Maryland
STATE DEPARTMENT OF EDUCATION

Carey M. Wright, Ed.D.
State Superintendent of Schools

**TO:** Members of the State Board of Education

**FROM:** Carey M. Wright, Ed.D., State Superintendent of Schools

**DATE:** December 3, 2024

**SUBJECT:** Prekindergarten-4 Science Early Learning Standards Presentation

## Executive Summary

1. The Maryland State Department of Education, in partnership with Maryland teachers, elementary and early childhood supervisors, and WestEd has drafted the Maryland Prekindergarten-4 (Pre-K4) Science Early Learning Standards.

2. The Pre-K4 Science Early Learning Standards follow the February 27, 2024, adoption of the revised and updated Early Learning Standards for children, birth through age three, bridging the gap between the revised Early Learning Standards and the Next Generation Science Standards (NGSS).

3. This presentation will provide information on the following:

    - Background
    - Standards Overview
    - Process for Engagement and Development
    - Next Steps

## Background and Process

The adoption of the Early Learning Standards for children, birth to age three, on February 27, 2024, addressed a tremendous need through the revision and updating of the previous standards and providing high-quality, developmentally appropriate standards that align with the College and Career Ready Standards.

For science, this created a new challenge, similarly experienced by other states across the country, to bridge the Early Learning Standards and the NGSS as a gap in science standards for Pre-K4 remained.

The development of the Pre-K4 Science Early Learning Standards was guided by current research that supports that children are capable of learning sophisticated science and engineering concepts and engaging in disciplinary practices, informed by their prior experiences and the funds of knowledge of their families and communities (NASEM, 2022) and that the K-12 Framework for Science Education can be applied to early childhood to align science learning from infancy through 12th grade (Greenfield, Alexander, Frechette, 2017).

The resulting Standards embrace the three-dimensional approach to science learning, including disciplinary core ideas, science and engineering practices, and crosscutting concepts, while linking to domains of the Early Learning Standards, recognize the need to support all Pre-K4 settings, including Head Start programs, child care centers, family child care homes, and faith-based settings, and acknowledge the specific needs of historically underserved groups of children in Maryland.

**Action Requested**

Review of the Maryland Prekindergarten-4 Science Early Learning Standards.

**Standard Regulation Promulgation Process**

No action is required; this information is for discussion only.

**Attachments**

MSBE_PK4_Science_Early_Learning_Standards_12_3_2024_FINAL.pptx

Office of Teaching and Learning Instructional Programs and Services

Division of Early Childhood

# Prekindergarten-4 Science Early Learning Standards

December 3, 2024

Presented By | Dr. Monique T. Felder, Assistant State Superintendent
Zachary Carey, Director of Science

Maryland
STATE DEPARTMENT OF EDUCATION

# Presentation Outline

1. Background
2. Standards Overview
3. Process for Engagement and Development
4. Next Steps
5. Appendix

# Background - Guiding Principles (1 of 2)

The Office of Teaching Learning Instructional Programs and Services (OTLIPS) Science Branch and Division of Early Childhood (DEC) were guided by the following:

- The revised, adopted Early Learning Standards provided **high-quality, developmentally appropriate standards** that align with the College and Career Ready Standards for children, birth to three.
- For science, this created a new challenge, similarly experienced by other states across the country, to **bridge the Early Learning Standards and the NGSS** as a gap in science standards for Pre-K4 remained.
- Current research that supports that **children are capable of learning sophisticated science and engineering concepts and engaging in disciplinary practices**, informed by their prior experiences and the funds of knowledge of their families and communities (NASEM, 2022) and that the K-12 Framework for Science Education can be applied to early childhood to align science from infancy through 12th grade (Greenfield, Alexander, Frechette, 2017).

Science and Engineering in Preschool Through Elementary Grades: The Brilliance of Children and the Strengths of Educators (NASEM, 2022).

Unleashing the Power of Science in Early Childhood: A Foundation for High-Quality Interactions and Learning (Greenfield, Alexander, Frechette, 2017)

# Background - Early Learning Timeline (2 of 2)

**2004**

- The Guidelines for Healthy Child Development and Care for Young Children (Birth-Three Years of Age) was published. (The Child Care Development Fund (CCDF) required states to submit program plans which included Early Learning Guidelines.)

**2015**

- Maryland Early Learning Standards Birth – 8 Years were released.

**2024**

- The adoption of the Early Learning Standards for children, birth to age three, on **February 27, 2024**, addressed a tremendous need through the revision and updating of the previous standards and providing high-quality, developmentally appropriate standards that align with the College and Career Ready Standards.

**2024**

- In **March 2024**, a committee of expert stakeholders, including Maryland teachers, along with elementary and early childhood supervisors met to discuss and provide feedback on how to align the Next Generation Science Standards with the Maryland Early Learning.

# Standards Overview - Bridging the Gap (1 of 4)

**The Pre-K4 Science Early Learning Standards address a need to bridge the Early Learning Standards and Next Generation Science Standards.**

## Early Learning Standards

### Age Period: 0-48 Months

1. Social and Emotional Development
2. Approaches to Learning
3. Language and Literacy
4. **Early Cognition and STEAM**
   - **Strand: Science, Technology, and Engineering**
5. Physical Well-Being and Motor Development

## Pre-K4 Science Early Learning Standards

### Age Period: 48-60 Months

1. Life Science
2. Physical Science
3. Earth and Space Science
4. Engineering, Technology, and Applications of Science

## Maryland Next Generation Science Standards

### Age Period: K-12

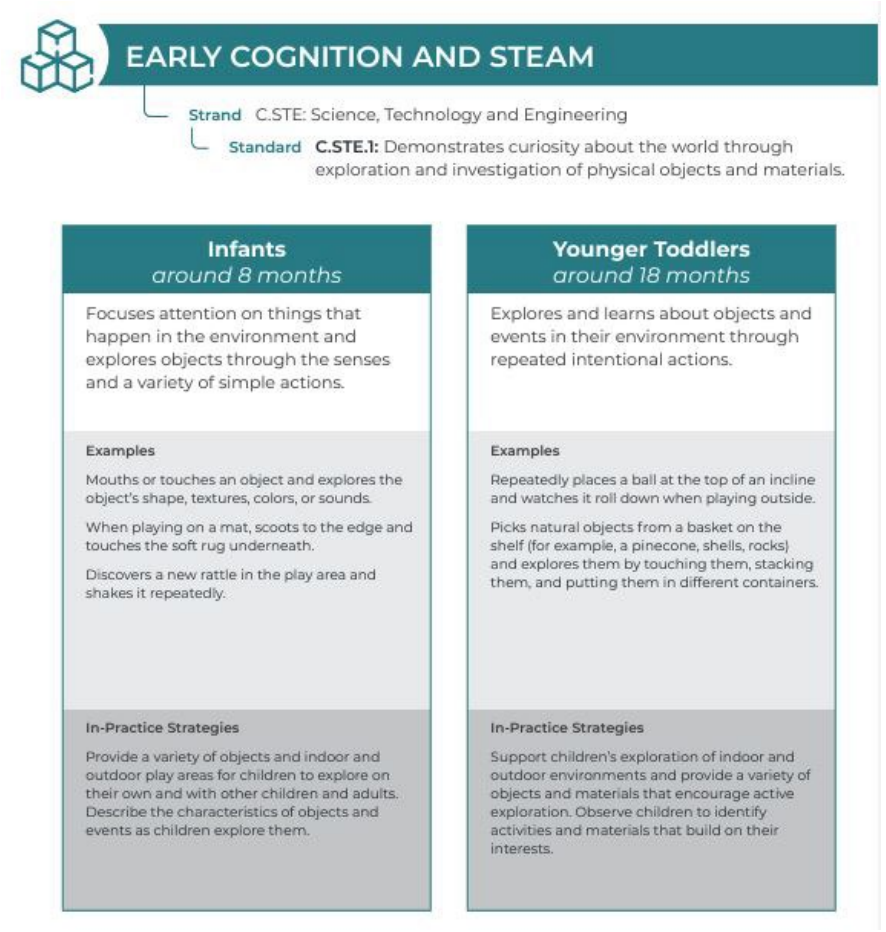
1. Life Science
2. Physical Science
3. Earth and Space Science
4. Engineering, Technology, and Applications of Science

