.A.2.2 Apply appropriate instruments for a specific purpose and describe the

information the instrument can provide.

S8A.3 Systems, Models and Patterns

S8.A.3.2 Apply knowledge of models to make predictions, and draw inferences, or explain technological concepts.

S8.D.1 Earth Features and Processes that Change Earth and Its Resources.

S8.D.1.1 Describe constructive and destructive natural processes that form different geologic structures and resources.

S8.D.3 Composition and Structure of the Universe

S8.D.3.1 Explain the relationships between and among the objects of our solar system.

ELIGIBLE CONTENT:

S8.A.2.2.3 Describe ways technology extends and enhances human abilities for specific purposes (e.g., microscope, telescope, micrometer, hydraulics, and barometer).

S8.A.3.2.1 Describe how scientists use models to explore relationships in natural systems (such as, an ecosystem, river system, or the soar system).

S8.D.1.1.1 Explain the rock cycle as changes in the solid earth and rock types found in Pennsylvania (igneous-granite, basalt, obsidian, pumice; sedimentary-limestone, sandstone, shale, coal; and metamorphic-slate, quartzite, marble, gneiss).

S8.D.1.1.2 Compare and contrast (geological processes, length of time over which change occurs, factors affecting the rate of change) different types of changes in Earth's surface (e.g., landslides, volcanic eruptions, earthquakes, mountain building, new land being formed, weathering, erosion, sedimentation, soil formation).

S8.D.1.1.3 Identify soil types. (i.e., humus, topsoil, subsoil, loam, loess, and parent material) and their characteristics (particle size, porosity, permeability) found in different biomes and in PA, and explain how they formed.

S8.D.1.1.4 Explain how fossils provide evidence about plants and animals that lived long ago throughout Pennsylvania's history (e.g., fossils provide evidence of different environments).

S8.D.3.1.1 Describe patterns of Earth's movements (i.e., rotation, revolution) in relation to the moon and sun (i.e., phases, eclipses, and tides).

S8.D.3.1.2 Describe the role of gravity as the force that governs the movement of the solar system and universe.

S8.D.3.1.3 Compare and contrast characteristics of celestial bodies found in the solar system (e.g., planets, moons, asteroids, comets, meteors, meteoroids, meteorites, inner and outer planets).

KEY CONCEPTS:

1. Understanding the composition, structure, and formation of the universe allows us to comprehend our place in it.
2. The solar system consists of the sun, moon, Earth, other planets and their moons, meteors, asteroids, and comets.
3. Each body has its own characteristics and features.
4. The distance between planets and sizes of the planets varies greatly. The outer, "gas" planets are very large, and the four inner planets are comparatively small and rocky.
5. Gravity is a force that keeps the planets in motion around the sun. Gravity acts everywhere in the universe.
6. Planets revolve around the sun, and moons revolve around planets. A planet rotates upon an axis.
7. As the Earth rotates, different sides of the Earth face toward or away from the sun, thus causing day and night, respectively.
8. The phases of the moon are caused by its position relative to the Earth and sun.
9. The Earth is a rocky planet, extensively covered with large oceans of liquid water, and having frozen ice caps in its polar regions. The Earth has a protective atmosphere consisting predominantly of nitrogen and oxygen and has a magnetic field. The atmosphere and the magnetic field help shield the Earth's surface from harmful solar radiation. Scientific evidence

indicates that the Earth is about 4.5 billion years old.

10. Seasons are caused by the tilt of the Earth on its axis, and thus, the angle at which sunlight strikes the surface of the Earth during its annual revolution around the sun.
11. Tides are the result of the gravitational pull of the moon and sun on the surface waters of the Earth.

UNIT OBJECTIVES:

Students will:

1. *Describe the eight planets and their relative position from the sun.*
   - The four planets closest to the Sun - Mercury, Venus, Earth, and Mars - are called the terrestrial planets because they have solid rocky surfaces. The four large planets beyond the orbit of Mars - Jupiter, Saturn, Uranus, and Neptune - are called gas giants.
   - Mercury: Scientists think that Mercury's core is ¾ iron. Mercury has almost no atmosphere. Its surface temperature changes from a low of about -170˚C to a high of about 430˚C.
   - Venus: Is the closet planet to Earth. Venus has a thick cloudy atmosphere made of poisonous gases.
   - Mars: Mars has a very thin atmosphere made mostly of carbon dioxide. Mars has polar ice caps of "dry ice" – solid carbon dioxide- and frozen water. Iron in its soil gives Mars' surface a reddish-orange color.
   - The Gas Giants- Jupiter, Saturn, Uranus, and Neptune are called the gas giants because they are mostly made of hydrogen, helium, and other gases. These planets have many moons and rings.

