Kindergarten Science Curriculum BOE Presentation

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Purpose - Request

- The Science and Early Childhood Offices request that the Kindergarten Science Curriculum be approved by the Board of Education for implementation for the 2025-2026 school year.

K-Science Standards Alignment

Maryland Science Standards

Science instruction in Maryland schools aims for all students to successfully achieve the ambitious vision of Maryland's **Next Generation Science Standards (NGSS).** The standards include rigorous performance expectations for each level of school and seamlessly incorporate the practices of science with the content of science. For more information on Maryland's Science Standards, please contact the Science Coordinator or follow this link: https://www.nextgenscience.org.

Maryland Environmental Literacy Standards

Environmental Literacy instruction in Maryland schools aims to equip all students with the knowledge and understanding to make decisions and to take actions that create and maintain an optimal relationship between themselves and the environment with an emphasis on the preservation and protection of the unique natural resources of Maryland including the Chesapeake Bay and its watershed. For more information on Environmental Literacy in Maryland, please contact the Environmental Literacy Specialist or navigate to Maryland's Environmental Literacy Program page.

Maryland
STATE DEPARTMENT OF EDUCATION

Rationale

Goal: High quality science curriculum to further align to the Maryland Science Standards (NGSS)

- **Gap Analysis** (K-5) using NGSS Evidence Statements
  - Revealed areas for improvement
    - Depth of science concepts
    - Inquiry based science instructional practices (pedagogy)
    - Integration of content, concepts, and practices in science and engineering

PROGRESS - TIMELINE

2023

- **Comprehensive K-Science Curriculum Team** was formed & bundled standards (Writing Team & Review Team)
- Drafted **Curriculum Maps** & **Earth Space Science** (ESS) unit by Writing Team

2024

- Drafted **Physical Science** (PS) and **Life Science** (LS) units by Writing Team
- Review Team provided **feedback, support and assistance** to finalize all units

2025

- Science Office **reviewed, revised, edited written curriculum** and uploaded to **K-Science Canvas** course

Comprehensive Curriculum Team

Writing Team

- Six Team Members
  - Diverse HCPS schools
    - HWES, NHES, RFES, RPES, HXES, BFES
  - Current kindergarten teachers

Review Team

- Eight Team Members
  - Diverse HCPS schools
    - HWES, NHES, RPES, HXES, BFES, HDES, GLES
  - 4 current kindergarten teachers
  - 3 former kindergarten teachers
    - 2 second grade teachers
    - 1 prek teacher
  - 1 first grade science curriculum writer

K-Science Curriculum

Weather and Sun's Energy

Unit Essential Questions

- What is a scientist?
- What is weather?
- How does weather affect daily life?
- What are some ways people adapt to different types of weather?

K.Weather and Climate

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Students who demonstrate understanding can:

K-PS3-1. **Make observations to determine the effect of sunlight on Earth's surface.** [Clarification Statement: Examples of Earth's surface could include sand, soil, rocks, and water] [Assessment Boundary: Assessment of temperature is limited to relative measures such as warmer/cooler.]

K-PS3-2. **Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.*** [Clarification Statement: Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun.]

K-ESS2-1. **Use and share observations of local weather conditions to describe patterns over time.** [Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months.] [Assessment Boundary: Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.]

K-ESS3-2. **Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.*** [Clarification Statement: Emphasis is on local forms of severe weather.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Asking Questions and Defining Problems
Asking questions and defining problems in grades K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested.
- Ask questions based on observations to find more information about the designed world. (K-ESS3-2)

Planning and Carrying Out Investigations
Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.
- Make observations (firsthand or from media) to collect data that can be used to make comparisons. (K-PS3-1)

Analyzing and Interpreting Data
Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.
- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-ESS2-1)

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.
- Use tools and materials provided to design and build a device that solves a specific problem or a solution to a specific problem. (K-PS3-2)

Obtaining, Evaluating, and Communicating Information
Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.
- Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world. (K-ESS3-2)

Connections to Nature of Science

Scientific Investigations Use a Variety of Methods
- Scientists use different ways to study the world. (K-PS3-1)

Science Knowledge is Based on Empirical Evidence
- Scientists look for patterns and order when making observations about the world. (K-ESS2-1)

Disciplinary Core Ideas

PS3.B: Conservation of Energy and Energy Transfer
- Sunlight warms Earth's surface. (K-PS3-1),(K-PS3-2)

ESS2.D: Weather and Climate
- Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time. (K-ESS2-1)

ESS3.B: Natural Hazards
- Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events. (K-ESS3-2)

ETS1.A: Defining and Delimiting an Engineering Problem
- Asking questions, making observations, and gathering information are helpful in thinking about problems. *(secondary to K-ESS3-2)*

Crosscutting Concepts

Patterns
- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (K-ESS2-1)

Cause and Effect
- Events have causes that generate observable patterns. (K-PS3-1),(K-PS3-2),(K-ESS3-2)

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology
- People encounter questions about the natural world every day. (K-ESS3-2)

Influence of Engineering, Technology, and Science on Society and the Natural World
- People depend on various technologies in their lives; human life would be very different without technology. (K-ESS3-2)

Pushes and Pulls

Unit Essential Questions

- What does science have to do with playing and movement?
- How do we use pushes and pulls to interact with objects in our world?

