

Wilson Area School District Planned Course Guide

Title of planned course: Science Grade 4

Subject Area: Science

Grade Level: 4

Course Description: This course is designed to meet the challenge of providing meaningful science education for all students in diverse American classrooms and to prepare them for life in the 21st century. Development of the FOSS program was, and continues to be, guided by advances in the understanding of how youngsters think and learn. Science is an active enterprise, made active by our human capacity to think. Scientific knowledge advances when scientists observe objects and events, think about how they relate to what is known, test their ideas in logical ways, and generate explanations that integrate the new information into the established order.

Time/Credit for this Course: One Academic Year

Curriculum Writing Committee: Russ Steger, Trudi Wilson

Curriculum Map

There are four modules that will be rotated between teachers within each school.

Human Body: 8 – 9 Weeks

Water: 8 – 9 Weeks

Magnetism and Electricity: 8 – 9 Weeks

Matter and Energy: 9 – 10 Weeks

Wilson Area School District Planned Course Materials

Course Title: Science Grade 4

Textbook: Foss Science Stories:

- Human Body
- Water
- Magnetism and Electricity
- Matter and Energy

Delta Education

Supplemental Books:

Teacher Resources:

- Foss Teaching Kit
- Foss Supplemental Books
- Foss Teaching Module Notes
- Foss Teaching Preparation Videos
- www.Fossweb.com
- PSSA Science Coach Book

Curriculum Scope & Sequence

Planned Course: Science Grade 4

Unit: Human Body

Time frame: 8 – 9 weeks, 16 sessions with optional project/summative assessment during last two weeks

State Standards and Related Anchors: 3.1.4.A, 3.1.4.B, 3.1.4.D, 3.1.4.E, 3.2.4.B, 3.2.4.C, 3.3.4.A, 3.3.4.B, 3.3.4.D, 3.4.4.C, 3.6.4.A, 3.7.4.B, 3.8.4.C

Essential content/objectives: The **Human Body Module** consists of four sequential investigations that engage students in thoughtful activities about the form and function of a most remarkable machine, their own body. At end of the unit, students will be able to:

- Observe and investigate the human skeletal and muscle systems.
- Become aware of the versatility of movement provided by an articulated skeleton.
- Gain experience with the use of photographs, diagrams, and model bones to gather information.
- Build mechanical models to demonstrate how muscles are responsible for human movement.
- Compare the bones and muscles in their own bodies to photographs and models.
- Investigate response time of hands and feet.
- Develop an awareness of human bone and muscle structure and function and an appreciation for the versatility of the human body.
- Acquire the vocabulary associated with the human skeletal and muscle systems.
- Use scientific thinking processes to conduct investigations and build explanations: observing, communicating, comparing, and organizing.

Core Activities: Students will complete/participate in the following:

- Bones investigations
 - Students observe the movements of the body while jumping rope.
 - Work in groups to determine the number of bones in their own bodies.
 - By studying skeleton photos and diagrams, students find over 200 bones.
 - Assemble a paper articulated skeleton.
 - Compare the bones of a human to those of a rodent.

- Joints investigations
 - Investigate the articulated skeleton by immobilizing certain hand joints and then performing everyday tasks.
 - Categorize the types of joints in the body and compare the movement of mechanical devices to the function of human joints.
- Muscles investigations
 - Observe the action of muscles that cause the body to move.
 - Given a number of facts about muscles, students build operational models to demonstrate how muscles move legs, thumbs, and arms.
- Coordination investigations
 - Investigate hand and foot response time by using a falling-cup device.
 - They take turns releasing the cup and trying to move their hand (or foot) from the path of the cup. Results are recorded and compared. Students repeat the coordination investigations to evaluate the effect of practice on response time.

Extensions:

- **Language Extension**
 - Make a bone-facts class book.
 - Play bone-name games.
 - Read about other skeletons.
 - Sing about bones.
 - Research joint disease.
 - Increase disability awareness.
 - Write about a girl with arms in casts.
 - Research artificial joints and limbs.
 - Collect photos of bodies in motion.
 - Discuss jumping muscles.
 - Identify muscle bridges.
 - Describe aches and pains.
 - Research muscles in space.
 - Write a stimulus/response story.
 - Write captions for pictures.
- **Math Extension**
 - Problems of the Week
 - Compare graphs.
- **Science Extensions**
 - Make a bone museum.
 - Look at X rays.
 - Immobilize knees and elbows.
 - Compare dolls and other movable toys.
 - Compare animal movement and joints.