2. *Recognize that the solar system consists of the sun, moon, Earth, other planets and their moons, meteors, asteroids, and comets.*
   - A comet is a frozen mass of various types of ice and dust that orbits the Sun in large elliptical paths. Comets have a nucleus, a coma (a giant cloud of dust and evaporated gases surrounding the nucleus), and two tails.
   - An asteroid is a large rocky mass that typically orbits the Sun between Mars and Jupiter in the asteroid belt.
   - A meteoroid is a small asteroid that is boulder-sized or smaller.
   - A meteor is a meteoroid that hits Earth's atmosphere and burns up before hitting Earth's surface.
   - A meteorite is a meteor that hits Earth.

3. *Explain the role of gravity in the solar system.*
   - Gravity keeps the Earth and other planets in orbits around the Sun. Gravity also keep the Moon orbiting around the Sun.

4. *Compare and contrast revolution and rotation and apply these terms to the relative movements of planets and moons their moons.*
   - Revolution is the motion of an object in space around another object.
   - Rotation is the spinning of a planet or object on its axis.

5. *Model and describe how day and night and the phases of the moon occur.*
   - Day and night are caused by the rotation of the Earth on its axis. This rotation helps keep temperatures mild.
   - Moon phases are the shapes of the lit side of the Moon that can be seen from Earth. The cycle of phases is due to the movements of the Moon and The Earth.
   - The Moon reflects light from the Sun. From Earth, different portions of the lighted side of the moon are seen, depending on how the Sun, Earth and Moon are positioned, thus causing the Moon's phases.

6. *Model and describe how the Earth's axial tilt and its annual orbit around the sun cause the seasons.*
   - Earth always tilts the same way during its year-long orbit.
   - The Earth's tilt also causes light from the Sun to hit different parts of the Earth at different angles. These rays transfer energy to Earth.
   - The amount of energy received by an area creates its climate and seasons.

7. *Describe the unique characteristics of planet Earth.*
   - The Earth is a rocky planet, extensively covered with large oceans of liquid water, and having frozen ice caps in its polar regions.
   - The Earth has a protective atmosphere consisting predominantly of nitrogen and oxygen and has a magnetic field.
   - The atmosphere and the magnetic field help shield the Earth's surface from harmful solar radiation.
   - Scientific evidence indicates that the Earth is about 4.5 billion years old.

8. *Tides are the result of the gravitational pull of the moon and sun on the surface waters of the Earth.*
   - The Moon is the main cause of tides on Earth.
   - The Moon's gravity causes the Earth's land, water and atmosphere to bulge slightly toward the Moon, but because water moves more easily than solid land, the bulge is most noticeable in bodies of water.
   - The Sun's gravity also affects the tides, but its effect is much smaller than the Moon's.

SUGGESTED ACTIVITIES:

1. Design and interpret a scale model of the solar system. (A scale model may be a physical representation of an object or concept. It can also be a mathematical representation that uses factors such as ratios, proportions, and percentages.)
2. Have students choose a planet and create an acrostic poem about it. For example, E is for Earth, third planet from the Sun. A is for atmosphere, this layer of air contains oxygen, etc.
3. Students can model revolution and rotation by having one student act as the Earth and another is the Sun. The Sun stands still and the Earth moves in an elliptical path around the Sun. (Revolution) Then have the student who is Earth spin as he/she moves around the Sun. (Rotation)
4. Create a Four Seasons Booklet where students can write or draw information about each season.
5. Demonstrate the difference between asteroid and comets with following activity. Form a snowball using snow or shaved/crushed ice. Have a volunteer press dirt, sand and dust into the snowball. Explain that this represents the nucleus of a comet. Have another volunteer hold an irregularly shaped rock near the dirty snowball and ask

ASSESSMENTS:

- ✧ Text Review questions
- ✧ Text Review worksheets
- ✧ Homework assignments
- ✧ Observation checklist
- ✧ Interviews and dialogue
- ✧ Learning Logs or notebooks
- ✧ Teacher-made tests and quizzes
- ✧ Products and projects
- ✧ Performance tasks
- ✧ Portfolios

REMEDIATION:

- ✧Peer support
- ✧Cooperative Learning
- ✧Individualized Instruction
- ✧Small Group Instruction
- ✧Computer Generated Visuals and Simulations.

