Greensburg Community School Corporation
Sixth Grade Curriculum

Science

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Greensburg Community Schools
Sixth Grade Science

Mission Statement

The mission of the Greensburg Community Schools is to serve individuals and the community by developing in all students the knowledge, understanding, skills and attitudes that will enable them to lead productive and fulfilling lives in our complex and changing society.

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Sixth Grade Science

Narrative Description

Sixth graders need to understand that science is a part of their every day lives. Often students do not realize that science is more than just information in a book. It affects everything we do. The sixth grade curriculum is designed to let students discover science through investigations, technology, mathematics, history, and collecting data. It is our intention that they finish this course with an appreciation for science and all that it has done for us.

Sixth graders will design investigations. They will use computers and other technology to collect and analyze data; they will explain findings and will be able to relate how they conduct investigations to how the scientific enterprise functions as a whole. Students will understand that technology has allowed humans to do many things, yet it cannot always provide solutions to our needs.

Sixth graders will use computers and other tools to collect information, calculate, and analyze data. They will prepare tables and graphs, using these to summarize data and identify relationships.

Sixth graders will collect and organize data to identify relationships between physical objects, events, and processes. They will use logical reasoning to question their own ideas as new information challenges their conceptions of the natural world.

Sixth graders will recognize that plants and animals obtain energy in different ways, and they will describe some of the internal structures of organisms related to this function. They will examine the similarities and differences between humans and other sciences. They will use microscopes to observe cells and recognize cells as the building blocks of all life.

Sixth graders will apply mathematics in scientific contexts. They will use mathematical ideas, such as relations between operations, symbols, and shapes in three dimensions, statistical relationships, and the use of logical reasoning, to represent and synthesize data.

Sixth graders will gain understanding of how the scientific enterprise operates through examples of historical events. Through the study of these events, they will understand that new ideas are limited by the context in which they are conceived, that the ideas are often rejected by the scientific establishment, that the ideas sometimes spring from unexpected findings, and that the ideas grow or transform slowly through the contributions of many different investigators.

Finally, sixth graders will use mental and physical models to conceptualize processes. They will recognize that many systems have feedback mechanisms that limit changes.

Course Concepts and Generalizations

- Students must model the process of scientific investigation through inquiries, fieldwork, lab work, etc. Through these experiences, students will practice designing investigations and experiments, making observations, and formulating theories based on evidence.

- Writing, in the form of journals, essays, lab reports, procedural summaries, etc., should be an

integral component of students' experiences in science.

- Students learn some of the relationships between physical objects, events, and processes in the universe.

- Students learn that plants and animals obtain energy in different ways and contain different structures for obtaining energy.

- Students need to solve problems in science, technology, and everyday life—problems ranging from how to model certain aspects of a complex scientific problem to how to balance a check book.

- Students need to gain insight into the historical background of the development of the modern science of chemistry.

- Students need opportunities to engage in long-term and on-going laboratory and fieldwork, and thus understand the role of change over time in studying the physical setting and the living environment.

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Units of Study

Unit Number	Unit Name	Time
1	Nature of Science & Technology	3 weeks
2	Scientific Thinking	5 weeks (ongoing)
3	Earth Science	12 weeks
4	Life Science	8 weeks
5	Physical Science	8 weeks

Unit Numbers correspond to the Unit Numbers on the State Standard Chart.

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Unit 1 Plan

Nature of Science and Technology

Individual Learner Objectives

1. Define science and identify questions that science cannot answer.
2. Compare and contrast theories and laws.
3. Identify some skills scientists use.
4. Describe various types of models and give their limitations.
5. Evaluate scientific explanations.
6. Understand and explain the work done by scientists.
7. Research information on notable scientists.

Subject Outline

I. What is science?
   A. Laws and theories
   B. Systems
   C. Branches of science

II. Science in action
   A. Skills
   B. Drawing conclusions
   C. Experiments
   D. Laboratory safety

III. Models in science
   A. Types
   B. Making models
   C. Limitations

IV. Evaluating scientific explanation
   A. Critical thinking
   B. Evaluating data
   C. Evaluating conclusions

D. Evaluating promotional materials

V. Science and the world
   A. Science in everyday life
   B. Science for the future
   C. Scientist—past and present
   D. Current events (ongoing throughout the year)

VI. Notable scientists
   A. Big6 research model
   B. Science careers
   C. Influence of scientists

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Unit 2 Plan

Scientific Thinking

Individual Learner Objectives

1. Use computers and other tools to collect information, calculate, and analyze data.
2. Prepare tables and graphs.
3. Summarize data and identify relationships.
4. Use the scientific method to explain an investigation.
5. Present scientific findings.
6. Create an investigation from start to finish.