# Early Learning Standards, Age Period: 0-48 Months (2 of 4)

**Researched-based, adopted standards for our youngest learners.**

## Early Learning Standards

- Age Period: 0-48 Months
- Domains:
  1. Social and Emotional Development
  2. Approaches to Learning
  3. Language and Literacy
  4. **Early Cognition and STEAM**
     - **Strand: Science, Technology, and Engineering**
       - **Standards**
       - **Examples**
       - **In-Practice Strategies**
  5. Physical Well-Being and Motor Development

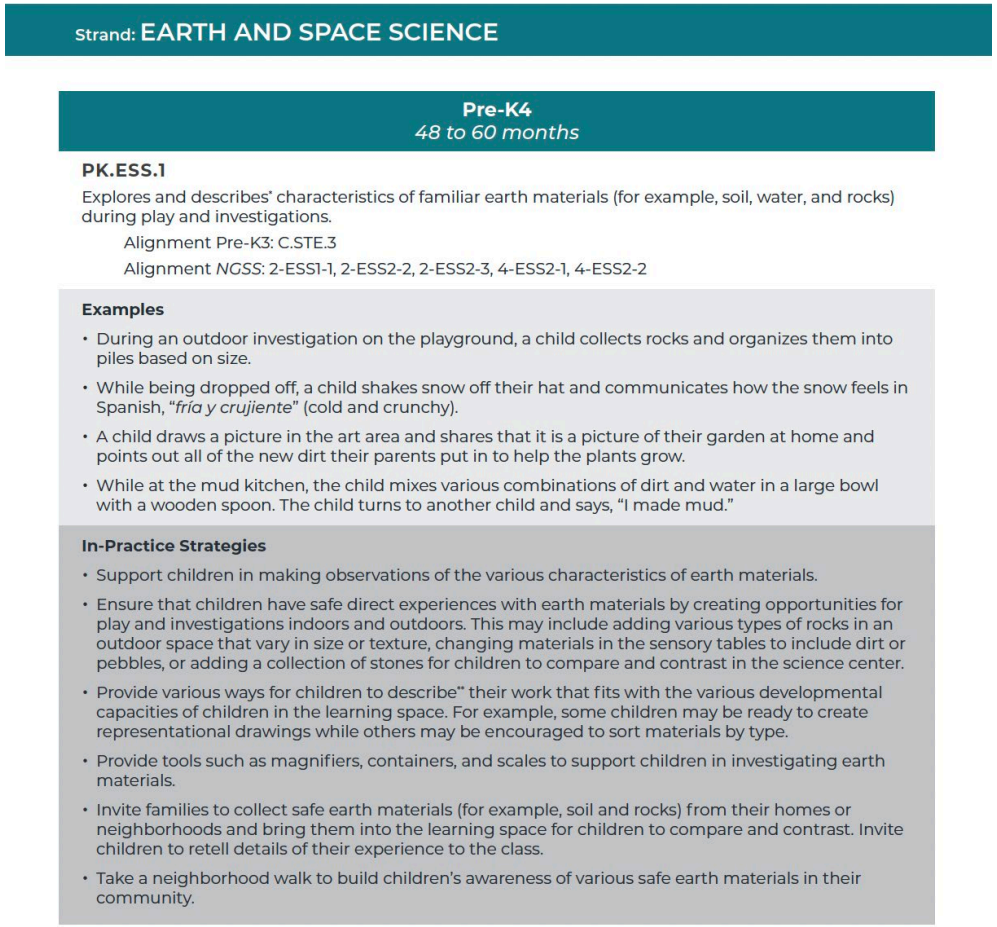


# Maryland Pre-K4 Science Early Learning Standards (3 of 4)

**Research based standards to guide science in pre-kindergarten.**

## Pre-K4 Science Early Learning Standards

- Strand
  - Life Science
  - Physical Science
  - Earth and Space Science
  - Engineering, Technology, and Applications of Science
- Age Period: 48-60 Months
- Standards
- Examples
- In-Practice Strategies



Strand: EARTH AND SPACE SCIENCE

**Pre-K4**
*48 to 60 months*

**PK.ESS.1**

Explores and describes* characteristics of familiar earth materials (for example, soil, water, and rocks) during play and investigations.

Alignment Pre-K3: C.STE.3

Alignment *NGSS*: 2-ESS1-1, 2-ESS2-2, 2-ESS2-3, 4-ESS2-1, 4-ESS2-2

**Examples**

- During an outdoor investigation on the playground, a child collects rocks and organizes them into piles based on size.
- While being dropped off, a child shakes snow off their hat and communicates how the snow feels in Spanish, "*fría y crujiente*" (cold and crunchy).
- A child draws a picture in the art area and shares that it is a picture of their garden at home and points out all of the new dirt their parents put in to help the plants grow.
- While at the mud kitchen, the child mixes various combinations of dirt and water in a large bowl with a wooden spoon. The child turns to another child and says, "I made mud."