ENRICHMENT:

- ✧ Research paper
- ✧ Class presentation of research
- ✧ WebQuest activities
- ✧ Present information on how Pluto's classification was changed from a planet to a "dwarf planet".

students to compare. The rock represents an asteroid.
6. Complete concept webs to organize ideas about the Earth and the solar system.
7. Provide students with two foam balls (Earth and Moon) and flashlight (Sun) and have them model phases of the Moon, Daylight, and Seasons.
8. Create a flip booklet detailing Earth's unique characteristics.

RESOURCES:

- Harcourt Teacher Resources
- Houghton Mifflin Teacher Resources
- Earth Science: Solar System Teacher's Guide

INTERNET RESOURCES:

- http://kids.nineplanets.org/intro.htm
- http://www.enchantedlearning.com/subjects/astronomy/
- http://school.discovery.com

Educational Videos through Unitedstreaming:
http://www.unitedstreaming.com/search/assetDetail.cfm?guidAssetID=D7B6623B-0A42-4D6A-BF52-10853D015A8B

EARTH SCIENCE: SOLAR SYSTEM
Description:
Welcome to the star and nine planets of our neighborhood, the solar system. Formed 4.5 billion years ago, it was made from dust and gas remnants of the big bang. Just one of billions of stars in our galaxy, the sun's gravitational pull holds the planets, comets, meteors, and asteroids in orbit. This "ordinary" star produces the heat and light that make life on Earth possible. The sun will live a life of about 10 billion years before expanding and then contracting to become a white dwarf. Larger stars' life cycles are more dramatic. They may go supernova and even form black holes, vast expanses where gravity is so strong that not even light can escape.

COURSE: Science	GRADE(S): 5th Grade
UNIT: Earth and Space Science - Unit 2: Earth Features and Processes	

NATIONAL STANDARDS:

SCIENCE THEMES: Systems and interactions, models, patterns of change, stability (constancy), energy, scale, change over time

PROCESS SKILLS: Observing, classifying, measuring, analyzing and interpreting data, formulating hypotheses, predicting, experimenting/testing

STATE STANDARDS:

3.4.7.D Describe essential ideas about the composition and structure of the universe and the Earth's place in it.

- Compare various planets' characteristics.
- Describe basic star types and identify the sun as a star type.
- Describe and differentiate comets, asteroids and meteors.
- Identify gravity as the force that keeps planets in orbit around the sun and governs the rest of the movement of the solar system and the universe.
- Illustrate how the positions of stars and constellations change in relation to the Earth during an evening and from month to month.
- Identify equipment and instruments that explore the universe.
- Identify the accomplishments and contributions provided by selected past and present scientists in the field of astronomy.
- Identify and articulate space program efforts to investigate possibilities of living in space and on other planets.

3.5.7.A Describe Earth features and processes.

- Describe major layers of the Earth.
- Describe the processes involved in the creation of geologic features (e.g., folding, faulting, volcanism, sedimentation) and that these processes seen today (e.g., erosion, weathering crustal plate movement) are similar to those in the past.
- Describe the processes that formed Pennsylvania geologic structures and resources including mountains, glacial formations, water gaps and ridges.
- Explain how the rock cycle affected rock formations in the state of Pennsylvania.
- Distinguish between examples of rapid surface changes (e.g., landslides, earthquakes) and slow surface changes.
- Identify living plants and animals that are similar to fossil forms.

3.5.7.B Recognize Earth resources and how they affect everyday life.

- Identify and locate significant earth resources (e.g., rock types, oil, gas, coal deposits) in Pennsylvania.
- Explain the processes involved in the formation of oil and coal in Pennsylvania.
- Explain the value and uses of different Earth resources (e.g., selected minerals, ores, fuel sources, and agricultural uses).
- Compare the locations of human settlements as related to available resources.

ASSESSMENT ANCHORS:

S8.A.1 Reasoning and Analysis

S8.A.1.3 Identify evidence that certain variables may have caused measurable changes in natural or human-made systems.

S8.A.2 Processes, Procedures and Tools of Scientific Investigations

S8.A.2.2 Apply appropriate instruments for a specific purpose and describe the information

the instrument can provide.

S8.A.3 Systems, Models and Patterns

S8.A.3.2 Apply knowledge of models to make predictions; draw inferences, or explain technological concepts.

