K-5 Science Curriculum Map

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Overview

The central tenets of District 109's instructional model for science revolve around making sense of phenomena and designing solutions to problems. These two key applications of the scientific endeavor provide meaningful, authentic contexts to motivate accompanying learning experiences. The instructional best practices described below are intended to support these core applications:

Instructional best practices in K-8 science classrooms generally include the following:

- Constructing explanations or models to make sense of phenomena or design solutions to problems.
- Hands-on investigations to generate evidence that can be used to support student claims and arguments.
- Student-centered practices that honor student ideas, questions, and experiences.
- Discussion to facilitate the sharing and revision of student ideas.

Students in kindergarten through fifth grade begin to develop an understanding of the four disciplinary core ideas: physical sciences; life sciences; earth and space sciences; and engineering, technology, and applications of science. In the earlier grades, students begin by recognizing patterns and formulating answers to questions about the world around them. By the end of fifth grade, students are able to demonstrate grade-appropriate proficiency in gathering, describing, and using information about the natural and designed world(s). The performance expectations in elementary school grade bands develop ideas and skills that will allow students to explain more complex phenomena in the four disciplines as they progress to middle school and high school.

Science Standards

Kindergarten Science Curriculum Map

Instructional Resource(s): Smithsonian Science for the Classroom

Unit Title/Description	Inquiry Questions
How can we be ready for the weather? In this unit, students explain two weather-related phenomena and propose solutions to weather-related problems. During the end-of-module science challenge, students pull together what they have learned to decide what they need to be prepared for spending time outdoors. Students will: ● Use models to carry out investigations and determine the causes of weather phenomena. ● Use observations to construct evidence-based explanations of weather-related phenomena caused by different combinations of weather variables (e.g., wind, precipitation, sunlight, and temperature). ● Record and analyze data to identify patterns of the variability in temperature, precipitation, sunlight, and weather-related hazards associated with particular locations and times ● Develop questions based on weather forecast data to anticipate potential problems storms may cause for objects and living things ● Obtain, evaluate, and communicate information from multiple sources to develop plans to mitigate weather-related risks of injury and damage to humans and property.	1. Why did an outdoor structure become wet on one side while remaining dry on the other side? 2. Why does a snowman melt at some times but not others? 3. How can we solve weather-related problems based on location? 4. How can we design a weather preparation plan for a fictional class preparing for an all-day hike at the Smithsonian Environmental Research Center?
How can we change an object's motion? In this unit, students explain a phenomenon and solve a problem related to the game of air hockey. They also explain a second phenomenon related to the game of miniature golf. In the end-of-module science challenge, students explain the phenomenon of a golf ball changing its direction of motion inside a mini golf feature. Students will: ● Use observations to explain how pushes and pulls change an object's motion. ● Carry out an investigation to evaluate the effectiveness of different objects to push a ball into a goal. ● Carry out an investigation to compare the effect of collisions with different materials on an object's motion. ● Design and test a wall for a hockey game that keeps the ball in the game space and allows the ball to score a goal after a collision with the side wall. ● Develop and test a model to figure out what caused a ball to change its direction of motion inside a mini golf feature.	1. What happened to a hockey puck before it moved quickly into a goal? 2. How can we cause a hockey puck to go where we want it to go? 3. How do different materials affect the amount of force imparted to an object? 4. What's going on inside a mini-golf feature that causes a golf ball to change direction?

What do plants and animals need to live? In this unit, students investigate two phenomena and propose solutions to three problems related to what plants and animals need and how Earth's systems support them. In the end-of-module science challenge, students develop plans for a play area that minimizes its impact on the land and the organisms that depend on it. Students will: ● In this unit, students will plan and carry out investigations to answer questions about what plants need to live. ● Use evidence from observations and text to support an argument about what caterpillars need to live and grow. ● Develop and use models to show how caterpillars' webs help them get what they need to live and grow. ● Communicate a solution that reduces the impact of a sidewalk on a tree's ability to get what it needs. ● Develop and use a model to determine which plan to build a play area is best for the system of living things on a piece of land.	1. What is causing radish plants to become unhealthy? 2. What do caterpillars need to live? 3. Why do caterpillars build webs? 4. What is causing a sidewalk to crack, and how can we solve the problem? 5. How can we design a play area that minimizes its impact on the land and the organisms that depend on it?

