HADDONFIELD PUBLIC SCHOOLS

Curriculum Map for Science, Grade 5, Magnets and Motors

5 Week Unit of Study

Targeted Standard(s): NJCCCS Science
Standard 5.1 Scientific Processes: All students will develop problem-solving, decision-making and inquiry skills, reflected by formulating usable questions and hypotheses, planning experiments, conducting systematic observations, interpreting and analyzing data, drawing conclusions, and communicating results.
Standard 5.2 Science and Society: All students will develop an understanding of how people of various cultures have contributed to the advancement of science and technology, and how major discoveries and events have advanced science and technology.
Standard 5.3 Mathematical Applications: All students will integrate mathematics as a tool for problem-solving in science, and as a means of expressing and/or modeling scientific theories.
Standard 5.7 Physics: All students will gain an understanding of natural laws as they apply to motion, forces, and energy transformations.
Standard 5.8 Earth Science: All students will gain an understanding of the structure, dynamics, and geophysical systems of the earth.
Standard 5.10 Environmental Studies: All students will develop an understanding of the environment as a system of interdependent components affected by human activity and natural phenomena.
Interdisciplinary: NJCCCS Technological Literacy 8.1.8A, 8.1.8B; Career Education and Life Skills/Critical Thinking 9.2.8A, 9.2.8C, 9.2.8D

Enduring Understandings (*The big ideas*):
Students will understand the relationships between magnets, electricity, and motors.

Essential Questions:
What can magnets do?
How can you find out what magnets can do?
How do you measure the strength of magnets?
How do you use a compass?
How do you crate magnetism through electricity?
What is an electromagnet?
How do you design, conduct, and report the data of a controlled experiment?
How does a motor work?
How can electricity be generated?

Core Content/Objectives		Instructional Actions	
Concepts *What students will know*	Skills *What students will be able to do*	Activities/Strategies *Learning Activities/ Differentiation* *Interdisciplinary Connections*	Assessment *How learning will be assessed*
• Magnets attract and repel each other: this attracting and repelling can be used to cause motion • A compass can be constructed by suspending a magnet so that it is free to rotate. • A compass will move in response to a magnet that is placed near it. • An electric current moving through a wire produces magnetism; a coil	• Observe, describe, and record the results of experiments. • Learn to plan and conduct experiment in which variables are controlled. • Predict and test how changing a variable affects the outcome of an experiment. • Interpret the results of experiments to draw	• Students learn how to set up and deep records in a student notebook. • Students will discover several properties of and uses for magnets. • Students will use what they know about magnetism to make predictions of the behavior of several different objects. • Students will conduct a controlled experiment to find out how strong	• Pre-Unit, Post-Unit Assessment and/or Additional Assessments which are benchmarked to the curriculum map's standards. • Teacher observations • Student science notebook • Class discussions

of copper wire conducting an electric current becomes an electromagnet. • A steel bolt placed inside a coil of wire conducting an electric current increases the strength of the electromagnet. • A simple motor can be made from an electromagnet and a rotating armature. • An electric current can be generated by placing a rotating coil of wire near a magnet.	conclusions. • Apply troubleshooting strategies to investigations with compasses, electromagnets, and motors. • Read and research to learn more about electricity and motors. • Communicate results through writing, drawing, and discussion.	different combinations of magnets are. Then the results of the experiment will be graphed. • Students investigate the behavior of a magnetic compass. • Students experiment with the compasses they built to determine which poles of the magnets point north. • Students explore the geographic usefulness of a compass. • Students investigate magnetic poles. • Students experiment with an electric circuit to discover that an electric current causes magnetism. • Students learn that a coil of wire with electricity flowing through it has magnetic poles. • Students build an electromagnet and begin to formulate their own questions about how it works. • Students learn about Joseph Henry, a historical figure in the field of electromagnetism. • Students identify several variables that they believe may have an effect on electromagnetic strength. • Students cooperatively design an experiment to test the effect that changing one variable has on electromagnetic strength. • Teams of students assemble and conduct the experiment that they designed. • Students graph the data they collected, and report the results to the class. They make connections between what they found out and other students' findings.	