S8.D.1 Earth Features and Processes that Change Earth and Its Resources

S8.D.1.1 Describe constructive and destructive natural processes that form different geologic structures and resources.

S8.D.3.1 Explain the relationships between and among the objects of our solar system.

ELIGIBLE CONTENT:

S8.A.2.2.3 Describe ways technology extends and enhances human abilities for specific purposes (e.g., microscope, telescope, micrometer, hydraulics and barometer).

S8.A.3.2.1 Describe how scientists use models to explore relationships in natural systems (such as, an ecosystem, river system, or the solar system).

S8.D.1.1.1 Explain the rock cycle as changes in the solid earth and rock types found in Pennsylvania (igneous-granite; basalt, obsidian, pumice; sedimentary-limestone, sandstone, shale, coal; and metamorphic-slate, quartzite, marble, and gneiss).

S8.D.1.1.2 Compare and contrast (geological processes, length of time over which change occurs, factors affecting the rate of change) different types of changes in Earth's surface (e.g., landslides, volcanic eruptions, earthquakes, mountain building, new land being formed, weathering, erosion, sedimentation, soil formation).

S8.D.1.1.3 Identify soil types, (i.e., humus, topsoil, subsoil, loam, loess, and parent material) and their characteristics (particle size, porosity, and permeability) found in different biomes and in PA, and explain how they formed.

S8.D.1.1.4 Explain how fossils provide evidence about plants and animals that lived long ago throughout Pennsylvania's history (e.g., fossils provide evidence of different environments).

S8.D.3.1.1 Describe patterns of Earth's movements (i.e., rotation, revolution) in relation to the moon and sun (i.e., phases, eclipses, and tides).

S8.D.3.1.2 Describe the role of gravity as the force that governs the movement of the solar system and universe.

S8.D.3.1.3 Compare and contrast characteristics of celestial bodies found in the solar system (e.g., planets, moons, asteroids, comets, meteors, meteoroids, meteorites, inner and outer planets).

KEY CONCEPTS:

1. Rocks move and change over time due to heat and pressure within the Earth and **weathering** and **erosion** at the surface. These and other processes constantly change rock from one type to another.
2. Rocks have properties that can be observed, tested, and described. Composition, grain size and textural features, color, and the presence of fossils help with identification. Classification keys can aid this process.
3. Depending on how rocks are formed, they are classified as sedimentary, igneous, or metamorphic.
4. Scientific evidence indicates the Earth is very ancient (approximately 4.6 billion years old). The age of many rocks can be determined very reliably. Fossils provide information about life and conditions of the past.
5. Scientific evidence indicates that the Earth is composed of four concentric layers (crust, mantle, inner core, and outer core), each with its own distinct characteristics. The outer two layers are composed primarily of rocky material. The innermost layers are composed mostly of iron and nickel. Pressure and temperature increase with depth beneath the surface.
6. The Earth's heat energy causes movement of material within the Earth. Large continent-sized blocks, (plates) move slowly about the Earth's surface, driven by that heat.
7. Most earthquakes and volcanoes are located at the boundary of the plates (faults). Plates can move together (convergent boundaries), apart (divergent boundaries), or slip past each other

horizontally (sliding boundaries, also called strike-slip or transform boundaries).

8. Geological features in the oceans (including trenches and mid-ocean ridges) and on the continents (mountain ranges, including the Appalachian Mountains) are caused by current and past plate movements.
9. Rocks and other materials on the Earth's surface are constantly being broken down both chemically and physically (mechanically). The products of weathering include clay, sand, rock fragments, and soluble substances. Weathered rock material can be moved by water and wind and deposited as sediment.
10. Mechanical and chemical weathering contributes to the formation of soil. The layers of soil consist of topsoil, subsoil, and bedrock.
11. Humans have varying degrees of impact on the Earth's surface through their everyday activities. With careful planning, the impact on the land can be controlled.

UNIT OBJECTIVES:

Students will:

1. *Draw and label the rock cycle and describe the major processes and rock types involved.*
   - Rocks are constantly being formed and destroyed
   - The rock cycle which involves weathering, melting, cooling, heat and pressure is not a one-way chain of events.
   - Rocks can change from one kind to another in any order, or stay the same for millions of years.

