Middletown Township Public Schools

Elementary Science Guidelines <u>for Parents</u> 2018-2019

The Elementary Science Curriculum is aligned to the *Next Generation Science Standards* (NGSS) adopted by the State of New Jersey in July 2014 and approved by Middletown Board of Education on May 23, 2017 and was the last step in full implementation of the NGSS K to 12, extending the preliminary work at the elementary level during the past three years which focused on the <u>Eight Science and Engineering Practices</u> and how they intersect with the New Jersey Learning Standards.

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

"Learning to read, write, and speak about science in K-5 is not the same thing as learning science. They intersect, not replace good science instruction". **--Mike Heinz, Science Coordinator, NJ State Dept. of Education**

All students should engage in science experiences that promote the ability to ask, find, or determine answers to questions derived from natural curiosity about everyday things and occurrences. The underpinning of the revised standards lies in the premise that ***science is experienced as an active process in which inquiry is central to learning and in which students engage in observation, inference, and experimentation on an ongoing basis, rather than as an isolated a process.*** *When engaging in inquiry, students describe objects and events, ask questions, construct explanations, test those explanations against current scientific knowledge, and communicate their ideas to others in their community and around the world. They actively develop their understanding of science by identifying their assumptions, using critical and logical thinking, and considering alternative explanations.*

NOTE: Due to the hands-on nature of "Next Generation Science Standards" and the important lab experiences involved, attendance in science class is important.

1. Program / Instructional Materials:

Effective September 2017, all classes use the *STEMscopes* Program from Accelerated Learning as their primary tool for science instruction. This program is aligned to the *Next Generation Science Standards* (NGSS), was piloted in twelve classrooms (one per school, two per grade) during the 2016-2017 school year, and has been primary adopted tool for science instruction in our middle schools since September 2016. As the program is entirely digital, it is updated regularly to remain current. In addition to lab activities, intervention and acceleration activities, videos, and readings, each unit is arranged to include the "Five E" components (Engage, Explore, Explain, Elaborate and Evaluate).

In grades 3 to 5, the teacher has the ability to electronically assign activities to the students to do either individually or as a group in class. In addition, all students are given a *STEMscopes* account that allows access to the program at home.

2. Assessments:

Teachers assess the students' progress in learning the curricular objectives as stated in the NJ Model Curriculum for Science. District-wide assessments are administered toward the end of each marking period to ensure consistency in teaching the new standards. Beginning in kindergarten, students learn to use the "Claim-Evidence-Reasoning" (CER) format for writing about science. Students in grades K-2 are only required to use "Claim-Evidence" components in their writing about science.

In addition to state assessments in language arts and mathematics, the state assessment for Science will be administered state-wide again this spring to students in **fifth grade** (as well as in eighth and eleventh grades) in order to measure student progress in the achievement of the required standards.

3. Curricular Objectives / Standards by Grade Level:

KINDERGARTEN:

SCIENCE PRACTICES
• Ask questions, analyze data, make observations, and communicate findings/solutions.
• Use a drawing or model to illustrate a concept, represent a relationship, or solve a problem.
EFFECTS OF THE SUN
• Understand the effect of sunlight on Earth's surface.
WEATHER
• Describe weather patterns over time and understand the purpose of weather forecasting.
PUSHES AND PULLS
• Understand the effects of different strengths/directions of pushes/pulls on the motion of an object.
BASIC NEEDS OF LIVING THINGS
• Understand the needs of plants and animals to survive.
• Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.
BASIC NEEDS OF HUMANS
• Understand the impact of humans on the land, water, air, and/or other living things in the local environment.

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FIRST GRADE:

SCIENCE PRACTICES
• Ask questions, analyze data, make observations, and communicate findings/solutions.
• Use a drawing or model to illustrate a concept, represent a relationship, or solve a problem.
LIGHT AND SOUND
• Understand the effect of light on objects, including those made with different materials.
• Understand that vibrating materials can make sound and that sound can make materials vibrate
COMMUNICATING WITH LIGHT AND SOUND
• Describe ways in which light or sound can communicating over a distance.
PATTERNS OF CHANGE IN THE NIGHT SKY
• Describe patterns that can be predicted with regard to the sun, moon, and stars.
• Understand the effect of different times of year on the amount of daylight.
CHARACTERISTICS OF LIVING THINGS
• Understand that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.
• Describe patterns in behavior of parents and offspring that help offspring survive.
MIMICKING ORGANISMS TO SOLVE PROBLEMS
• Understand how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

SECOND GRADE:

SCIENCE PRACTICES
• Ask questions, analyze data, make observations, and communicate findings/solutions.
• Use a drawing or model to illustrate a concept, represent a relationship, or solve a problem.
RELATIONSHIPS IN HABITATS
• Understand the diversity of life in different habitats.
• Explain why plants need sunlight and water to grow and how an animal functions in dispersing seeds or pollinating plants.
PROPERTIES OF MATTER
• Classify different kinds of materials by their observable properties.
• Understand that materials have the properties that are best suited for an intended purpose.
CHANGES TO MATTER
• Understand that an object made of a small set of pieces can be disassembled & made into a new one.
• Explain that some changes caused by heating or cooling can be reversed and some cannot.
THE EARTH'S LAND AND WATER
• Identify where water is found on Earth and that it can be solid or liquid.
• Understand the shapes and kinds of land and bodies of water in an area.
CHANGES TO EARTH'S LAND
• Explain how Earth events can occur quickly or slowly.
• Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.