Resources/Technology:
STC (Science & Technology for Children) Magnets and Motors Unit with both consumable and non-consumable materials

(5 weeks)

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Standard 5.3 Mathematical Applications: All students will integrate mathematics as a tool for problem-solving in science, and as a means of expressing and/or modeling scientific theories.
Standard 5.4 Nature and Process of Technology: All students will understand the interrelationships between science and technology and develop a conceptual understanding of the nature and process of technology.
Standard 5.5: Characteristics of Life: All students will gain an understanding of the structure, characteristics, and basic needs of organisms and will investigate the diversity of life.
Standard 5.10 Environmental Studies: All students will develop an understanding of the environment as a system of interdependent components affected by human activity and natural phenomena.
Interdisciplinary: NJCCCS Technological Literacy 8.1.8A, 8.1.8B; Career Education and Life Skills/Critical Thinking 9.2.8A, 9.2.8C, 9.2.8D

Enduring Understandings (*The big ideas*):
Students will understand the properties of magnifiers. Students will understand the importance of careful observation, and purpose of detailed and accurate records of observations.

Essential Questions:
How do you record observations?
What is the value of accurately recording observations in words and sketches?
What are the properties of lenses?
What are the properties of magnifier?
What are observable properties?
What are the functions of the parts of a microscope?
How do you focus a microscope?
How do you prepare slides?
What is field of view?
How do you identify unknown specimens through observation?
What is the best way to handle living, moving creatures?

Core Content/Objectives		Instructional Actions	
Concepts *What students will know*	Skills *What students will be able to do*	Activities/Strategies *Learning Activities/ Differentiation* *Interdisciplinary Connections*	Assessment *How learning will be assessed*
• In order to magnify a lens must be transparent and curved. • Magnification is directly related to how much a lens is curved • Higher magnification reveals more detail in a smaller area of a	• Determine which of various objects can magnify. • Use magnifiers, including hand lenses and microscopes, to observe living and nonliving specimens.	• Students share prior knowledge of magnifiers and generate questions about magnifiers. • Students learn to use a hand lens and discover something new in an everyday object.	• Teacher observation • Student science journal • Class charts • Small discussion groups • Record sheet • Class discussions

specimen being observed. • In light microscopes, lenses are combined to focus light and increase magnification. • Some living organisms are too small to see without magnification. • Some living organisms are too small to see without magnification. • All living things are made are made of at least one cell. • When magnified, all cells have observable structures • Microorganisms are widespread in nature • Some bacteria are eaten by other microorganisms. • Like all organisms, microorganisms grow and reproduce. • Microorganisms have structures that help them survive in specific environmental conditions.	• Use appropriate equipment and techniques in preparing microscope slides for viewing. • Use a microscope to observe basic cell structure. • Communicate detailed observations through writing, drawing, and discussion. • Make measurements of small objects using hair-widths and millimeters. • Explore ways to slow the movement of living microscopic specimens for closer observation.	• Students make detailed observations • Students record observations in both words and sketches. • Students experiment with different shapes to learn which ones magnify. • Students discover the properties common to all objects that act as magnifiers. • Students acquire background information about the microscope. • Students become aware of the process of focusing a lens. • Students learn the functions of the parts of a microscope. • Students learn how to adjust the light and how to focus the microscope. • Students develop the concept of field of view. • Students measure objects in hair-width, and then more precise measurements in millimeters. • Students prepare wet-mount slides and well slides for their microscopes. • Students learn to focus up and down over the surface of an object that has depth. • Students apply their skills viewing three-dimensional objects under the microscope and identify the unknown specimens through observation. • Students experiment independently with different slides making techniques to practice making light adjustments and focusing. • Students read about Robert Hooke, a scientist and inventor responsible for many improvements of the microscope. He is known for the detailed drawings of the specimens viewed under his microscopes.	• Post-Unit Assessment and/or Additional Assessments which are benchmarked to the curriculum map's standards.