1st Grade Science Curriculum Map

Instructional Resource(s): Smithsonian Science for the Classroom

Unit Title/Description	Inquiry Questions
How can we predict when the sky will be dark? In this unit, students begin to build an explanation for the phenomenon of the daytime and nighttime skies. In the end-of-module science challenge, students identify the times of the year that it will be dark when kids walk to and from school in a specific town and recommend a light source to use so objects can be seen when kids walk to school in the dark. Students will: ● Analyze and interpret observations of the sky to identify when the Sun, Moon, and stars are visible and the Sun and Moon's daily pattern of motion in the sky. ● Use observations to explain that we see objects when light shines on them or if they give off their own light. ● Compare two models of the Moon to identify which model better represents the observed patterns of the real Moon. ● Plan and carry out an investigation to identify the pattern of daylight throughout the year. ● Carry out an investigation to identify the times of the year that it will be dark when kids walk to or from school. ● Explain how different light sources will allow objects to be seen when kids walk to school in the dark.	1. When are the sun, moon, and stars visible? 2. What allows us to see the objects around us? 3. What patterns do we notice in the motions of the sun and moon? 4. How does the amount of daylight vary by season? 5. How can we find our way in the dark?
How can we send a message using sound? In this unit, students solve the problem of sending a message using sound using a variety of methods and media. In the end-of-module design challenge, students apply what they have learned about sound and engineering to make a simple musical instrument that can send a message a short distance. ● Identify the problem of how to send a message a long distance. ● Learn that patterns of sounds can be used to send a message without speaking. ● Collect evidence to build a claim that sound is caused by something vibrating ● Test different materials to find the ones that make the best kazoo. ● Construct an explanation for how we hear. ● Use their understanding of sound to make a simple musical instrument that can send a message.	1. How can we send messages over long distances? 2. What causes sound? 3. How does our body allow us to hear sound? 4. How can we figure out which solution is best for creating the sound we intend?

How do living things stay safe and grow? In this unit, students explore similarities and differences between young and adult plants and animals and how behavior and external parts help living things survive. For the end-of-module science challenge, students engage in argument from evidence, constructing and communicating an explanation of how patterns of behavior and the structure and function of plants and animals can help living things survive. Students will: ● Use observations of adult plants and animals as evidence that offspring are very similar to, but not exactly like, their parents. ● Obtain information from text, images, video, and a simulation to determine how patterns of behavior help offspring survive. ● Explore how external parts of plants and animals help them survive, grow, and meet their needs . ● Mimic external parts of plants and animals in designing a tool to solve a human problem. ● Apply their knowledge of behaviors and external parts to "survive" in a hypothetical game.	1. How can we use similarities and differences to categorize living things? 2. How much are offspring like their parents? 3. How do the structures and behaviors of living thighs help them survive? 4. How can we learn from plants and animals to help us solve problems?

2nd Grade Science Curriculum Map

Instructional Resource(s): Smithsonian Science for the Classroom

Unit Title/Description	Inquiry Questions
What can maps tell us about land water on earth? In this unit, students explore the patterns of land and water on Earth and how they can represent those patterns with models, including maps. During the end-of-module science challenge, students make a two-dimensional map of their three-dimensional models of land and water. Students will: ● Obtain information about and develop models of the kinds of land and water on Earth. ● Plan and carry out an investigation into the properties of solid and liquid water ● Obtain information from models and informational text about the patterns of land, solid water, and liquid water on Earth. ● Obtain information from historical maps to determine patterns of how maps represent land and water. ● Develop symbols for land and water and create their own legend ● Develop and use a two-dimensional map of their three-dimensional model of land and water.	1. How can we use models to represent different shapes and kinds of land and water? 2. How do the properties of solid and liquid water differ? 3. Where on Earth can we find solid and liquid water? 4. How can we use symbols to help us find different types of land and water?
How can we change solids and liquids? In this unit, students explore how solids and liquids can change by heating, cooling, building up, carving, and taking apart. In the culminating science challenge, students identify the best material for a replica gemstone based on its properties. ● Organize solids by color, shape, and hardness. ● Obtain information from a text about how hard and soft materials are used to make different types of sculpture. ● Carry out investigations to see whether a sculpture made from pieces can be taken apart and made into a different sculpture. ● Argue from evidence for whether sand is a solid or a liquid. ● Analyze data from tests to find the best material to use in a cold pack. ● Construct an explanation for how a silver necklace can be made starting from wax wrapped in clay. ● Plan and carry out investigations to find the best material for a replica gemstone.	1. How can we use the properties of materials to categorize them? 2. How does a material's properties affect its suitability for different purposes? 3. Why are some changes in a material's properties reversible while others are not? 4. How can we decide on the most suitable material for creating a replica gemstone?