- Research articulated machines.
- Look closely at a chicken wing.
- Add extensor muscles to the models.
- Keep an exercise journal.
- Investigate other stimuli.
- Practice jumping rope.
- Practice coordination activities.

- **Physical Education Extension**
 - Play Twister with a focus on joints.
 - Research injuries.
 - Research cramps.

- **Art Extension**
 - Create action figures.

Remediation:

- Repeat activity in centers
- Forms and student sheets in Spanish
- Hands-on activities help serve the specific disabilities of many students.

Instructional Methods:

- Whole group discussion and hypothesis
- Small group investigation.

Materials & Resources:

- Teacher Guide
- Preparation Video
- Equipment Kits
- FOSS Science Stories
- www.fossweb.com

Assessments:

- Teacher generated materials
- End-of-module test
- Portfolio assessment
- Student response sheets
- Science journals/notebooks
- Summative and formative assessments.

Curriculum Scope & Sequence

Planned Course: Science Grade 4

Unit: Water

Time frame: 8 – 9 weeks, 21 sessions with optional projects and summative assessments during the last 2 weeks

State Standards or Adapted Anchors: 3.1.4.A, 3.1.4.C, 3.1.4.E, 3.2.4.B, 3.2.4.C, 3.2.4.D, 3.4.4.A, 3.5.4.A, 3.5.4.B, 3.5.4.D, 3.6.4.A, 3.7.4.A, 3.7.4.B, 3.8.4.A, 3.8.4.B, 3.8.4.C

Essential content/objectives: Water is the most important substance on Earth. Water dominates the surface of our planet, changes the face of the land, and defines life. These powerful, pervasive ideas are introduced here. The **Water Module** consists of four investigations in which students explore properties of water, changes in water, interactions between water and other earth materials, and how humans use water. At end of the unit, students will be able to:

- Observe and explore properties of water in liquid, solid, and gaseous states.
- Observe the expansion and contraction of water as it warms and cools.
- Investigate factors that influence evaporation and condensation of water.
- Consider components of the water cycle.
- Observe and compare how water moves through different types of earth materials, including soil and gravel.
- Consider the water quality of local water sources.
- Investigate how water can be used to do work.
- Acquire vocabulary associated with water.
- Record observations in writing and pictures.
- Exercise language, social studies, and math skills in the context of science.
- Become aware of the importance of water in their lives.
- Use scientific thinking processes to conduct investigations and build explanations: observing, communicating, comparing, and organizing.

Core Activities: Students will complete/participate in the following:

- Water Observations
 - Investigate properties of water.
 - Compare the way water interacts with four different surfaces.
 - Observe the property of surface tension.
 - Investigate how to change this property.
 - Compare the rates of different amounts of water flowing downhill.

- Hot Water/Cold Water
 - Observe the properties of water as it is heated, cooled, and frozen.
 - Make a water thermometer and find that water expands as it is heated.
 - Compare the density of water at different temperatures and find that warm water is less dense than cool water, and ice is less dense than liquid water.

- Water Vapor
 - Introduce water vapor and evaporation.
 - Explore the effects of environmental conditions and surface area on rates of evaporation.
 - Set up condensation chambers and consider how evaporation and condensation contribute to the water cycle.

- Water Works
 - Compare what happens when water is poured through two different earth materials, soil and gravel.
 - Construct a waterwheel and use it to lift objects, learning about the power of water.
 - Collect water from local sources, examine its properties, and are introduced to the concept of water quality.

Extensions:

- **Water Observations:**
 - Language Extensions
 - * What are raincoats?
 - * Discuss water uses.
 - Math Extensions
 - * Problem of the week.
 - * Weigh water.
 - Measure water drops.
 - Music and Science Extensions
 - * Listen to water music.
 - * Study movement of water through earth.
 - * Run water through a maze.
 - * Capture raindrops.

- **Hot Water/Cold Water:**
 - Language Extension
 - * Describe icy worlds.
 - Math Extension
 - * Problem of the week.
 - Social Studies and Science Extensions
 - * Calibrate a thermometer.
 - * Research ice in warm and cold climates.
 - * Freeze salt water.
 - * Compare density of salt and plain water.

- **Water Vapor:**
 - Language Extension
 - * Research recycling water.
 - Math Extensions
 - * Problem of the week.
 - * Measure and graph surface area.
 - Social Studies and Science Extensions
 - * Research water storage and delivery systems.
 - * Investigate how humidity affects evaporation.

