Elementary Science

Scarsdale elementary classrooms have completed the transition to the NYS Science Learning Standards. Currently, all kindergarten through third-grade classrooms are using the *Science 21* curriculum as a basis for meeting these new science learning goals. Fourth-grade classrooms are using the *Smithsonian Science* curriculum and fifth-grade classrooms are using a combination of curricula from *Science 21* and *Smithsonian Science*.

SCIENCE 21 VISION STATEMENT

The Science 21 Elementary Science Curriculum Project envisions science classrooms as a learning environment where all students learn the practices, core ideas, and crosscutting concepts of science and engineering to become independent and collaborative problem-solvers, and self-directed learners in their present and future lives. In such an environment students will:

- Engage in the active **construction of essential core ideas** in science and engineering that is developmentally appropriate and relevant to their lives in the life sciences, earth/space sciences, physical science, and engineering.
- Be encouraged to **evaluate phenomena** and then construct meaning through hands-on activities using appropriate materials and skills.
- Be encouraged to **identify real-world human problems**, designing solutions, evaluating solutions and communicating this information in a variety of ways including spoken, written, pictorial, graphical, and mathematical forms.
- Engage in a variety of child-centered learning experiences where they can **apply Science and Engineering Practices and Crosscutting Concepts** to other disciplines and in areas beyond the classroom.
- Be **assessed in a variety of ways**, including performance tasks, exhibitions, and written and oral tests and portfolios, to demonstrate what they know and can do in science.

Kindergarten Science

Weather and Climate

- Demonstrate an understanding that the Sun warms the Earth by identifying the relative temperature of various surfaces.
- Understand what makes a fair test (controlled experiment) by creating an investigation to examine solar energy.

- Design a structure that protects an ice cube from solar energy.
- Explore how to gather information to predict and prepare for severe weather.
- Identify trends/patterns in weather that are typical of a time of year (or a season) and use data to make predictions.

Forces and Interactions: Pushes and Pulls

- Discover various pushes and pulls in their surroundings.
- Investigate the relationship between cause and effect when a strong or gentle force acts on an object.
- Understand the effect that force has on the way things move when they are pushed, pulled, or collide.
- Use arrows to create models to visualize and describe the strength and direction of forces applied when an object is pushed or pulled.
- Design, test, and improve a solution to solve a problem.

Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment

- Identify classroom resources and how to conserve them.
- Stop waste from going to landfills by learning to sort and recycle their snack waste.
- Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.
- Design an experiment to test if a plant needs water and light to grow, and draw a conclusion using evidence.
- Create a ladybug habitat that includes food, water, shelter, and air for survival.

First Grade Science

Space Systems: Patterns and Cycles The Sun, Moon, and Stars

- Observe and record the changes in the sun over a day and throughout the year, how the Moon's illumination changes each day, how the stars can be seen, and the amount of daylight changes over the course of a year.
- Investigate the changes throughout the day of an object's shadow and explain a pattern based on the changing position of the Sun.
- Utilize a data collection tool to identify that differing amounts of daylight are seen at different times of the year.
- Chart and describe changes that occur in the appearance of the Moon over a 20-day period and identify a pattern in the lunar cycle.

Waves: Light and Sound

- Discover the cause-and-effect relationships between vibrations and movement.
- Investigate how sound and light behave in unique ways when they encounter different materials.
- Collect evidence that they can see objects only when they are illuminated.
- Plan and conduct investigations showing the relationship between vibrations and sound.
- Design and redesign “phones” to test which one communicates sound the best over a distance.

Structure, Function, and Information Processing

- Identify and describe patterns in the behaviors of parents and offspring that help offspring survive.
- Argue from evidence using physical characteristics that young plants and young animals are similar to but not exactly like their parents.
- Observe and record how plants and animals use their external parts to overcome challenges to survival.
- Identify real engineering solutions and the external parts of plants and animals that inspired them.
- Design, create, and wear a device that helps them survive, grow, or meet their needs using inspiration from the external parts of plants and animals.

Engineering is Elementary - The Best of Bugs: Designing Hand Pollinators

- Conduct investigations to discover that plants have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow.
- Identify that everyday objects designed by people as solutions to problems are examples of technology.
- Investigate the parts of a flower and the parts of a bee. Recognize that a system may fail if a part of it is missing or is not working.
- Conduct a fair test to determine which materials and properties of materials are good or poor choices for a design that can mimic a bee’s ability to pick up and deposit pollen.
- Use the Engineering Design Process to engineer their own technologies for pollinating plants by hand.