THIRD GRADE:

SCIENCE PRACTICES
• Ask questions, analyze data, make observations, and communicate findings/solutions.
• Use a drawing or model to illustrate a concept, represent a relationship, or solve a problem.
WEATHER AND CLIMATE
• Describe typical weather conditions expected during a particular season and in different regions of the world and explain solutions that reduce the impacts of weather-related hazards.
FORCES AND MOTION
• Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
• Understand how patterns can be used to predict future motion.
ELECTRICAL AND MAGNETIC FORCES
• Explain cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.
TRAITS
• Understand that plants and animals have traits inherited from parents, that variation of these traits exists in a group of similar organisms, and that traits can be influenced by the environment.
CONTINUING THE CYCLE
• Understand that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death; and explain how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, & reproducing.
ORGANISMS AND THE ENVIRONMENT
• Understand that some animals form groups that help members survive and that in a particular habitat some organisms can survive well while some cannot survive at all.
USING EVIDENCE TO UNDERSTAND CHANGE IN ENVIRONMENTS
• Understand how fossils provide evidence of organisms and the environments in which they lived long ago, and explain solutions to a problem caused when the environment changes and the types of plants and animals that live there may change.

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FOURTH GRADE:

SCIENCE AND ENGINEERING PRACTICES
• Ask questions, analyze data, make observations, and communicate findings/solutions.
• Design and/or use a drawing or model to illustrate patterns or a concept, represent a relationship, or solve a problem.
• Generate and compare multiple possible solutions to a problem.
• Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
WEATHERING AND EROSION
• Explain the effects of weathering/rate of erosion by water, ice, wind, or vegetation; and the changes in a landscape over time.
EARTH PROCESSES
• Describe patterns of Earth's features and explain how to reduce the impacts of natural Earth processes on humans.
STRUCTURE AND FUNCTION
• Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
HOW ORGANISMS PROCESS INFORMATION
• Understand that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways—for example, that light reflecting from objects and entering the eye allows objects to be seen.
TRANSFER OF ENERGY
• Understand that energy can be transferred from place to place by sound, light, heat, and electric currents.
• Understand that energy and fuels are derived from natural resources and explain how their uses affect the environment.
FORCE AND MOTION
• Explain how the speed of an object relates to the energy of the object.
• Explain changes in energy that occur when objects collide.
USING ENGINEERING DESIGN WITH FORCE AND MOTION SYSTEMS
• Understand how energy converts from one form to another.
WAVES AND INFORMATION
• Describe waves in terms of amplitude and wavelength and understand that waves can cause objects to move.

FIFTH GRADE:

SCIENCE AND ENGINEERING PRACTICES
• Ask questions, analyze data, make observations/measurements, and be able to communicate/support findings/solutions.
• Design and/or use a model or graphical display to illustrate patterns or a concept, represent a relationship, or solve a problem.
PROPERTIES OF MATTER
• Identify materials based on their properties, and understand that matter is made of particles too small to be seen.
CHANGES TO MATTER
• Understand that, regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.
• Determine whether the mixing of two or more substances results in new substances.
ENERGY AND MATTER IN ECOSYSTEMS
• Understand that plants get the materials they need for growth chiefly from air and water.
• Describe the movement of matter among plants, animals, decomposers, and the environment; and that energy in animals' food was once energy from the sun.
WATER ON THE EARTH / EARTH SYSTEMS
• Explain distribution of water on Earth.
• Describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
• Explain ways individual communities use science ideas to protect Earth's resources & environment.
INTERACTIONS WITHIN THE EARTH, SUN, AND MOON SYSTEM
• Understand that the apparent brightness of the sun and stars is due to their relative distances from the Earth.
• Describe patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

The district **Elementary Standards-Based Report Card** aligns with the objectives reflected in the *Next Generation Science Standards* as listed above. Rubrics to help parents better understand their child's progress as assessed on the report card can be found on the district website.

4. OTHER

Students in grades three through five will continue to take a science field trip to **Poricy Park** this year as in the past. The third grade trip is entitled "Pond Study", the fourth grade trip is entitled "Geo Exploration", and the fifth grade trip is entitled "Matter Matters". The trips are aligned with the NGSS and support the adopted curriculum.