**In-Practice Strategies**

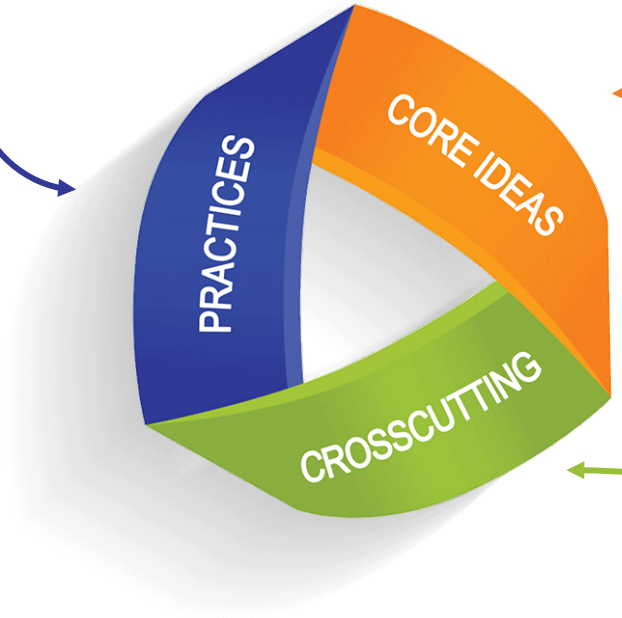
- Support children in making observations of the various characteristics of earth materials.
- Ensure that children have safe direct experiences with earth materials by creating opportunities for play and investigations indoors and outdoors. This may include adding various types of rocks in an outdoor space that vary in size or texture, changing materials in the sensory tables to include dirt or pebbles, or adding a collection of stones for children to compare and contrast in the science center.
- Provide various ways for children to describe** their work that fits with the various developmental capacities of children in the learning space. For example, some children may be ready to create representational drawings while others may be encouraged to sort materials by type.
- Provide tools such as magnifiers, containers, and scales to support children in investigating earth materials.
- Invite families to collect safe earth materials (for example, soil and rocks) from their homes or neighborhoods and bring them into the learning space for children to compare and contrast. Invite children to retell details of their experience to the class.
- Take a neighborhood walk to build children's awareness of various safe earth materials in their community.

# Maryland Next Generation Science Standards (NGSS) (4 of 4)

**Researched-based, three-dimensional standards for K-12.**

How students are acting and thinking to engage with the content or scientific phenomena.

The scientific content that students are engaging with.




The lens through which students view the world around them

Next Generation Science Standards

# Process for Engagement and Development (1 of 3)

- **Fall 2023** - DEC and OTLIPS collaborated on the Early Learning Standards Project, related to Science, Technology, Engineering, Arts, and Math (STEAM).
- **Winter 2023/2024** - DEC and OTLIPS conducted outreach across the state to identify experts to guide the development of the Pre-K4 Science Standards.
- **Winter 2024** - The Early Learning Standards for children, birth to age three, were adopted on February 27, 2024, revising and updating of the previous standards and providing high-quality, developmentally appropriate standards that align with the College and Career Ready Standards.
- **Spring 2024** - On March 7, 2024, in alignment with the Standards and Frameworks Validation Committee Process, a committee of expert stakeholders, including Maryland teachers, along with elementary and early childhood specialists, coordinators, and supervisors met to discuss and provide feedback on how to align the Next Generation Science Standards with the Maryland Early Learning.

# Process for Engagement and Development (2 of 3)

| | | | |
|---|---|---|---|
| Allegany Co | Dr. Cheri | Helmstetter | Early Learning Program Specialist |
| Anne Arundel Co | Matthew | Walter | Early Childhood Resource Teacher |
| Anne Arundel Co | K. Brian | LeCompte | Academic Specialist, Elementary Science |
| Baltimore City | Berol | Dewdney | Pre-K Teacher |
| Baltimore City | Sage | Caspersson | Elementary Science Specialist |
| Baltimore Co | Eric | Cromwell | Coordinator of Elementary Science |
| Harford Co | Amy | Ryan | Elementary Science Curriculum Specialist |
| Harford Co | Heather | Budke | PreK Teacher Specialist |
| Harford Co | Shelbi | Wilhelm | Early Childhood – PreK Instructional Coach |
| Howard Co | Amy | Reese | Elementary Science Coordinator |
| Howard Co | Jenn | Brown-Whale | Elementary Science Resource Teacher |
| Howard Co | Kym | Nwosu | Early Childhood Programs, Resource Teacher |
| Montgomery Co | Jennifer | Orodeckis | Instructional Specialist, PreK-12 Science Department |
| St. Mary's Co | Jason | Hayes | Elementary Science and Health Supervisor |
| Washington Co | Tara | Ellis | Elementary Science Content Specialist |
| Wicomico Co | Hemalatha | Bhaskaran | Science Supervisor |

# Process for Engagement and Development (3 of 3)

- **March 2024 to September 2024** - The Expert Committee met and provided feedback from March 2024 to September 2024, including:
  - A landscape analysis of NGSS and A Framework for K–12 Science Education-aligned Pre-K4 Science Early Learning Standards implemented from other states and districts;
  - A guiding discussion of approaches to align with stakeholders' community's vision and need for science learning; and
  - A series of meetings that provided opportunities for continuous input throughout the development process.
- Based on guiding input and feedback from the Expert Group participants, WestEd developed standards that bridged the Early Learning Standards and NGSS. Private providers supported the development of the framework for the Early Learning and the Pre-K4 Science Standards.

# Next Steps

1. Aligned to the Standards and Frameworks Validation Committee process:
    - There will be a 30-day public comment period;
    - Standards and/or revisions are drafted following the conclusion of public comment; and
    - The final version of the standards will be presented for approval to the Maryland State Board of Education.
2. An alignment document to Next Generation Science Standards will be developed.
3. The Division of Early Childhood and the Instructional Programs and Services Science Branch will develop professional learning and training that will be rolled out to support the field with implementation of the new standards.

# Appendix

**Items Include:**

- Expert Committee Participants
- Vendor Selection Background
- Age Progression

# Expert Committee

| | | | |
|---|---|---|---|
| Allegany Co | Dr. Cheri | Helmstetter | Early Learning Program Specialist |
| Anne Arundel Co | Matthew | Walter | Early Childhood Resource Teacher |
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| Wicomico Co | Hemalatha | Bhaskaran | Science Supervisor |

# Vendor Selection: WestEd

Based on discussions with early learning practitioners and the need to create Early Learning Standards for the State, the following occurred:

- DEC received recommendations on who could assist with this process.
- WestEd had prior experience in working with developing early learning standards in California, New Jersey, Minnesota and Ohio, as well as the Early Learning Outcomes Framework for Head Start. (Part of their team was a writer/contributor for the Head Start Framework.) A team member was also a reviewer for Louisiana as well as the government of Singapore.
- WestEd reviewed the current standards, made recommendations to DEC, conducted focus groups and structured interviews based upon DEC recommendations and provided information on feedback from the participants.

In partnership with DEC, OTLIPS continued the work with WestEd on the Pre-K4 Early Learning Standards.

# New Age Progressions Aligned with Child Development

## Current Age Periods

1 year

2 year

3 year

4 year

Kindergarten (5-6 years)

Grade 1 (6-7 years)

Grade 2 (7-8 years)

## New Age Periods

Young Infants (0 – 8 months)

Older Infants (8 – 18 months)

Toddlers (18 – 36 months)

PreK 3 (36 – 48 months)

4 year / Pre-K 4 (48 – 60 months)

Kindergarten (5-6 years)

Grade 1 (6-7 years)

Grade 2 (7-8 years)

MARYLAND

# Pre-K4 SCIENCE

## EARLY LEARNING STANDARDS

NOVEMBER 2024

Maryland
STATE DEPARTMENT OF EDUCATION

## MARYLAND STATE DEPARTMENT OF EDUCATION

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# ACKNOWLEDGMENTS

Many people were involved in the development of the Maryland Pre-K4 Science Early Learning Standards including project leaders, principal writers, and project staff from WestEd; staff from the Maryland Department of Education; and early childhood education stakeholder organizations. Each person listed below deserves credit for making important contributions to this publication. We gratefully acknowledge their efforts.