2. *Compare and contrast the origin of igneous, sedimentary, and metamorphic rocks.*
   - **Sedimentary** rocks form when layers of sediment settle on top of each other and then harden. Examples of sedimentary rocks found in Pennsylvania include limestone, sandstone, shale, and coal.
   - **Igneous** rocks are formed when melted rock cools and hardens. Examples of igneous rocks found in Pennsylvania include granite, basalt, obsidian and pumice.
   - **Metamorphic** rock is pressurized and heated to very high temperatures changing the properties of the rock. Examples of metamorphic rock found in Pennsylvania include slate, quartzite, marble and gneiss.

3. *Make plausible inferences about changes in the Earth over time based on fossil evidence. This includes the presence of fossils of organisms in sedimentary rocks of Pennsylvania.*
   - Fossils provide direct evidence of the types of plants and animals that have lived on earth.
   - Fossils demonstrate how these organisms evolved and changed through time.

4. *Describe the structure of Earth in terms of its major layers and how the Earth's interior affects the surface.*
   - Earth's layers are the crust, mantle, outer core and inner core.
   - Crust- thin, nearly solid rock layer that is uppermost in Earth's structure.
   - Mantle-thick layer of Earth's structure just below Earth's crust.
   - Inner core- thought to be solid metal
   - Outer core-thought to be liquid metal
   - The crust and upper mantle make up the lithosphere which is composed of sections called plates that shift in relation to one another.
5. *Differentiate among the three types of plate tectonic boundaries (divergent, convergent, and sliding boundaries) and how these relate to the changing surface of the Earth and the ocean floor.*
   - Converging boundaries: Two plates move toward each other. One plate may move under the other.
   - Diverging boundaries: Two plates move away from each other. Molten rock rises to fill the gap, creating new crust.
   - Sliding boundaries: Two plates slide past each other, moving in opposite directions.

6. *Compare and contrast the origin of earthquakes and volcanoes and how they affect the Earth's surface.*
   - Earthquakes most often occur at faults along plate boundaries. Faults are cracks in Earth's crust where the surrounding rock has moved or shifted.
   - The epicenter is the position on Earth's surface above an earthquake's origin.
   - Earthquakes can cause landslides on land and tsunamis under the ocean.
   - Most volcanoes form near colliding plate boundaries. As the plates move, rock partially melts and forms magma, which is forced to the surface through a weak spot in the crust.
   - When a volcano builds from the ocean floor and reaches the water's surface, a volcanic island forms.

7. *Differentiate between chemical and mechanical weathering and erosion.*
   - Weathering is a slow process that reduces rocks into smaller pieces of rock.
   - Mechanical weathering is the breaking of larger rocks into smaller pieces of rock called sediment due to gravity, ice, plant roots, or other forces.
   - Chemical weathering changes the composition of a rock through a chemical process.
   - Erosion is the movement of materials away from one place. Deposition is the placing of materials in a new place.
   - Mechanical and chemical weathering both contribute to the formation of soil.

8. *Identify soil types (topsoil, subsoil, and bedrock) and their characteristics.*
   - Topsoil is the top layer of soil. It has large amount of decayed material from plants, animals, bacteria, and other organisms. All these decayed materials make this soil very fertile.
   - Subsoil is the second layer of soil is called subsoil. It is often a different color than minerals but less decayed matter than the topsoil.
   - Bedrock is nearly solid rock that lies under the surface. It is deeper in some places than in others. Water may seep into cracks in bedrock and slowly weather it into smaller rocks. Eventually, bedrock may become sediments in soil.

SUGGESTED ACTIVITIES:

Students will:

1. Given a diagram, label the rock cycle and describe the major processes and rock types involved.
2. Create a poster using magazine pictures of weathering and erosion on the earth's surface.
3. Draw a timeline describing events that change the earth's surface.
4. Identify displayed rock samples as igneous, sedimentary or metamorphic and test for hardness through a scratch test.
5. Compare and contrast the origin of igneous, sedimentary and metamorphic rocks and give examples of how rocks are used by society. (Granite-countertops, slate-patios, shale-driveways, limestone-building or crushed for cement.
6. Make a fossil by pressing a seashell in clay and filling the area with plaster of Paris
7. Build a model of the Earth using different color clay to represent the Crust, Mantle, Inner core and outer core.
8. Act out the differing movements involved

ASSESSMENTS:

- ✧ Text review questions
- ✧ Text review worksheets
- ✧ Homework assignments
- ✧ Observation checklist
- ✧ Interviews and dialogue
- ✧ Learning logs or notebooks
- ✧ Teacher-made tests and quizzes
- ✧ Products and projects
- ✧ Performance tasks
- ✧ Portfolios

REMEDIATION:

- ✧ Peer support
- ✧ Cooperative learning
- ✧ Individualized instruction
- ✧ Small group instruction
- ✧ Computer generated visuals and simulations.