		• Students use the microscope to observe the cells of an onion. They draw and describe their observations. • Students learn the best way to handle living, moving, creatures and how to prepare slides for them. • Students use the microscope to observe volvox, Blepharisma, and vinegar eels. • Students recognize individual microbes on their slide. • Students may observe an organism reproducing by the process of binary fission. • Students experiment with methods for slowing down the vinegar eel. • Students discover that microbes have developed in the hay and grass infusions.	
Resources/Technology: STC Microworlds kit			

(5 weeks)

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Standard 5.3 Mathematical Applications: All students will integrate mathematics as a tool for problem-solving in science, and as a means of expressing and/or modeling scientific theories.
Standard 5.6 Chemistry**:** All students will gain an understanding of the structure and behavior of matter.
Interdisciplinary: NJCCCS Technological Literacy 8.1A, 8.1B; Career Education and Life Skills/Critical Thinking 9.2A, 9.2B, 9.2C, 9.2D

Enduring Understandings (*The big ideas*):
Materials exist throughout our physical world. The structures of materials influence their physical properties, chemical reactivity, and use.

Essential Questions:
What is a mixture?
What is a solution?
What is evaporation?
Can materials be identified by their crystals?
How do you separate a liquid from a solid in a solution?
How do you separate a mixture?
How do you know when a solution has reached saturation?
How do you measure mass?
What is volume? How do you measure volume?
How do you compare the concentration of solutions?
How do you know when a chemical reaction occurs?
Can an unknown chemical be identified by its solubility?

Core Content/Objectives		Instructional Actions	
Concepts *What students will know*	Skills *What students will be able to do*	Activities/Strategies *Learning Activities/ Differentiation* *Interdisciplinary Connections*	Assessment *How learning will be assessed*
• A mixture combines two or more materials that retain their own properties. • A solution forms when a material dissolves in a liquid (solvent) and cannot be retrieved with a filter. • Evaporation can separate a liquid from a solid in a solution • The solid material separated by evaporation from a solution forms distinctive patterns. • Apply content introduced in	• Separate mixtures with a screen and filters. • Separate salt from water in a solution through evaporation. • Measure mass. • Create solutions measuring volume of liquid, and amount of solids. • Compare the mass of solid materials dissolved in saturated solutions. • Identify an unknown material	• Students make mixtures of water and solid materials and separate the mixtures with screen and filters. • Students separate salt from water in a solution. They compare the total mass of a mixture to the mass of its parts. Students evaporate the salt solution. • Students observe salt crystals left when the water in a salt solution has evaporated. • Students separate a dry mixture	• Teacher observation • Student science journal • Class charts • Small discussion groups • Record sheet • Class discussions • Post-Unit Assessment and/or Additional Assessments which are benchmarked to the curriculum map's standards.