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**Thanks are extended to the following staff members for ongoing revisions and recommendations:**

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# INTRODUCTION TO THE Pre-K4 SCIENCE STANDARDS

The Maryland Pre-K4 Science Standards reflect the science and engineering knowledge and skills that children ages four to five can demonstrate with proper support and engaging learning experiences. In Pre-K4, children build on the knowledge and skills they have developed in earlier years. Children's science and engineering learning in Pre-K4 serves as a foundational component for cultivating the knowledge and skills children develop in kindergarten and beyond.

The Pre-K4 Science Standards are intended to build a bridge between the learning expectations described in the Pre-K3 indicators of the Early Learning Standards in Science, Technology, and Engineering[1] and the *Next Generation Science Standards*[2] in kindergarten through fifth grade.

The Pre-K4 programs that children learn in are varied, including Head Start programs, child care centers, family child care homes, and faith-based settings. The Pre-K4 Science Standards are written to showcase a range of learning settings and experiences that illustrate the diversity of learning contexts across the state. The standards provide guidance to anyone in the state of Maryland who supports early science and engineering learning for children between 48 and 60 months of age (or 4 to 5 years old). This includes educators and support staff working directly with children, administrators making choices about curricula, and coaches and professional learning providers supporting educational practice.

As children grow, so do their worlds and experiences. Their science understanding and inquiry skills become more complex and precise as they participate in play and learning experiences.[3] For example, children pay closer attention to characteristics of various animals and plants and what they need to survive, how objects change or move, and Earth phenomena such as changes in weather. Furthermore, four- and five-year olds' cognitive growth allows them to attend to similarities and differences with greater specificity, share their observations and explanations in greater detail, and critically analyze and evaluate information when reasoning about a phenomenon they observe or investigate. For example, they observe, describe, and compare the characteristics of Earth materials, such as soil, water, and rocks, as they play outdoors. They can then draw on their observations to make predictions about how different materials might change during a science investigation, for instance, exploring the changing properties of melting ice.

Children's abilities to reason, problem solve, and communicate through multiple means of expression enables them to engage in science with greater purpose. For instance, as they problem solve while building a stable structure, children intentionally change the placement of blocks depending on what they observe. Children are also better able to present their solutions and describe how they changed their approach to a problem, using specific science and engineering vocabulary. For example, during a whole group meeting, children might explain their approach to building a stable structure. Children's growing science knowledge and skills as they develop and learn is reflected in the Pre-K4 Science Standards.

# GUIDING PRINCIPLES

The following guiding principles were used in creating the Maryland Pre-K4 Science Standards. These guiding principles also serve as a resource for educators when designing environments and learning experiences to support children's science learning and development.

- **Children learn through play, exploration, and discovery of authentic scientific phenomena.** Children learn best through active, hands-on learning experiences with support and guidance from a trusting educator. By participating in experiences that are based on real-world scientific phenomena and draw on children's interests, direct experiences, initiative, and curiosity, children engage in science learning experiences that foster meaningful, authentic learning.

- **Children thrive in environments intentionally designed to support meaningful science learning.** Children learn best in high-quality environments that promote meaningful interactions with educators and peers. High-quality indoor and outdoor environments offer diverse learning materials that are tailored to a child's interests, strengths, and needs. Providing rich and developmentally appropriate science and engineering learning experiences requires intentional planning by educators..

- **Children differ individually from one another and have unique experiences and diverse strengths.** Individual children develop and learn at different rates and in their own way. Their learning is influenced by many factors, such as the environment, culture, heritage, linguistic experiences, temperament, disabilities, and any experiences of trauma. Effective teaching practices build on an individual child's unique experiences and support the child's diverse strengths, interests, and needs so that all children can be successful learners.

- **Children draw from their family and community experiences.** Children bring with them prior science knowledge and skills developed through experiences they have with their families and in their communities. Educators can acknowledge and build on the knowledge and skills that children have already developed to create authentic science learning experiences that incorporate families' and communities' ways of knowing. Educators can build connections with families to extend learning into the home and take inspiration from children's home experiences to create meaningful science and engineering learning experiences in their early care and education settings.

- **Children's learning is integrated.** Children's learning occurs across domains. Children's development of skills and concepts in science will often support and be supported by the skills and concepts developed in other domains. Thus, Pre-K4 Science Standards have been written to highlight how the knowledge and skills children develop in science are highly related to skills in other domains.

# THREE-DIMENSIONAL APPROACH **TO SCIENCE LEARNING**

In alignment with the *NGSS*, the Maryland Pre-K4 Science Standards embrace the three-dimensional approach to science learning, including disciplinary core ideas, science and engineering practices, and crosscutting concepts.[4] This three-dimensional approach invites children to engage with science and engineering content through hands-on and minds-on learning experiences. The four science disciplines from which disciplinary core ideas are drawn—life science, physical science, Earth and space science, and engineering, technology, and applications of science—serve as the organizing structure for the Pre-K4 Science Standards. Science and engineering practices (indicated with the SEP acronym) and crosscutting concepts (indicated with the CCC acronym) are highlighted throughout the standards to show how children engage with science and engineering learning experiences and what they notice as they explore phenomena and problems. Not all the scientific practices and crosscutting concepts referenced in the *NGSS* are reflected in the Pre-K4 Science Standards; however, early science and engineering learning experiences serve as a foundation for how children engage with these practices and concepts in later years.

# INCLUSIVE STANDARDS **FOR ALL CHILDREN**

Maryland's network of schools and early care and education programs, including Head Start programs, child care centers, family child care homes, and faith-based settings, serve a tremendous diversity of children, each influenced by many factors associated with children's individual characteristics and local contexts. A recognition of this was incorporated into the development of the Pre-K4 Science Standards to ensure that the standards are inclusive of all children in Maryland. This includes children from diverse cultural and socioeconomic backgrounds, early multilingual learners, and children with disabilities and developmental delays. To this end, the standards include references to children making connections to their prior knowledge and experiences at home and in their communities and include a variety of examples of how children may interact with learning materials and demonstrate their growing knowledge and skills. The standards also describe the intentional connections educators can make with families to extend learning at home and in their communities..

Acknowledging the specific needs of historically underserved groups of children in Maryland, including multilingual learners, was prioritized in the development of the Pre-K4 Science Standards. Honoring and building upon children's home languages is important in creating high-quality science and engineering learning experiences, fostering home connections, expanding prior knowledge, and promoting a sense of belonging in science.[5] For this reason, the standards show how children may use their home language to communicate and strategies for educators to honor children's home languages. In addition, the standards include references to how children can communicate their ideas and understanding using diverse ways of expression, such as drawings, graphs, and models. Principles of Universal Design for Learning have been incorporated throughout the standards to show how educators can adapt learning experiences to consider and respond effectively to the individual learning needs of all children in the classroom.[6]

# HOW ARE THE MARYLAND Pre-K4 SCIENCE STANDARDS ORGANIZED?

The Maryland Pre-K4 Science Standards are organized into two sections. The first section includes a table that presents the alignment between the Pre-K3 indicators in Science, Technology, and Engineering, the Pre-K4 Science Standards, and the NGSS for Kindergarten–Grade 5.