ENRICHMENT:

- ✧ Research paper
- ✧ Class presentation of research
- ✧ WebQuest activities
- ✧ Present information supporting the concept of plate tectonics.

with converging, diverging, and sliding boundaries.

9. Research and present an oral report on the origin of a particular earthquake or volcanic eruption and the affect on the Earth's surface.
10. Decide whether the formation of the Delaware Water Gap resulted from weathering or erosion. Write a paragraph using facts to support your belief.
11. Experiment using topsoil, subsoil and bedrock to plant bean seeds. Controls bean seeds and same amount of light and water, Variables would be soil. Which soil type is most fertile?

RESOURCES:

Harcourt Teacher Resources
Houghton Mifflin Teacher Resources
Earth Science: Solar System Teacher's Guide
The Many Faces of Delaware Water Gap: An integrated guide to the geology of Delaware Gap National Recreation Area
Geological Processes: Teacher's Guide

Websites:

http://www.unitedstreaming.com/search/assetDetail.cfm?guidAssetID=9BE2C7CB-2A2B-4047-8F3A-5FDC6EA20C8B

TLC Elementary School: Geological Processes
In 1989, Northern California felt the effects of an earthquake that measured 7.0 on the Richter scale—powerful evidence of the Earth's inner turmoil. Segments cover earthquakes, types of rock, identification of minerals, and plate tectonics. The Rock Cycle—Takes students around the United States to find examples of the three types of rock: igneous, metamorphic, and sedimentary. How To Identify Minerals—Travels with a geologist who explains how a rock found in Namibia is identical to one found in Argentina. Plate Tectonics—explains why the surface of the Earth looks the way it does as a result of the activity that goes on below it. • The Rock Cycle (7 min.) • How To Identify Minerals (7 min.) • Plate Tectonics (5 min.)

http://www.unitedstreaming.com/search/assetDetail.cfm?guidAssetID=3FF74D22-6652-4502-B8A4-E3ED305DC497

TLC Elementary School: Prehistoric Earth How do geologists know what happened on Earth billions of years ago? Segments cover the nature and divisions of geologic time, a variety of prehistoric life-forms, and how fossils reveal clues to Earth's distant past. Geologic Time—Explains the system used by scientists to describe and organize prehistoric time periods. Prehistoric Life—Discusses what modern scientists study to uncover facts about the past. Events in Earth's Past—Chronicles events in the four major periods within the geologic time scale: Precambrian and the Paleozoic, Mesozoic Era, and Cenozoic eras. Dinosaurs and Fossils—Points out that each time period is marked by a significant change in the number or type of fossils found, and explores what fossils reveal about Earth's history. ● Geologic Time (6 min.) ● Prehistoric Life (4 min.) ● Events in Earth's Past (5 min.) ● Dinosaurs and Fossils (5 min.)	

COURSE: Science	GRADE(S): 5th Grade
UNIT: Earth and Space Science/Unit 3: Protecting Earth's Resources	

NATIONAL STANDARDS:

SCIENCE THEMES: Systems and interactions, models, patterns of change, stability (constancy), energy, scale, change over time

PROCESS SKILLS: Observing, classifying, measuring, analyzing and interpreting data, formulating hypotheses, predicting, experimenting/testing

STATE STANDARDS:

3.5.7.B Recognize Earth's resources and how they affect everyday life.

- Identify and locate significant Earth's resources (e.g., rock types, oil, gas, coal deposits) in Pennsylvania.
- Explain the processes involved in the formation of oil and coal in Pennsylvania.
- Explain the value and uses of different earth resources (e.g., selected minerals, ores, fuel sources, agricultural uses).
- Compare the locations of human settlements as related to available resources.

3.6.7.A Explain biotechnologies that relate to related technologies of propagating, growing, maintaining, adapting, treating and converting.

- Identify the environmental, societal and economic impacts that waste has in the environment.
- Identify and explain the impact that a specific medical advancement has had on society.
- Explain the factors that were taken into consideration when a specific object was designed.
- Define and describe how fuels and energy can be generated through the process of biomass conversion.
- Identify and group basic plant and animal production processes.
- Explain the impact that agricultural science has had on biotechnology.