Second Grade Science

Structure and Properties of Matter

- Observe, describe, sort, and classify materials based on their properties and use.

- Plan and carry out investigations to determine the flexibility and absorbency of various materials.
- Analyze data to choose the best material for creating small-scale 3D models of playground equipment.
- Use the Engineering Design Process and knowledge of the properties of materials to build a bridge and/or to support a book above a surface.
- Observe changes in substances as they are heated and cooled and categorize them as reversible or non-reversible.

Earth's Systems: Processes that Shape the Earth

- Identify that Earth's events can occur quickly or slowly.
- Research informational sources to make and support evidence-based claims about Earth's changes.
- Plan and carry out an investigation on how wind and rain cause erosion.
- Develop a model to test and compare design solutions to slow or prevent erosion.
- Research, record, and communicate characteristics of different landforms.

Interdependent Relationships in Ecosystems

- Plan and carry out an investigation to determine whether plants need sunlight and water to grow.
- Investigate the relationship between the unique structures of plants and animals and their functions.
- Use models to communicate how animals depend on plants or other animals for food.
- Use the Engineering Design Process to create a model of a seed that can be carried by wind, water, or an animal.
- Make and record observations about different habitats and recognize patterns in the diversity of life.

Third Grade Science

Forces and Interactions

- Create a model to demonstrate an understanding of the different strengths and directions of forces needed to balance an object.
- Plan and conduct an investigation to demonstrate how friction can affect the motion of an object.
- Investigate the motion of a pendulum and make predictions of its future motion.

- Discover the cause-and-effect relationship responsible for magnetic attraction and repulsion.
- Design a magnetic device to solve a real-world problem.

Interdependent Relationships in Ecosystems

- Demonstrate an understanding that fossils may have formed a very long time ago.
- Analyze and interpret data about animals, plants, and habitats to develop a model that shows whether a species is suited for one or more habitats.
- Use data to support a claim that being a part of a group helps some animals obtain food, water, shelter, and protection from predators.
- Use evidence from a model of an ecosystem to argue that a change in a habitat will affect the organisms living there in specific ways.
- Balancing the constraints of time, cost, and materials, evaluate the merit of a solution to a problem caused by an environmental change that may affect the organisms in a habitat.

Weather and Climate

- Gather and interpret weather and climate data over periods of time to predict future patterns.
- Plan and conduct an investigation to discover the relationship between the water cycle and the weather.
- Represent data in a bar graph and predict patterns in weather.
- Evaluate the effectiveness of design solutions for various weather hazards and support claims with evidence.
- Analyze and interpret climate/weather patterns of four vacation destinations to support an argument for which city is most desirable to visit.

Inheritance and Variation of Traits

- Develop a model to demonstrate an understanding that plants and animals have traits inherited from parents.
- Identify and explain how variation in traits of the same species can be beneficial for survival.
- Use data to identify environmental factors that can change some traits of organisms and determine if the new trait gives the species a survival advantage.
- Develop models demonstrating the unique and diverse life cycles of plants and animals.

Engineering is Elementary - The Attraction is Obvious: Designing a Maglev System

- Identify that everyday objects designed by people as solutions to problems are examples of technology
- Investigate properties of magnets
- Use the Engineering Design Process to design, test, and improve their own tabletop maglev transportation systems
- Troubleshoot and learn from failure
- Understand the central role of materials and their properties in engineering solutions

Fourth Grade Science

Smithsonian Science

How can animals use their senses to communicate?

- 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.
- Explore the senses, including how light travels when we see an object.
- Compare and contrast animal eyes and analyze how their structures support different survival needs.
- Explore how the brain processes information through experiencing optical illusions and analyze data from research into how birds can learn to avoid distasteful insects.
- Investigate how animals can communicate with each other using a variety of signals.
- Consider problems in communication and explore how humans can communicate over great distances in very little time using digital signals.
- Analyze data based on testing with models to construct an argument about which firefly flash patterns would be most effective for finding a mate.

What is our evidence that we live on a changing earth?