Subject Outline

I. Computation and estimation
   A. Mean and median
   B. Use of technology

II. Communication skills
   A. Tools for capturing data
   B. Data tables and graphs
   C. Locating scientific information
   D. Analyze and interpret findings

III. Scientific method
   A. Observe, questions, and collect information
   B. Hypothesize
   C. Investigate
   D. Analyze
   E. Conclude and communicate
   F. Repeat to support
   G. Revise if necessary

IV. Science Fair Project
   A. Science Fair guidelines
   B. Reports
   C. Variables

D. Displays
E. Oral presentations

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Unit 3 Plan

Earth and Space Science

Individual Learner Objectives

1. Explain that we live on a planet which appears at present to be the only body in the solar system capable of supporting life.

2. Use models or drawings to explain Earth's seasons and weather patterns.

3. Explain the phases of the moon.

4. Describe the Earth and its atmosphere.

5. Explain that fresh water is essential for life and understand that this resource can be depleted or polluted.

6. Illustrate the cycling of water in and out of the atmosphere plays an important role in determining climatic patterns.

7. Describe the motions of ocean waters and identify their causes.

8. Identify and explain the effects of oceans on climate.

9. Identify, explain, and discuss some effects human activities have on weather and the atmosphere.

10. Give examples of some minerals and explain how recycling and the development of substitutes can reduce their rate of depletion.

11. Explain weathering and erosion.

Subject Outline

I. Solar System
   A. Earth's location and place in space
      1. Rotation
      2. Revolution
      3. Seasons
      4. Moon phases
      5. Sunlight
      6. Eclipses

7. Tides

B. Solar system
   1. Measuring distances
   2. Inner planets
   3. Outer planets
   4. Comets

C. Stars and galaxies
   1. Constellations
   2. Magnitude
   3. Life cycle
   4. Galaxies
   5. Speed of light
   6. Universe

II. Atmosphere

A. Levels of Earth's atmosphere
   1. Importance
   2. Makeup
   3. Layers
   4. Atmospheric pressure
   5. Temperature of layers

B. Energy transfer in the atmosphere
   1. Energy from sun
   2. Heat
   3. Water cycle

C. Air movement
   1. Wind
   2. Global winds
   3. Wind systems

III. Weather

A. Definition of weather
   1. Weather factors
   2. Dew point
   3. Clouds
   4. Precipitation

B. Weather patterns
   1. Fronts
   2. Severe weather

C. Weather forecasts
   1. Weather observations
   2. Weather maps

IV. Air pollution

A. Types and causes
   1. Primary Pollutants
   2. Secondary Pollutants

3. Smog
4. Acid Rain
5. Particulate Pollution
6. Toxic Pollutant
7. Chlorofluorocarbons

B. Effects
1. Health
2. Earth's organisms
3. Materials and structures

C. Solutions
1. Legislation
2. Air quality improvements

V. Water
A. Nature of water
1. Forms
2. Latent Heat
3. Polar Molecule

B. Importance
C. Recycling

VI. Oceans
A. Composition
B. Temperature and pressure
C. Ocean currents and climates
1. Surface currents
2. Density currents
3. Upwellings

D. Waves
1. Winds
2. Tides
3. Erosion

E. Life in oceans
1. Ecosystems
2. Nutrients

VII. Rocks and minerals
A. Properties
B. Common minerals
C. Igneous and sedimentary rocks
D. Metamorphic rocks and the rock cycle

VIII. Weathering and Erosion
A. Soil formations
B. Chemical weathering
C. Earth's surface
1. Gravity

2. Ice
3. Wind
4. Water
5. Effects

IX. Resources
- A. Energy resources
  1. Generating energy
  2. Fossil fuels
- B. Alternative energy resources
  1. Solar
  2. Wind
  3. Hydroelectric
  4. Geothermal
  5. Water
- C. Water
  1. Groundwater
  2. Pollution
  3. Water distribution
- D. Land
  1. Forest conservation
  2. Mineral resources

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Unit 4 Plan

Life Science

Individual Learner Objectives

1. Explain the differences among the kingdoms of organisms.
2. Give examples of how organisms are classified and show problems with classifying some organisms into the standard taxonomy.
3. Describe the structures and forms of animals and plants.
4. Recognize and describe how organisms reproduce.
5. Investigate and explain that all living things are composed of cells.
6. Distinguish the main differences between plant and animal cells.
7. Explain that in all environments organisms with similar needs may compete with one another for resources.
8. Recognize and explain competitive and/or cooperative relationships between organisms.
9. Describe how life on Earth depends on energy from the sun.