4.2.7.C Explain natural resource distributions.

- Distinguish between readily available and less accessible resources.
- Identify the locations of different concentrations of fossil fuels and mineral resources.
- Analyze the effects of management practices on air, land and water in forestry, agriculture, fisheries, wildlife, mining and food and fiber production that is unique to different climates.

ASSESSMENT ANCHORS:

S8.D.1 Earth Features and Processes that Change Earth and Its Resources

ELIGIBLE CONTENT:

S8.D.1.2.1 Describe a product's (synthetic gas produced from coal, bio-diesel produced from soybeans, ethanol produced from corn, laminated hardwood flooring produced from maple trees) transformation process from production to consumption (e.g., prospecting, propagating, growing, maintaining, adapting, treating, converting, distributing, disposing) and explain the process's potential impacts on Earth's resources.

S8.D.1.2.2 Describe potential impacts of human made processes (e.g., manufacturing, agriculture, transportation, mining on Earth's resources, both nonliving (air, water, or earth materials) and living (plants and animals).

KEY CONCEPTS:

1. There are costs and risks to society and environment posed by the use of nonrenewable energy.
2. The limited supply of usable energy sources places great significance on the development of renewable energy resources.
3. Reusing, recycling, and reducing the use of natural resources will improve and protect the quality of life.

UNIT OBJECTIVES:

Students will:

1. *Differentiate between renewable and nonrenewable energy resources.*
   - Renewable energy resources can be replaced.
   - Nonrenewable energy resources either cannot be replaced at all or cannot be replaced as fast as we use them.

2. *Identify fossil fuels (oil, natural gas, and coal) as nonrenewable energy resources that are made from the remains of organisms.*
   - Fossil fuels offer the advantage of easily providing large amounts of energy, but they have the disadvantage of causing pollution.

3. *Identify renewal energy resources.*
   - Solar energy is a renewable resource.
   - Solar energy has advantages, such as not running out, and disadvantages, such as not being available at night or on cloudy days.
   - Wind energy is a nonpolluting renewal resource that people have been using for thousands of years.
   - Moving water is an important energy renewable resource which has been used to run generators at hydroelectric power plants. Hydroelectric power produces no pollution or waste, however the lakes created by dams can cause environmental damage.

SUGGESTED ACTIVITIES:

1. Read articles related to energy costs and consumption.
2. Use computation skills to determine the economic effects of rising energy costs
3. Conduct research and create a project that will be used to teach others about an alternative/renewable energy sources.
4. Create a model, experiment, and diagram or PowerPoint presentation about a specific renewable resource.
5. Participate in a debate over advantages and disadvantages of specific energy sources.

RESOURCES:

Harcourt Science Series
Power Up: Energy in Our in Environment (Teacher's Guide)
Energy Hog Challenge Student Workbook and Teacher Guide

ASSESSMENTS:

- ✧Text review questions
- ✧Text review worksheets
- ✧Homework assignments
- ✧Observation checklist
- ✧Interviews and dialogue
- ✧Learning Logs or Notebooks
- ✧Teacher-made tests and quizzes
- ✧Products and projects
- ✧Performance tasks
- ✧Portfolios

REMEDIATION:

- ✧Peer support
- ✧Cooperative learning
- ✧Individualized instruction
- ✧Small group instruction
- ✧Computer generated visuals and simulations.

ENRICHMENT:

- ✧ Research paper
- ✧ Class presentation of research

Lesson Plan: Exploring Alternative Energy Sources ***Websites:*** http://www.unitedstreaming.com/search/assetDetail.cfm?guidAssetID=E0B2ECD3-2634-42F5-8414-5B487D7DE5AD ***Power Up: Energy in Our Environment*** **Description:** Saving the earth is or should be a number one priority in our lives. This full motion video focuses on various issues relating to energy in the environment. It concentrates primarily on the greenhouse effect, air pollution, acid rain and energy conservation. Students will see how we use and rely on energy in our daily lives, sources of energy, what fossil fuels are and how burning fossil fuels contribute to air pollution, smog, acid rain and the greenhouse effect. In addition, the video addresses some things society can do to lessen the effects of energy consumption. Students will also see how they personally can help solve environmental problems related to energy through conservation. 24 minutes. © 1992 Rainbow Educational Media	✧ WebQuest activities ✧ Independent activities