- **Water Works:**
 - Language Extensions
 - * Investigate local water.
 - * Write raindrop stories.
 - Math Extensions
 - * Problem of the week.
 - * Graph water use.
 - Science Extensions
 - * Get the salt out.
 - * Test aquarium water.

Remediation:

- Repeat activity during center time
- Forms and student sheets in Spanish
- Hands-on activities help serve the disabilities of many students

Instructional Methods:

- Whole group discussion
- Small group investigations

Materials & Resources:

- FOSS Teacher Guide
- Equipment Kits
- Teacher Preparation Video
- FOSS Science Stories
- www.FOSSWEB.com

Assessments:

- Teacher generated materials
- Summative assessments
- Formative assessments
- Portfolio assessments
- Student Response Sheets
- Journals/notebooks

Curriculum Scope & Sequence

Planned Course: Science Grade 4

Unit: Magnetism and Electricity

Time frame: 8 – 9 weeks, 18 sessions with optional project/summative assessment during last two weeks

State Standards and Related Anchors: 3.1.4.A, 3.1.4.B, 3.2.4.C, 3.4.4.B, 3.4.4.C, 3.6.4.B, 3.8.4.B, 3.8.4.C

Essential content/objectives: The **Magnetism and Electricity Module** consists of five sequential investigations, each designed to introduce or reinforce concepts in physical science. The investigations provide opportunities for students to explore the natural and human-made worlds by observing and manipulating materials in focused settings using simple tools. At end of the unit, students will be able to:

- Observe the interaction of permanent magnets with a variety of common materials.
- Discover that magnets display forces of attraction and repulsion.
- Measure the change in force between two magnets as the distance between them changes.
- Identify materials that are conductors and insulators.
- Understand and construct simple open, closed, parallel, and series circuits.
- Learn how to make an electromagnet.
- Experience the relationship between the number of turns of wire around an electromagnet core and the strength of the magnetism.
- Use their knowledge of electromagnets to make a telegraph.
- Acquire vocabulary associated with magnetism and electricity.
- Exercise language, math, and social studies skills in the context of magnetism and electricity investigations.
- Develop and refine the manipulative skills required for making investigations in magnetism and electricity.
- Use scientific thinking processes to conduct investigations and build explanations: observing, communicating, comparing, and organizing.

Core Activities: Students will complete/participate in the following:

- Force investigations:
 - Work with permanent magnets to discover that iron is the only everyday material that sticks to magnets
 - Investigate variables that influence the force of attraction between two magnets and look for ways to detect the presence of a magnet.
- Making Connections investigations:
 - Investigate current electricity and circuits, the pathways through which electricity flows

- Find that some materials permit the flow of electricity (conductors), and some don't (insulators)
- Advanced Connections investigations:
 - Explore series and parallel circuits and compare the functioning of the components in each circuit
- Current Attractions investigations
 - Learn how to use electricity to make an electromagnet
 - Explore the variables that influence the strength of the magnetism produced by their electromagnets.
- Click It investigations
 - Use all the concepts they have learned to build a telegraph system that enables them to send and receive messages.
 - Use their inquiry skills to design, conduct, and report students' own investigations.

Extensions:

- **Language Extension**
 - Write a creative story about life from a magnet's point of view.
 - Make posters about safe electricity use.
 - Write about life without electricity.
 - Read *Dear Mr. Henshaw*.
 - Research inventors who have contributed to electricity use in everyday life.
 - Write short stories describing encounters (real or imaginary) with electromagnets.
 - Read up on codes; create a code.
- **Math Extension**
 - Problems of the week
- **Science Extensions**
 - Make a water compass.
 - Conduct more force investigations.
 - Explore different magnets.
 - Examine the inside of a lightbulb.
 - Find out how houses are wired.
 - Interview an electrician.
 - Build a flashlight; make a burglar alarm.
 - Make a rheostat.
 - Detect magnetism around current wires.
 - Compare magnets to electromagnets.
 - Build a cardboard telegraph.
 - Make an electric quiz board.
 - Build a model motor.
- **Social Studies Extension**
 - Research historical sources of energy.

Remediation:

- Repeat activity in centers
- Forms and student sheets in Spanish
- Hands-on activities help serve the specific disabilities of many students.