Subject Outline

I. Cells
   - C. Cells and organisms
     1. Make up
     2. Cell energy
   - D. Structure
     1. Organelles
     2. Systems
   - E. Different jobs

II. Bacteria, Protists, and Fungi
   - A. Bacteria
     1. Characteristics
     2. Types
     3. Bacteria and health

4. Bacteria and industry
5. Bacteria and environment

B. Protists
1. Characteristics
2. Importance

C. Fungi
1. Characteristics
2. Types
3. Fungi and the environment
4. Fungi and humans

III. Plants
A. Characteristics
B. Seedless plants
C. Seed plants

IV. Invertebrate
A. Characteristics of animals
B. Sponges, Cnidarians, Flatworms, and Roundworms
C. Mollusks and Segmented Worms
D. Arthropods and Echinoderms

V. Vertebrates
A. Characteristics of chordates
B. Amphibians and reptiles
C. Birds
D. Mammals

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Unit 5 Plan

Physical Science

Individual Learner Objectives

1. Recognize and describe that energy is a property of many objects and is associated with heat, light, electricity, mechanical motion, and sound.

2. Investigate and describe how materials may be combined to form new materials with properties different from the originals.

3. Investigate that materials may be composed of parts that are too small to be seen without magnification.

4. Investigate that equal volumes of different substances usually have different masses as well as different densities.

5. Investigate that light is made up of a mixture of many different colors of light, even though the light is perceived as almost white.

6. Demonstrate that vibrations in materials set up wavelike disturbances.

7. Explain that electrical circuits provide a means of transferring electrical energy from sources to devices in which heat, light, sound, and chemical changes are produced.

Subject Outline

I. Matter and its changes
   - A. Physical properties and changes
     1. States
     2. Metallic properties
   - B. Chemical properties and changes
     1. Common characteristics
     2. Law of Conservation of Mass

II. Energy
   - A. Energy changes
     1. Forms
     2. Kinetic
     3. Potential
     4. Law of Conservation of Energy
   - B. Temperature

C. Chemical energy

III. Electricity and magnetism
- A. Electric charge
  1. Forces
  2. Electric field
  3. Conductors and insulators
  4. Static charge
- B. Electric current
  1. Simple circuits
  2. Transferring electric energy
  3. Voltage
  4. Series and parallel circuits
- C. Magnetism
  1. Magnets
  2. Electromagnets
  3. Generating electric current

IV. Waves
- A. Description of Waves
  1. Model
  2. Mechanical
  3. Sound waves
  4. Electromagnetic waves
- B. Wave properties
  1. Amplitude
  2. Wavelength
  3. Frequency
  4. Speed
- C. Wave behavior
  1. Reflection
  2. Refraction
  3. Diffraction
  4. Interference

Indiana Academic Standards for Science, Grade 6

State Standard	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Standard 1: The Nature of Science and Technology					
6.1.1 Explain that some scientific knowledge is very old and yet is still applicable today. Understand, however, that scientific knowledge is never exempt from review and criticism.	X	X			
6.1.2 Give examples of different ways scientists investigate natural phenomena and identify processes all scientists use, such as collections of relevant evidence, the use of logical reasoning, and the application of imagination in devising hypotheses and explanations, in order to make sense of the evidence.	X	X			
6.1.3 Recognize and explain that hypotheses are valuable, even if they turn out not to be true, if they lead to fruitful investigations.	X				
6.1.4 Give examples of employers who hire scientists, such as colleges and universities, businesses and industries, hospitals, and many government agencies.	X	X			
6.1.5 Identify places where scientists work including offices, classrooms, laboratories, farms, factories, and natural field settings ranging fro space to the ocean floor.	X		X		
6.1.6 Explain that computers have become invaluable in science because they speed up and extend people's ability to collect, store, compile, and analyze data; prepare research reports; and share data and ideas with investigators all over the world.	X	X			
6.1.7 Explain that technology is essential to science for such purposes as access to outer space and other remote locations, sample collections and treatment, measurement, data collection and storage, computation, and communication of information.		X	X	X	
6.1.8 Describe instances showing that technology cannot always provide successful solutions for problems or fulfill every human need.	X	X			
6.1.9 Explain how technologies can influence all living things.	X	X			
Standard 2: Scientific Thinking					
6.2.1 Find the mean and median of a set of data.		X			
6.2.2 Use technology, such as calculators or computer spreadsheets, in analysis of data.		X		X	
6.2.3 Select tools, such as cameras and tape recorders, for capturing information.		X	X		
6.2.4 Inspect, disassemble, and reassemble simple mechanical devices and describe what the various parts are for. Estimate what the effect of making a change in one part of a system is likely to have on the system as a whole.		X			
6.2.5 Organize information in simple tables and graphs and identify relationships they reveal. Use tables and graphs as examples of evidence for explanations when writing essays or writing about lab work, fieldwork, etc.	X	X	X	X	X
6.2.6 Read simple tables and graphs produced by others and describe in words what they show.		X	X	X	X
6.2.7 Locate information in reference books, back issues of newspapers, and magazines, CD-ROMs, and computer databases.		X	X	X	X