The second section includes the Pre-K4 Science standards organized as follows (refer to Figure 1 for a diagram of the elements of the standards).

### STRAND

The Maryland Pre-K4 Science Standards are organized into four strands that reflect the disciplinary content areas outlined by the *NGSS*:

- Life Science
- Physical Science
- Earth and Space Science
- Engineering, Technology, and Applications of Science

### AGE PERIOD

The Maryland Pre-K4 Science Standards cover the period between 48 and 60 months of age. Children vary in their learning and development, and the standards and examples describe the knowledge and skills that children typically demonstrate across the age range of 48 to 60 months.

### STANDARD

Each strand includes multiple standards. Standards describe the knowledge, concepts, and skills that children can demonstrate with proper support and engaging learning experiences. Standards include connections to the science and engineering practices (SEP) that children use and crosscutting concepts (CCC) that children explore as they engage with scientific phenomena, disciplinary core ideas, or problems.

### EXAMPLES

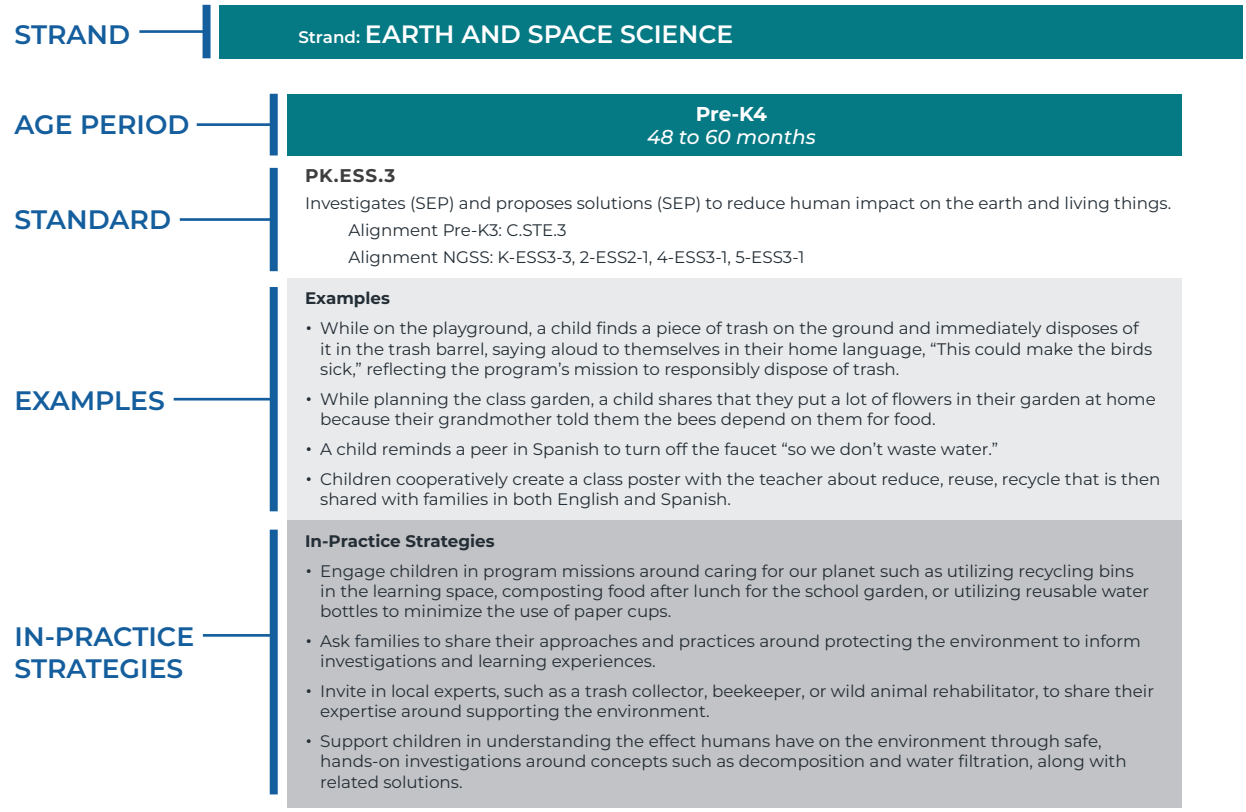
Each standard includes three to four examples highlighting a range of ways that children may engage in science learning, demonstrating the skills, concepts, and actions described in the standard. Additionally, examples highlight how children from diverse cultural backgrounds, multilingual learners, and those with diverse learning needs may express their developing skills, understanding, and behaviors described in the standards. Science and engineering practices (SEP) and crosscutting concepts (CCC) are also highlighted.

## IN-PRACTICE STRATEGIES

The in-practice strategies provide ideas for how early learning educators might support children's development of the skills, concepts, and behaviors described in the standards. Strategies include ways to honor and reflect children's cultural and linguistic diversity as well as incorporate universal design strategies, making learning accessible to all children. In-practice strategies note that educators should take safety precautions in selecting tools and materials and planning learning experiences. Science and engineering practices (SEP) and crosscutting concepts (CCC) are also highlighted.

The Pre-K4 Science Standards, examples, and in-practice strategies show how children draw from their learning and development in other domains, such as language and literacy and mathematics skills, to make meaning of science learning experiences. The Pre-K4 Science Standards should be used strategically alongside standards in other content areas while planning learning activities.

### FIGURE 1. ORGANIZATION OF THE Pre-K4 SCIENCE STANDARDS



# ALIGNMENT

The following table shows the alignment between the Pre-K3 Early Learning Standard indicators in Science, Technology, and Engineering, the Pre-K4 Science Early Learning Standards, and the *Next Generation Science Standards* for Kindergarten–Grade 5.

# ALIGNMENT TABLE

| Pre-K3 EARLY LEARNING STANDARDS | Pre-K4 SCIENCE EARLY LEARNING STANDARDS | NEXT GENERATION SCIENCE STANDARDS FOR KINDERGARTEN—GRADE 5 |
|---|---|---|
| **STRAND: Science, Technology, and Engineering** | **STRAND: Life Science** | **DOMAIN: Life Science** |
| **C.STE.3.** Explores the characteristics of the natural world, including living things, earth materials, the weather, and objects in the sky.<br>*Pre-K3 Indicator:* Describes the needs of living things and how living things (plants and animals) change over time, the properties of materials and objects, and how the weather and objects in the sky (sun, moon, stars, and clouds) appear to move and change. | **PK.LS.1.** Investigates (SEP) and describes* (SEP) the characteristics (such as external body parts, behaviors, habitats) of a variety of animals and plants and what they need to grow and survive, including food, water, and shelter. | **K-LS1-1.** Use observations to describe patterns of what plants and animals (including humans) need to survive.<br>**K-ESS3-1.** Uses a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.<br>**1-LS1-1.** Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.<br>**1-LS1-2.** Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.<br>**2-LS2-1.** Plan and conduct an investigation to determine if plants need sunlight and water to grow.<br>**2-LS4-1.** Make observations of plants and animals to compare the diversity of life in different habitats.<br>**3-LS4-3.** Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.<br>**4-LS1-1.** Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.<br>**5-LS1-1.** Support an argument that plants get the materials they need for growth chiefly from air and water. |

* Descriptions could include, but are not limited to, oral, pictorial, written, and kinesthetic.