How can we find the best place for a plant to grow? In this unit, students investigate what plants need to live, grow, and reproduce, as well as how these factors are parts of a system that work together in each plant's habitat. In the science challenge, students use their knowledge of plant needs to decide where to plant two types of seeds. Finally, students use their knowledge and evidence accumulated throughout the lessons to construct an explanation for the disappearance of the grand spider orchid. Students will: ● Ask questions about what plant habitats have that help plants live, grow, and reproduce. ● Investigate whether plants need light and water to grow. ● Design a hand pollinator based on bee structure and function. ● Analyze data about plant and animal ranges to identify patterns. ● Engage in argumentation, based on information from a map, about the best place for new plants in a schoolyard. ● Construct an explanation for why there are fewer and fewer grand spider orchids every year.	1. What do plants need to grow and reproduce? 2. How do the structures of plants and animals relate to their functions? 3. How can we solve the problem of decreasing pollinator populations? 4. How does changes in a species' population impact other species?

3rd Grade Science Curriculum Map

Instructional Resource(s): Smithsonian Science for the Classroom

Unit Title/Description	Inquiry Questions
How do weather and climate affect our lives? In this unit, students learn why and how scientists measure weather. In the final science challenge, students analyze and interpret patterns in climate data to recommend the best time and location for a kids' soccer tournament. Students will: ● Carry out an investigation to determine if weather can vary over short distances. ● Analyze the function of an anemometer in order to adjust the structure and improve the function. ● Represent data on bar graphs to identify annual weather patterns. ● Design, build, and test a roof to withstand the effects of a climate with heavy precipitation. ● Analyze and interpret patterns in climate data to make a claim about which month would be best to host a soccer tournament in a particular city.	1. Why measure weather? 2. What does weather in the past tell us about weather in the future? 3. How does climate affect the way buildings are designed? 4. How can climate and weather data help us plan a soccer tournament?
How can we predict patterns of motion? In this unit, students explore how objects can exert forces on other objects and predict an object's future motion based on observations of patterns of motion. As a final science challenge, students plan and carry out an investigation to answer a question about how magnets affect the pattern of motion of a steel pendulum. They use their data to predict the future motion of their swing and write a claim that answers their question. Students will: ● Ask questions about what causes objects to move. ● Predict patterns of motion of a pendulum. ● Investigate forces that can act at a distance. ● Investigate the properties of permanent magnets and electromagnets. ● Design a solution to a problem that can be solved using a magnet. ● Ask questions about and investigate how magnets affect a steel pendulum’s motion.	1. How do forces applied by touch affect an object’s motion? 2. How can we observe and measure repeating patterns of motion? 3. What kinds of forces can act at a distance? 4. How can magnets be used to solve problems? 5. How can magnets affect the pattern of motion of a pendulum?
How can we protect animals when their habitat changes? In this unit, students explore the topic of what animals need to survive and how animals are affected when their habitat changes. In the culminating design challenge, students apply what they have learned about science and engineering to build and test a tunnel that can stop salamanders from being killed when crossing roads. Students will: ● Identify the problem of animal population decline caused by habitat change. ● Design a classroom habitat where roly polys can survive. ● Use camera trap data to explain why different animals live in different habitats. ● Compare fossils to modern organisms to explain that habitats on Earth have changed. ● Use a model of a tiger habitat to explain why tiger populations have declined. ● Design a salamander tunnel that will reduce the deaths of salamanders on roads.	1. What do animals need to survive? 2. Why do animals live in different habitats? 3. What can fossils tell us about animals and habitats? 4. What happens to animals when their habitat changes? 5. How can we reduce salamander deaths on roads?

4th Grade Science Curriculum Map

Instructional Resource(s): Smithsonian Science for the Classroom

Unit Title/Description	Inquiry Questions
What is our evidence that we live on a changing Earth? In this unit, students identify, analyze, and communicate evidence that we live on a changing planet. In the science challenge, students apply what they have learned to create a museum exhibit explaining that a variety of forms of evidence tell us that we live on a changing Earth. Students will: ● Analyze models of Earth, maps and globes, identifying patterns in the locations of major topographic features and occurrences of earthquakes and volcanoes. ● Obtain information about the hazards associated with earthquakes and volcanoes and ways humans monitor such Earth processes. ● Explain differences between wind-driven ocean waves and tsunami waves. ● Design and test models of earthquake-resistant buildings. ● Investigate weathering and erosion processes and explain the roles these processes have in changing the landscape. ● Use fossils and structures found in rock layers to explain the appearance of former landscapes. ● Propose a Smithsonian exhibit on Our Changing Earth that answers the module question.	1. How do volcanoes and earthquakes affect humans? 2. How can humans protect themselves from earthquakes? 3. How do Earth processes change the landscape? 4. How do rock layers show that landscapes change? 5. How can we use evidence to tell the story of a changing Earth?
How can we provide energy to people's homes? In this unit, students explore how energy moves and changes, as well as how people obtain sources of energy and convert them for practical purposes. In the culminating design challenge, students apply what they have learned about electrical systems to design, build, test, and optimize a solar-powered doorbell system for a model house. Students will: ● Observe evidence of energy in systems and explore how that energy moves and changes. ● Research how people obtain sources of energy for practical purposes. ● Explain that some sources of energy affect the environment more than others. ● Investigate how their designs affect the success of a student-built device. ● Use their understanding of science and engineering to design and test a model house doorbell system that runs on solar energy.	1. How does energy transfer and change? 2. What are the advantages and disadvantages of the different energy resources used to generate electricity? 3. How does electricity power our devices? 4. How can you design a house that runs on renewable energy?