6.2.8 Analyze and interpret a given set of findings, demonstrating that there may be more than one good way to do so.		X			
6.2.9 Compare consumer products, such as generic and brand-name products, and consider reasonable personal trade-offs among them on the basis of features, performance, durability, and costs.		X	X		
Standard 3: The Physical Setting					
6.3.1 Compare and contrast the size, composition, and surface features of the planets that comprise the solar system, as well as the objects orbiting them. Explain that the planets, except Pluto, move around the sun in nearly circular orbits.			X		
6.3.2 Observe and describe that planets change their position relative to the background of stars.			X		
6.3.3 Explain that Earth is one of several planets that orbit the sun, and that the moon, as well as many artificial satellites and debris, orbit around Earth.			X		
6.3.4 Explain that we live on a planet which appears at present to be the only body in the solar system capable of supporting life.			X		
6.3.5 Use models or drawings to explain that Earth has different seasons and weather patterns because it turns daily on an axis that is tilted relative to the plane of Earth's yearly orbit around the sun. Know that because of this, sunlight falls more intensely on different parts of Earth during the year (the accompanying greater length of days, also has an effect) and the difference in heating produces seasons and weather patterns.			X		
6.3.6 Use models or drawings to explain that the phases of the moon are caused by the moon's orbit around Earth, once in about 28 days, changing what part of the moon is lighted by the sun and how much of that part can be seen from Earth, both during the day and night.			X		
6.3.7 Understand and describe the scales involved in characterizing Earth and its atmosphere. Describe that Earth is mostly rock, that three-fourths of its surface is covered by a relatively thin layer of water, and that the entire planet is surrounded by a relatively thin blanket of air.			X		
6.3.8 Explain that fresh water, limited in supply and uneven in distribution, is essential for life and also for most industrial processes. Understand that this resource can be depleted or polluted, making it unavailable or unsuitable for life.			X		
6.3.9 Illustrate that the cycling of water in and out of the atmosphere plays an important role in determining climatic patterns.			X		
6.3.10 Describe the motions of ocean waters, such as tides, and identify their causes.			X		
6.3.11 Identify and explain the effects of oceans on climate.			X		
6.3.12 Describe ways human beings protect themselves from adverse weather conditions.			X		
6.3.13 Identify, explain, and discuss some effects human activities, such as the creation of pollution, have on weather and the atmosphere.			X		
6.3.14 Give examples of some minerals that are very rare and some that exist in great quantities. Explain how recycling and the development of substitutes can reduce the rate of depletion of minerals.			X		