Instructional Methods:

- Whole group discussion and hypothesis
- Small group investigation

Materials & Resources:

- Teacher Guide
- Preparation Video
- Equipment Kits
- FOSS Science Stories
- www.fossweb.com

Assessments:

- Teacher generated materials
- End-of-module test
- Portfolio assessment
- Student response sheets
- Science journals/notebooks
- Summative and formative assessments.

Curriculum Scope & Sequence

Planned Course: Science Grade 4

Unit: Matter and Energy

Time frame: 8 - 9 weeks, 22 sessions with optional projects and summative assessments during the last 2 weeks

State Standards or Adapted Anchors: 3.1.4.A, 3.1.4.B, 3.1.4.C, 3.1.4.D, 3.2.4.A, 3.2.4.B, 3.2.4.C, 3.4.4.A, 3.4.4 B, 3.5.4.D, 3.7.4. B, 3.8.4 B

Essential content/objectives: The Matter and Energy Module consists of four sequential investigations. Students experience a variety of forms of matter and energy. They investigate the properties of light, observe the conversion of energy from one form to another, and explore properties of the three common states of matter (solid, liquid, and gas). Students use metric tools to measure the properties of matter—mass, volume, and temperature—and observe that starting substances can change into new substances as a result of a chemical reaction.

At end of the unit, students will be able to:

- Learn that light from the Sun is the source of most of the energy on Earth.
- Observe energy sources doing work and learn how energy (light, heat, motion, chemical, electric) can be converted from one form to another.
- Learn that stored energy takes many forms; machines and organisms can convert energy into motion and heat.
- Describe how energy can be carried from one place to another by waves, electric current and moving objects.
- Learn that light energy travels in straight lines from a source.
- Find out how light can reflect from the surface of a mirror.
- Learn that white light is a mixture of all colors of light, that matter can absorb and reflect light, and that a shadow is the dark area behind objects that block light.
- Learn that the apparent color of an object is the result of the light it reflects; observe that the apparent color of an object is affected by the color of light striking it.
- Explore properties of the three forms of matter (solid, liquid, and gas), including change of state.
- Learn that all matter is made of particles.
- Use metric tools to measure mass, volume, and temperature, and make multiple numerical observations to improve accuracy.
- Observe and analyze a chemical reaction.
- Collect and analyze data to develop logical conclusions.

Core Activities: Students will complete/participate in the following:

- Energy
 - Investigate different forms of energy (light, heat, sound, and motion) and determine ways that energy is converted to make things happen

- Explore ways that energy forms are carried from one place to another.
- Light
 - Use mirrors to reflect light and learn that light travels in straight lines
 - Introduction to blocked light (shadows), light absorption, and white light as a mixture of all colors of light
 - Investigate firsthand and through simulations, video, and readings how the appearance of an object is affected by the color of light.
- Matter
 - Work with different states of matter
 - Measure mass and volume using metric standards and tools
 - Solve problems using their knowledge of metric measurement
 - Develop a set of defining characteristics for states of matter
 - Read about the difference between opinion and evidence.
- Changing Matter
 - Use a thermometer to measure and record temperatures as they explore melting of common substances
 - Conduct an evaporation investigation where students use the data to draw conclusions
 - Combine substances and observe the results of a chemical reaction
 - Read about solids, liquids, and gases and about reactions.

Extensions:

- **Energy:**
 - Math Extensions
 - * Problem of the week.
 - Science Extension
 - * Start an energy toy collection.
- **Light:**
 - Math Extension
 - * Problem of the week.
 - Language Extensions
 - * Travel through the looking glass.
 - * Write mirror messages.
 - Art Extension
 - * Create mirror pictures.
 - Science Extensions
 - * Share light.
 - * Look at symmetry of faces.
 - * Make a periscope.
- **Matter:**
 - **Math Extensions**
 - * Problem of the week.
 - * Estimate capacity of other containers.
 - **Science Extensions**

- * Determine volume of solid objects.
- **Language Extension**
 - * Discuss metric prefixes.
- **Changing Matter:**
 - **Science Extension**
 - * Conservation of matter.

Remediation:

- Repeat activity during center time
- Forms and student sheets in Spanish
- Hands-on activities help serve the disabilities of many students

Instructional Methods:

- Whole group discussion and hypothesis
- Small group investigations

Materials & Resources:

- FOSS Teacher Guide
- Equipment Kits
- Teacher Preparation Video
- FOSS Science Stories
- www.FOSSWEB.com

Assessments:

- Teacher generated materials
- Summative assessments
- Formative assessments
- Portfolio assessments
- Student Response Sheets
- Journals/notebooks