- Identify, analyze, and communicate evidence that we live on a changing planet.
- Analyze global maps to find patterns in the locations of Earth features and in the occurrence of earthquakes and volcanic eruptions.
- Explain how these two processes cause specific hazards to humans and compare the structure of one of those hazards, tsunami waves, to wind-driven ocean waves.

- Define problems associated with earthquake shaking. Students read about engineering solutions to such problems and design, build, and test models of earthquake-resistant buildings.
- Investigate additional Earth processes that affect the landscape: weathering and erosion
- Create models of mountains to test the effects of rainfall, vegetation, earthquakes, wind, and glaciers on landforms.
- Consider what clues can be found in rock layers to serve as evidence of past landscapes.
- 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.

How can we provide energy to people's homes?

- Explore how energy moves and changes, and how people obtain sources of energy and convert them for practical purposes.
- Observe phenomena—motion, light, sound, and heat—that provide evidence of the presence of energy, and track how energy moves and changes in systems.
- Observe that electrical energy moves via electric current and can be changed into other forms of energy.
- Obtain and combine information about the advantages and disadvantages of using various natural resources to generate electricity and identify the best energy resource solution for four real-world locations, based on criteria and constraints.
- Obtain information about how energy gets from power plants to homes, and explore simple electric circuits.
- Design and build electric devices that serve specific purposes.
- Apply what they have learned about electrical systems to solve an engineering problem: to design, build, and test a power system that enables multiple electronic devices to function independently from one another.

How does motion energy change in a collision?

- Explore how motion energy can change in a collision by being transferred to either heat, light, or sound and moving to another object.
- Use evidence from collisions to construct a claim that faster objects have more motion energy.
- Carry out an investigation into how the surface affects how far an object slides and how air can slow objects down.

- Construct an explanation that motion energy causes air to heat up and discover that a helmet can protect our brain by changing motion energy to heat.
- Design a helmet using an egg as a model for the head.

Fifth Grade Science

Science 21

Space Systems: Stars and the Solar System

- Engage in a high-interest kinesthetic activity (a game of “shadow tag”), then investigate daily and monthly patterns involving the apparent motion of the sun, moon, and stars.
- Predict what will happen in various scenarios involving changing shadows, phases of the moon, and cyclical patterns of star constellations.
- Identify cause and effect relationships to make sense of change. Changes include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year.
- Analyze and interpret data to support the practice of engaging in argument from evidence.

Structure and Properties of Matter

- Collaborate with others to plan investigations of phenomena and use observations, measurements, and graphs as evidence to support their ideas.
- Create different models to make sense of how the tiny particles that makeup solids, liquids, and gases (matter) behave.
- Utilize models to explain their understanding of everyday phenomena, such as melting ice, dissolving salt, evaporating water, and chemical reactions.
- Perform a fair test investigation to determine the perfect recipe for slime while discovering when two or more different substances are mixed, a new substance with different properties may be formed.

Smithsonian Science

How can we predict change in ecosystems?

- Explore how plants and animals get the matter and energy they need to live and grow, how they interact in food webs, how a change in one part of an ecosystem

can have various effects, and how newly introduced species can sometimes become invasive.
- Through a series of investigations, discover what contributes most of the matter to plant growth.
- Analyze data from studies on food intake and weight of animals along with observations of energy transfer from food items to build the case that animals get both matter and energy by consuming food.
- Trace matter and energy through complex food web interactions.
- Observe what happens when one component of an ecosystem changes and use models to make predictions about how the introduction of a top predator can affect even the bottom of a food web.
- 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 non-native sea squirt.

How can we provide fresh water to those in need?

- Explore the topic of water scarcity and the various ways humans have attempted to get water to where it is needed.
- Collect evidence and experiences on their water footprints and on how little accessible freshwater actually exists.
- Create a water scarcity–based public service announcement for a region in distress.
- Solve a water pumping challenge, develop models based on the interaction of Earth's four spheres, and then design a solution to a water pollution problem.
- Utilize a digital game and a newspaper activity to see how humans have tried to solve the global and regional problems of getting fresh water to where it's needed and raise awareness of the unintended consequences of our solutions
- Take on the role of various key stakeholder groups and collaboratively design solutions to the water access, treatment, and allocation issues facing individuals and communities around the Earth.