previous parts. • A solution is saturated when as much solid material as possible has dissolved in the liquid. • Simple solutions are composed of two components: a liquid solvent and a solid solute dissolved in the solvent. • Solubility is the property that substances have of dissolving in solvents • Solubility is different for different materials and can change with temperature and different solvents. • Salt, Citric-acid and Epsom-salts crystals have specific shapes and patterns. • Concentration is the amount of material dissolved in a measure of liquid. • The more material dissolved in a liquid, the more concentrated the solution. • A concentrated solution can be made more dilute by adding solvent to the solution. • The more material dissolved in a liquid, the more concentrated the solution. • When equal volumes of two solutions made from the same ingredients are compared, the heavier on is the more concentrated solution. • When a change results from mixing two or more materials, that change is a chemical reaction. A reaction results in new products. • Precipitate is a solid material that sometimes forms as a product of a reaction. • Reactants are the active chemicals in a reaction.	by comparing the mass of salt it takes to saturate 50ml of water, and compare the value to other solids. • Identify citric-acid, Epsom-salts and salt crystals. • Observe and compare solutions of different concentrations. • Determine the relative concentrations of three mystery salt solutions. • Observe and identify evidence of a chemical reaction.	using the techniques of filtering and evaporation. • Students make a saturated solution by adding salt to water until no more salt will dissolve. Using a balance, students find the mass of the solution to determine the amount of salt that dissolved in the solution. • Students make a saturated citric-acid solution and compare the solubility of salt and citric acid by comparing the mass of the solid materials dissolved in the saturated solutions. • Students get an unknown material (Epsom salts), determine the mass of salt it takes to saturate 50ml of water, and compare the value to other solids thus identifying the material. • Students observe citric-acid and Epsom-salts crystals and compare them to salt crystals. • Students observe and compare soft-drink solutions that differ in the amount of powder (water held constant) and that differ in the amount of water (powder held constant) to develop the concept of concentrations. • Students make salt solutions and compare their concentrations. Taste is no longer a viable indicator, so students use a balance to determine the relative concentration of the salt solutions. • Students determine the relative concentrations of three mystery salt solutions (which is the most concentrated and which is the most dilute). • Students systematically mix combinations of solid materials (calcium chloride, baking soda, and	

• Some products of a reaction are soluble and can be observed only after evaporating the solution.		citric acid) with water and observe changes that occur. The changes (formation of a gas and a white precipitate) are identified as evidence of a chemical reaction. • Students use techniques from earlier investigations to separate and study the products of the reactions. • Using combinations of the materials previously used, produce chemical reactions in a zip bag. The closed systems allow students to observe the gas more critically.	
Resources/Technology: Foss Mixtures and Solutions kit			

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Enduring Understandings (*The big ideas*):
The sun's energy acts on the Earth's atmosphere, land, water, causing weather.

Essential Questions:
What is the atmosphere?
What is the importance of the atmosphere?
What is weather?
How does the sun affect the atmosphere?
What is the water cycle?
How do we predict the weather?
How do clouds form?
How do storms form?
How do weather systems move?

Core Content/Objectives		Instructional Actions	
Concepts *What students will know*	Skills *What students will be able to do*	Activities/Strategies *Learning Activities/ Differentiation* *Interdisciplinary Connections*	Assessment *How learning will be assessed*
Air is all around us. Air has mass. Weather takes place in the atmosphere. The atmosphere is the layer of gases that surrounds the Earth.	Describe and illustrate the water cycle. Describe conditions in the atmosphere that lead to weather systems and how these systems are represented on weather maps. Explain how technology designed to investigate features of the Earth's surface	Make a flow chart describing the water cycle. Research cloud types. Create own weather instruments. Chart weather conditions using weather instruments.	• Teacher observation • Student science journal • Class charts • Small discussion groups • Class discussions • Record sheet • Post-Unit Assessment and/or Additional Assessments which are benchmarked to the

Conditions in the atmosphere lead to weather systems. Water follows a circular pattern. Water is constantly being recycled.	impacts how scientists study of the Earth. Explain how the tilt, rotation, and orbital pattern of the Earth relative to the sun produces season and weather patterns. Evaluate the strengths and weaknesses of data, claims, and arguments. Communicate experimental findings to others. Identify questions and make predictions that can be addressed by conducting investigations. Design and conduct investigations incorporating the use of a control.	Investigate the idea that air has weight. Keep a weather journal. Examine weather maps to predict weather, utilizing computer models. Research how technology has supported more accurate prediction of weather throughout history.	curriculum map's standards.
Resources/Technology: FOSS Unit: Water Planet (Delta Education) Student Resource Book: *Understanding the Atmosphere* (Scholastic Pub.)			