How can animals use their senses to communicate? In this unit, students investigate how animals, including humans, use their internal and external structures to sense the world around them, process information, communicate information to others, and react accordingly. For the culminating science challenge, students analyze data based on testing with models to construct an argument about which firefly flash patterns would be most effective for finding a mate. Students will: ● Analyze structures that support animals' senses and investigate how light travels when they see an object. ● Investigate how information is processed in the brain and analyze data to determine how memories can affect behaviors. ● Carry out an investigation into whether fiddler crabs wave more often when there are other crabs present and analyze the system in terms of sender, signal, and receiver. ● Design and test a method for sending information about a picture using 1s and 0s and short and long flashes of light. ● Construct an argument based on testing with models for which firefly flash patterns are the most effective for communicating to find a mate.	1. How can animals sense the world around them? 2. How can animals process and respond to information? 3. How can animals send and receive information to communicate? 4. What are some challenges in communication? 5. How can fireflies communicate to attract a mate?

5th Grade Science Curriculum Map

Instructional Resource(s): Smithsonian Science for the Classroom

Unit Title/Description	Inquiry Questions
How can we provide freshwater to those in need? In this unit, students explore the topic of water scarcity and the various ways humans have attempted to get water to where it is needed. In the culminating design challenge, students design a solution to the problem of providing freshwater to agriculture, industry, the environment, and housing within their town. Students will: ● Define the problem of human's need for freshwater and the limited amount of freshwater available. ● Develop a model to show how human activities interact with components of the Earth's system to cause groundwater pollution. ● Design, test, and evaluate different solutions for treating contaminated water. ● Use a digital simulation to design and test a solution to the problem of water scarcity. ● Communicate two perspectives on the causes and effects of an environmental crisis. ● Design, test, and evaluate a solution to pump, treat, and allocate water in a particular town.	1. Where does the water you need come from? 2. How have humans impacted the water we need? 3. How have humans tried to solve the problem of getting freshwater to where it's needed? 4. How can we provide freshwater to agriculture, industry, the environment, and housing in your town?
How can we identify materials based on their properties? In this unit, students learn how they can use the properties of materials to identify those materials. In the culminating science challenge, students apply what they have learned about material properties to identify four unknown solids. Students will: ● Compare six solids using just senses and argue from evidence that sugar and cornstarch are made by plants. ● Draw models to show that the dissolving of sugar in water and the evaporation of a sugar solution can be explained by very small particles. ● Obtain information from a text to explain that salt is added to roads in the winter to lower the freezing point of water. ● Carry out an investigation to show that mixing solids with vinegar and iodine can result in something new being formed. ● Graph weight before and after mixing to show that in any change the weight remains the same. ● Argue from evidence that four unknown solids can be identified based on their properties.	1. How can we use our senses to compare materials? 2. What happens when materials are mixed with water? 3. How do heating and cooling affect materials? 4. Does mixing materials together form a new material? 5. How can we identify unknown kitchen materials?

How can we predict change in ecosystems? In this unit, students explore how plants and animals get the matter and energy they need to live and grow, how change in one part of an ecosystem can have multiple effects, and how newly introduced species can become invasive. For the culminating science challenge, students analyze data, develop and use models, and engage in argumentation to make a prediction about which of two coastal locations is likely more susceptible to an invasion by a nonnative species. Students will: ● Carry out investigations to provide evidence that plants get most of their matter from air and water. ● Analyze data showing that animals get both matter and energy by consuming food. ● Develop and use food web models to track matter and energy flows in ecosystems. ● Obtain information about the causes and effects of invasive species. ● Use models to support a prediction about which of two coastal locations is more likely to be invaded by a nonnative sea squirt.	1. How can plants get what they need to live and grow? 2. How can animals get what they need to live and grow? 3. How do matter and energy flow through ecosystems? 4. What affects the stability of ecosystems? 5. How can we use models to make predictions about invasive species?