# ALIGNMENT TABLE

| Pre-K3 EARLY LEARNING STANDARDS | Pre-K4 SCIENCE EARLY LEARNING STANDARDS | NEXT GENERATION SCIENCE STANDARDS FOR KINDERGARTEN—GRADE 5 |
|---|---|---|
| **STRAND: Science, Technology, and Engineering** | **STRAND: Life Science** | **DOMAIN: Life Science** |
| **C.STE.3.** Explores the characteristics of the natural world, including living things, earth materials, the weather, and objects in the sky.<br>*Pre-K3 Indicator:* Describes the needs of living things and how living things (plants and animals) change over time, the properties of materials and objects, and how the weather and objects in the sky (sun, moon, stars, and clouds) appear to move and change. | **PK.LS.2.** Investigates (SEP) and describes* (SEP) how living things grow and change (CCC) over time, including transformations related to their life cycle. | **3-LS1-1.** Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. |

* Descriptions could include, but are not limited to, oral, pictorial, written, and kinesthetic.

# ALIGNMENT TABLE

| Pre-K3 EARLY LEARNING STANDARDS | Pre-K4 SCIENCE EARLY LEARNING STANDARDS | NEXT GENERATION SCIENCE STANDARDS FOR KINDERGARTEN—GRADE 5 |
|---|---|---|
| **STRAND: Science, Technology, and Engineering** | **STRAND: Physical Science** | **DOMAIN: Physical Science** |
| **C.STE.1.** Demonstrate curiosity about the world through exploration and investigation of physical objects and materials.<br>*Pre-K3 Indicator:* Asks questions about why things happen. Explains the impact of specific actions on objects and events. | **PK.PS.1.** Explores and describes* (SEP) the physical properties (for example, size, weight, shape, color, texture, smell, and sound) of objects and changes (CCC) of solid or liquid materials during play and investigations (SEP). | **2-PS1-1.** Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.<br>**2-PS1-4.** Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.<br>**5-PS1-2.** Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved. |
| **C.STE.2.** Develops an understanding of the causes and effects of actions and events.<br>*Pre-K3 Indicator:* Asks questions about why things happen. Explains the impact of specific actions on objects and events. | | |

* Descriptions could include, but are not limited to, oral, pictorial, written, and kinesthetic.

# ALIGNMENT TABLE

| Pre-K3 EARLY LEARNING STANDARDS | Pre-K4 SCIENCE EARLY LEARNING STANDARDS | NEXT GENERATION SCIENCE STANDARDS FOR KINDERGARTEN—GRADE 5 |
|---|---|---|
| **STRAND: Science, Technology, and Engineering** | **STRAND: Physical Science** | **DOMAIN: Physical Science** |
| **C.STE.1.** Demonstrate curiosity about the world through exploration and investigation of physical objects and materials.<br>*Pre-K3 Indicator:* Asks questions about why things happen. Explains the impact of specific actions on objects and events. | **PK.PS.2.** Explores the motion of objects during play and investigations (SEP). Predicts (SEP), and describes* (SEP) changes (CCC) in an objects' direction, speed, or distance. | **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.<br>**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.<br>**3-PS2-1.** Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of objects.<br>**3-PS2-2.** Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.<br>**4-PS3-1.** Use evidence to construct an explanation relating the speed of an object to the energy of that object.<br>**4-PS3-3.** Ask questions and predict outcomes about the changes in energy that occur when objects collide. |
| **C.STE.2.** Develops an understanding of the causes and effects of actions and events.<br>*Pre-K3 Indicator:* Asks questions about why things happen. Explains the impact of specific actions on objects and events. | | |

* Descriptions could include, but are not limited to, oral, pictorial, written, and kinesthetic.

# ALIGNMENT TABLE

| Pre-K3 EARLY LEARNING STANDARDS | Pre-K4 SCIENCE EARLY LEARNING STANDARDS | NEXT GENERATION SCIENCE STANDARDS FOR KINDERGARTEN—GRADE 5 |
|---|---|---|
| **STRAND: Science, Technology, and Engineering** | **STRAND: Physical Science** | **DOMAIN: Physical Science** |
| **C.STE.1.** Demonstrate curiosity about the world through exploration and investigation of physical objects and materials.<br>*Pre-K3 Indicator:* Develops a sense of number and demonstrates some basic knowledge of counting. | **PK.PS.3.** Explores and describes* (SEP) the properties and changes (CCC) in sound, light, and shadows by manipulating different objects and materials during play and investigations (SEP). | **1-PS4-1.** Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.<br>**1-PS4-2.** Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.<br>**1-PS4-3.** Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.<br>**1-PS4-4.** Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.<br>**4-PS3-2.** Makes observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. |
| **C.STE.2.** Develops an understanding of the causes and effects of actions and events.<br>*Pre-K3 Indicator:* Asks questions about why things happen. Explains the impact of specific actions on objects and events. | | |

* Descriptions could include, but are not limited to, oral, pictorial, written, and kinesthetic.

# ALIGNMENT TABLE

| Pre-K3 EARLY LEARNING STANDARDS | Pre-K4 SCIENCE EARLY LEARNING STANDARDS | NEXT GENERATION SCIENCE STANDARDS FOR KINDERGARTEN—GRADE 5 |
|---|---|---|
| **STRAND: Science, Technology, and Engineering** | **STRAND: Earth and Space Science** | **DOMAIN: Earth and Space Science** |
| **C.STE.3.** Explores the characteristics of the natural world, including living things, earth materials, the weather, and objects in the sky.<br>*Pre-K3 Indicator:* Describes the needs of living things and how living things (plants and animals) change over time, the properties of materials and objects, and how the weather and objects in the sky (sun, moon, stars, and clouds) appear to move and change. | **PK.ESS.1.** Explores and describes* (SEP) characteristics of familiar earth materials (for example, soil, water, and rocks) during play and investigations (SEP). | **2-ESS1-1.** Use information from several sources to provide evidence that Earth events can occur quickly or slowly.<br>**2-ESS2-2.** Develop a model to represent the shapes and kinds of land and bodies of water in an area.<br>**2-ESS2-3.** Obtain information to identify where water is found on Earth and that it can be solid or liquid.<br>**4-ESS2-1.** Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.<br>**4-ESS2-2.** Analyze and interpret data from maps to describe patterns of Earth's features. |

* Descriptions could include, but are not limited to, oral, pictorial, written, and kinesthetic.