K.Forces and Interactions: Pushes and Pulls

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Students who demonstrate understanding can:

K-PS2-1. **Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.** [Clarification Statement: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.] [Assessment Boundary: Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets.]

K-PS2-2. **Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.*** [Clarification Statement: Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn.] [Assessment Boundary: Assessment does not include friction as a mechanism for change in speed.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*.

Science and Engineering Practices

Planning and Carrying Out Investigations
Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.
- With guidance, plan and conduct an investigation in collaboration with peers. (K-PS2-1)

Analyzing and Interpreting Data
Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.
- Analyze data from tests of an object or tool to determine if it works as intended. (K-PS2-2)

Connections to Nature of Science

Scientific Investigations Use a Variety of Methods
- Scientists use different ways to study the world. (K-PS2-1)

Disciplinary Core Ideas

PS2.A: Forces and Motion
- Pushes and pulls can have different strengths and directions. (K-PS2-1),(K-PS2-2)
- Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. (K-PS2-1),(K-PS2-2)

PS2.B: Types of Interactions
- When objects touch or collide, they push on one another and can change motion. (K-PS2-1)

PS3.C: Relationship Between Energy and Forces
- A bigger push or pull makes things speed up or slow down more quickly. *(secondary to K-PS2-1)*

ETS1.A: Defining Engineering Problems
- A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. *(secondary to K-PS2-2)*

Crosscutting Concepts

Cause and Effect
- Simple tests can be designed to gather evidence to support or refute student ideas about causes. (K-PS2-1),(K-PS2-2)

Life and The Environment

Unit Essential Questions

- What is needed for plants and animals to survive?
- What is the relationship between plants and animals and where they live?
- How can plants and animals change their environment to survive?
- How can humans reduce the impact of their choices on the local environment?

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

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Students who demonstrate understanding can:

K-LS1-1. **Use observations to describe patterns of what plants and animals (including humans) need to survive.** [Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and that all living things need water.]

K-ESS2-2. **Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.** [Clarification Statement: Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete.]

K-ESS3-1. **Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.** [Clarification Statement: Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested areas, and grasses need sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system.]

K-ESS3-3. **Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.*** [Clarification Statement: Examples of human impact on the land could include cutting trees to produce paper and using resources to produce bottles. Examples of solutions could include reusing paper and recycling cans and bottles.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models
Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.
- Use a model to represent relationships in the natural world. (K-ESS3-1)

Analyzing and Interpreting Data
Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.
- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-LS1-1)

Engaging in Argument from Evidence
Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s).
- Construct an argument with evidence to support a claim. (K-ESS2-2)

Obtaining, Evaluating, and Communicating Information
Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.
- Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas. (K-ESS3-3)

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence
- Scientists look for patterns and order when making observations about the world. (K-LS1-1)

Disciplinary Core Ideas

LS1.C: Organization for Matter and Energy Flow in Organisms
- All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. (K-LS1-1)

ESS2.E: Biogeology
- Plants and animals can change their environment. (K-ESS2-2)

ESS3.A: Natural Resources
- Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. (K-ESS3-1)

ESS3.C: Human Impacts on Earth Systems
- Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. *(secondary to K-ESS2-2)*,(K-ESS3-3)

ETS1.B: Developing Possible Solutions
- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. *(secondary to K-ESS3-3)*

Crosscutting Concepts

Patterns
- Patterns in the natural and human designed world can be observed and used as evidence. (K-LS1-1)

Cause and Effect
- Events have causes that generate observable patterns. (K-ESS3-3)

Systems and System Models
- Systems in the natural and designed world have parts that work together. (K-ESS2-2),(K-ESS3-1)

K-Science Curriculum

Current Kindergarten Science

- Hands-on science
- Linked to MD standards
- Thematic approach (5 Units)
  - Theme Based Science - Winter, Fall Harvest, Engineers, Extreme Earth
- Traditional Lesson Plans
  - Teacher modeling before hands-on
- Printed student science journals

Proposed Kindergarten Science

- Hands-on science
- Improved alignment to MD standards
- Scientific content and concept-focused which aligns to grades 1-5 science curriculum (3 Units)
  - Earth Space, Physical, Life Sciences
  - Engineering is embedded for content match
- 5E Lesson Plan
  - Inquiry Based Science Instruction
  - Engage, Explore, Explain, Extend, Evaluate
- Student-generated science notebooks

Next Steps - Pending Approval

Professional Development

- **Full Day Training** (6 hours)
  - Introduction (30 minutes)
  - Curriculum Training (1.5 hours per unit)
    - Earth Space, Physical, Life
  - Closure/Evaluation (30 minutes)
- **Curriculum Writers** – Master Teachers will facilitate unit training

June 2025

Implementation & Evaluation

- **Implementation** of K-Science curriculum
- **Ongoing training** for kindergarten teachers
- **Science walkthroughs**
- **Teacher feedback surveys**
- **Collaborative planning sessions**
- **Lesson coaching and modeling**

SY 2025-26

Purpose - Request

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Questions