6.3.15 Explain that although weathered rock is the basic component of soil, the composition and texture of soil and its fertility and resistance to erosion are greatly influenced by plant roots and debris, bacteria, fungi, worms, insects, and other organisms.			X		
6.3.16 Explain that human activities, such as reducing the amount of forest cover, increasing the amount and variety of chemicals released into the atmosphere, and farming intensively, have changed the capacity of the environment to support some life forms.			X		
6.3.17 Recognize and describe that energy is a property of many objects and is associated with heat, light, electricity, mechanical motion, and sound.			X	X	X
6.3.18 Investigate and describe that when a new material, such as concrete, is made by combining two or more materials, it has properties that are different from the original materials.					X
6.3.19 Investigate that materials may be composed of parts that are too small to be seen without magnification.					X
6.3.20 Investigate that equal volumes of different substances usually have different masses as well as different densities.					X
6.3.21 Investigate , using a prism for example, that light is made up of a mixture of many different colors of light, even though the light is perceived as almost white.					X
6.3.22 Demonstrate the vibrations in materials set up wavelike disturbances, such as sound and earthquake waves, that spread away from the source.					X
6.3.23 Explain that electrical circuits provide a means of transferring electrical energy from sources such as generators to devices in which heat, light, sound, and chemical changes are produced.					X
Standard 4: The Living Environment					
6.4.1 Explain that one of the most general distinctions among organisms is between green plants, which use sunlight to make their own food, and animals, which consume energy-rich foods.				X	
6.4.2 Give examples of organisms, that cannot be neatly classified as either plants or animals, such as fungi and bacteria.				X	
6.4.3 Describe some of the great variety of body plans and internal structures animals and plants have that contribute to their being able to make of find food and reproduce.				X	
6.4.4 Recognize and describe that a species comprises all organisms that can mate with one another to produce fertile offspring.				X	
6.4.5 Investigate and explain that all living things are composed of cells whose details are usually visible only through a microscope.				X	
6.4.6 Distinguish the main differences between plant and animal cells, such as the presence of chlorophyll and cell walls in plant cells and their absence in animals cells.				X	
6.4.7 Explain that about two-thirds of the mass of a cell is accounted for by water. Understand that water gives cells				X	

many of their properties.					
6.4.8 Explain that in all environments, such as freshwater, marine, forest, desert, grassland, mountain, and others, organisms with similar needs may compete with one another for resources, including food, space, water, air, and shelter. Note that in any environment, the growth and survival of organisms depend on the physical conditions.			X	X	
6.4.9 Recognize and explain that two types of organisms may interact in a competitive or cooperative relationship, such as producer/consumer, predator/prey, or parasite/host.				X	
6.4.10 Describe how life on Earth depends on energy from the sun.				X	
6.4.11 Describe that human beings have body systems for obtaining and providing energy, defense, reproduction, and the coordination of body functions.				X	
6.4.12 Explain tat human beings have many similarities and differences and that the similarities make it possible for human beings to reproduce and to donate blood and organs to one another.					
6.4.13 Give examples of how human beings use technology to match or exceed many of the abilities of other species.				X	
Standard 5: The Mathematical World					
6.5.1 Demonstrate that the operations addition and subtraction are inverses and that multiplication and division are inverses of each other.		X		X	
6.5.2 Evaluate the precision and usefulness of data based on measurements taken.		X		X	
6.5.3 Explain why shapes on a sphere like Earth cannot be depicted on a flat surface without some distortion.			X		
6.5.4 Demonstrate how graphs may help to show patterns, such as trends, varying rates of change, gaps, or clusters, which can be used to make predictions.		X		X	
6.5.5 Explain the strengths and weaknesses of using an analogy to help describe an event, object, etc.	X	X			
6.5.6 Predict the frequency of the occurrence of future events based on data.		X		X	
6.5.7 Demonstrate how probabilities and ratios can be expressed as fractions, percentages, or odds.		X	X	X	
Standard 6: Historical Perspective					
6.6.1 Understand and explain that from the earliest times until now, people have believed that even though countless different kinds of materials seem to exits in the world, most things can be made up of combinations of just a few basic kinds of things. Note that there has not always been agreement, however, on what those basic kinds of things are, such as the theory of long ago that the basic substances were earth, water, air, and fire. Understand that this theory seemed to explain many observations about the world, but as we know now, it fails to explain many others.					X

6.6.2 Understand and describe that scientists are still working out the details of what the basic kinds of matter are on the smallest scale, and of how they combine, or can be made to combine, to make other substances.	X				X
6.6.3 Understand and explain that the experimental and theoretical work done by French scientist Antoine Lavoisier in the decade between the American and French Revolutions contributed crucially to the modern science of chemistry.	X				X
Standard 7: Common Themes					
6.7.1 Describe that a system, such as the human body, is composed of subsystems.	X			X	
6.7.2 Use models to illustrate processes that happen too slowly, too quickly, or on too small a scale to observe directly, or are too vast to be changed deliberately, or are potentially dangerous.	X	X	X		
6.7.3 Identify examples of feedback mechanisms writing systems that serve to keep changes within specified limits.				X	