# ALIGNMENT TABLE

| Pre-K3 EARLY LEARNING STANDARDS | Pre-K4 SCIENCE EARLY LEARNING STANDARDS | NEXT GENERATION SCIENCE STANDARDS FOR KINDERGARTEN—GRADE 5 |
|---|---|---|
| **STRAND: Science, Technology, and Engineering** | **STRAND: Earth and Space Science** | **DOMAIN: Earth and Space Science** |
| **C.STE.3.** Explores the characteristics of the natural world, including living things, earth materials, the weather, and objects in the sky.<br>*Pre-K3 Indicator:* Describes the needs of living things and how living things (plants and animals) change over time, the properties of materials and objects, and how the weather and objects in the sky (sun, moon, stars, and clouds) appear to move and change. | **PK.ESS.2.** Investigates (SEP) and describes* (SEP) characteristics and changes (CCC) of objects in the sky (sun, moon, stars, clouds) and weather over time. | **K-ESS2-1.** Use and share observations of local weather conditions to describe patterns over time.<br>**K-ESS3-2.** Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.<br>**1-ESS1-1.** Use observations of the sun, moon, and stars to describe patterns that can be predicted.<br>**1-ESS1-2.** Make observations at different times of year to relate the amount of daylight to the time of year.<br>**3-ESS2-2.** Obtain and combine information to describe climates in different regions of the world.<br>**5-ESS1-1.** Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from the Earth.<br>**5-ESS1-2.** Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. |

* Descriptions could include, but are not limited to, oral, pictorial, written, and kinesthetic.

# ALIGNMENT TABLE

| Pre-K3 EARLY LEARNING STANDARDS | Pre-K4 SCIENCE EARLY LEARNING STANDARDS | NEXT GENERATION SCIENCE STANDARDS FOR KINDERGARTEN—GRADE 5 |
|---|---|---|
| **STRAND: Science, Technology, and Engineering** | **STRAND: Earth and Space Science** | **DOMAIN: Earth and Space Science** |
| **C.STE.3.** Explores the characteristics of the natural world, including living things, earth materials, the weather, and objects in the sky.<br>*Pre-K3 Indicator:* Describes the needs of living things and how living things (plants and animals) change over time, the properties of materials and objects, and how the weather and objects in the sky (sun, moon, stars, and clouds) appear to move and change. | **PK.ESS.3.** Investigates (SEP) and proposes solutions (SEP) to reduce human impact on the earth and living things. | **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.<br>**2-ESS2-1.** Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.<br>**4-ESS3-1.** Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.<br>**5-ESS3-1.** Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. |

# ALIGNMENT TABLE

| Pre-K3 EARLY LEARNING STANDARDS | Pre-K4 SCIENCE EARLY LEARNING STANDARDS | NEXT GENERATION SCIENCE STANDARDS FOR KINDERGARTEN—GRADE 5 |
|---|---|---|
| **STRAND: Science, Technology, and Engineering** | **STRAND: Engineering, Technology, and Applications of Science** | **DOMAIN: Engineering, Technology, and Applications of Science** |
| **C.STE.4.** Takes action, uses tools, and carries out solutions to achieve goals or solve problems.<br>*Pre-K3 Indicator:* With adult support, designs and tests solutions for solving a problem or reaching a goal using a sequence of multiple steps and a variety of tools. Collaborates with peers and adults to plan and carry out solutions. | **PK.ETS.1.** Identifies a simple problem (SEP) in the classroom, their daily life, or community, designs a solution (SEP), and tests (SEP) and refines the solution with adults and peers. | **K-2-ETS1-1.** Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.<br>**K-2-ETS1-2.** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.<br>**K-2-ETS1-3.** Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.<br>**3-5-ETS1-1.** Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.<br>**3-5-ETS1-2.** Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.<br>**3-5-ETS1-3.** 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. |

# Pre-K4 SCIENCE STANDARDS

## Strand: LIFE SCIENCE

### Pre-K
*48 to 60 months*

**PK.LS.1**

Investigates (SEP) and describes* (SEP) the characteristics (such as external body parts, behaviors, habitats) of a variety of animals and plants and what they need to grow and survive, including food, water, and shelter.

Alignment Pre-K3: C.STE.3

Alignment *NGSS*: K-LS1-1, 1-LS1-2, 2-LS2-1, 2-LS4-1, 3-LS4-3, 4-LS1-1, 5-LS1-1

**Examples**

- A child observes (SEP) the class pet, a fish, and communicates in Spanish, "*Mueve su cola de un lado a otro para nadar* (It moves its tale from one side to the other to swim)."
- During an investigation (SEP) about which food the Baltimore Oriole likes best, a child notices that the birds are coming close to the blueberries that they have put out and describes (SEP), "They like blueberries. They eat them to grow."
- A child notices a plant looking wilted and brings it to the teacher along with the watering can. The teacher fills the watering can and invites the child to water the plant.
- In response to a family activity that the teacher sent home inviting families to investigate (SEP) the animals that live in their communities, a child shares a photo of an opossum and describes (SEP), "This is a picture of an opossum. I saw it near the woods when I was walking with my daddy. It has a really long tail."

**In-Practice Strategies**

- Ensure children have access to living things in the learning space such as plants and class pets, for firsthand observations (SEP) and investigations (SEP). If access to living things in the learning space is authorized, be sure to reference district processes and receive approval prior to introducing animals, including pets, into the learning space.
- Add models of living things that accurately depict their characteristics (for instance, a flower model that shows the realistic parts of a plant) to science centers for children to explore.
- Provide safe materials that invite children to investigate (SEP) how the parts of living things [their structure (CCC)] help them to grow, change (CCC), and survive [their function (CCC)], such as tongs to represent a bird's beak and how it helps them feed or a straw for a plant's stem that draws up water.
- Take time to identify some existing habitats outside, around the yard and local community, and invite children to work collaboratively to safely investigate the living things in it.
- Provide families with extension activities to safely explore living things in their communities.
- Invite families to share materials, such as plants they grow at home, or their expertise, such as gardening, with the class.
- Have a variety of fiction and nonfiction books that accurately represent animals found in local habitats available as part of whole-group reading and as part of learning centers. When texts do not represent animals in a scientifically accurate manner, engage children in conversations about the difference between fiction and real-world scientific representations.
- Post key vocabulary, including names of animals, plants, their characteristics, and habitats, labeled in English and children's home languages, paired with images, to illustrate the vocabulary.

* Descriptions could include, but are not limited to, oral, pictorial, written, and kinesthetic.

## Strand: LIFE SCIENCE

**Pre-K4**
*48 to 60 months*

### PK.LS.2

Investigates (SEP) and describes* (SEP) how living things grow and change (CCC) over time, including transformations related to their life cycle.

Alignment Pre-K3: C.STE.3

Alignment *NGSS*: K-LS1-1

**Examples**

- After observing (SEP) the caterpillar change (CCC) into a butterfly in the classroom, a child organizes the photos of the stages of the butterfly life cycle in order, from egg to butterfly.
- While walking by the classroom's garden outside, a child notices a change (CCC) in the cucumbers planted and states, "Look at all of the yellow flowers growing. Soon there will be cucumbers."
- While observing the growth of a tadpole that the teacher found in a local pond, the teacher prompts children to draw a picture of what they learned. A child draws a picture and dictates to the teacher to write down that the tadpole changed from a fish to a frog, growing legs and losing its tail.

**In-Practice Strategies**

- Create opportunities for children to safely investigate (SEP) and observe (SEP) change (CCC) in living things, such as the growth of seedlings, changes of caterpillars into butterflies, or observing (SEP) eggs hatching into chicks. Support children in having conversations with their peers about their observations (SEP). If access to living things in the learning space is authorized, be sure to reference district processes and receive approval prior to introducing animals, including pets, into the learning space.
- Utilize photo cards to clearly and visually highlight changes (CCC) that occur with familiar living things, such as the life cycle of a frog or baby animals with their parents.
- Vary the challenge level to ensure all children are being challenged appropriately. For example, some children may benefit from opportunities to investigate (SEP) simple and sudden change (CCC) while other children may be ready to notice more subtle changes (CCC).
- Use a variety of ways to describe* (SEP) change (CCC), including measurements, photos across time, and children's drawings.
- Invite children to share their own observations (SEP) of changes (CCC) in living things that occur at home, such as those they observe (SEP) in a pet, plants, or even wild animals in their communities, such as birds nesting.
- Introduce phrases for children to use to identify changes (CCC) they have noticed such as "It used to be _____ , and now it is _____ ."

* Descriptions could include, but are not limited to, oral, pictorial, written, and kinesthetic.

## Strand: PHYSICAL SCIENCE

### Pre-K4
*48 to 60 months*

**PK.PS.1**

Explores and describes* (SEP) the physical properties (for example, size, weight, shape, color, texture, smell, and sound) of objects and changes (CCC) of solid or liquid materials during play and investigations (SEP).

Alignment Pre-K3: C.STE.1, C.STE.2

Alignment *NGSS*: 2-PS1-1, 2-PS1-4, 5-PS1-2

**Examples**

- While making modeling dough, a child observes (SEP) and describes (SEP) individual ingredients' color, texture, and state. When the child combines the water and flour, they describe (SEP) the change (CCC) in the texture, "The water and flour make it squishy."
- During an investigation (SEP) out on the playground, a child paints with water on the sidewalk and observes (SEP) that the water lines disappear quickly where it is sunny and more slowly where it is shady. The child looks to their teacher and says in Spanish, "*El sol hace que el agua se seque rápido* (The sun makes the water dry fast)."
- Rolling a toy car down various ramps, a child observes (SEP) that the car rolls faster on the smooth ramp and more slowly on the bumpy ramp.
- In response to a family activity that the teacher sent home inviting families to cook simple recipes with their children, a child shares that they baked a cake, and the goopy batter changed (CCC) into a yummy, spongy, chocolate cake.

**In-Practice Strategies**

- Support children in making observations (SEP) of the various characteristics of objects and how they change (CCC).
- Provide access to a variety of safe materials and objects with differing attributes that children can manipulate and explore, such as blocks made of different materials or materials with different textures.
- Incorporate safe materials throughout the learning centers that support children's investigations (SEP) around change (CCC), such as paints in the art center, modeling dough in manipulatives center, and transparent color paddles in the science center.
- Provide space for children to collaboratively conduct safe investigations (SEP) with materials and objects individually and together, making predictions (SEP) and testing (SEP) out their ideas about change (CCC).
- Support children in making connections between their investigations (SEP) and daily life examples (for example, changes (CCC) during food preparation with their families, puddles evaporating after the rain while playing in their community).
- Model ways for children to describe(SEP) findings about materials and objects in a visual way using models (SEP), including photographs, observational drawings, and graphs.
- Model rich vocabulary (for example, solid, liquid, property) and support children in framing questions (SEP) that reflect their wonderings about materials and objects in English or their home language. For example, after observing a child combine flour and water while making modeling clay, a teacher may respond by saying, "What do you notice? What are you wondering?"

* Descriptions could include, but are not limited to, oral, pictorial, written, and kinesthetic.

## Strand: PHYSICAL SCIENCE

**Pre-K4**
*48 to 60 months*

### PK.PS.2

Explores the motion of objects during play and investigations (SEP). Predicts (SEP) and describes* (SEP) changes (CCC) in an object's direction, speed, or distance.

Alignment Pre-K3: C.STE.1, C.STE.2

Alignment *NGSS*: K-PS2-1, K-PS2-2, 3-PS2-1, 3-PS2-2, 4-PS3-1, 4-PS3-3

**Examples**

- A child attempts to make the ball roll further across the floor off a ramp. The child predicts (SEP) that increasing the height of the ramp will cause (CCC) the ball to roll further and tests (SEP) out their prediction (SEP), confirming it is accurate. The child describes (SEP) to the teacher in Spanish, "*Mira, la rampa hace que la pelota llegue lejos. Se fue hasta la mesa* (Look, the ramp makes it go far. It went all the way to the table)."
- While on a scooter, a child uses greater force pushing off with their foot, predicting (SEP) it will make them roll faster. The child notices they are moving faster than other children. When the teacher asks how they were able to go so fast, the child answers in their home language, which the teacher also speaks, "Pushing hard makes the scooter go fast. Pushing easy makes the scooter go slow."
- While playing with paper fans and pom-poms, a child demonstrates how waving the fan causes (CCC) the pom-pom to move across the table.
- In response to a teacher's invitation to find objects at home that roll and do not roll, a child brings a soup can and demonstrates that placing it on the rounded side and pushing it causes (CCC) it to roll.

**In-Practice Strategies**

- Support children in making observations (SEP) of how objects move, including changes (CCC) in an object's direction, speed, or distance.
- Provide a variety of safe materials (for example, various size balls, ramps, child-size wagon), both inside and outside, that invite and challenge children to work collaboratively to plan investigations (SEP) to explore changes (CCC) in motion, pushing, and pulling in a variety of ways. Gather materials that might be familiar to children by collaboratively learning from families and community members.
- Provide space and time for children to test (SEP) out predictions (SEP) about changes (CCC) in motion and make adaptations to their plan. Support children in having conversations with their peers regarding their predictions (SEP) and observations (SEP).
- Help children to retell the steps they took while investigating (SEP) the motion of objects.
- Support children in representing their thinking about motion using two- or three-dimensional models (SEP), using a variety of forms or safe materials (for example, drawn pictures, digital images, blocks, clay, natural items).
- Scaffold children's thinking using open-ended questions about their investigations (SEP) of motion. For example, "Why do you think the ball stopped?" or "What might you do to make the ball roll further?"
- Repeat and extend what children communicate to bring clarity to children's explanations (SEP). Create opportunities for children to use their home language or English when making sense of phenomena.

* Descriptions could include, but are not limited to, oral, pictorial, written, and kinesthetic.

## Strand: PHYSICAL SCIENCE

**Pre-K4**
*48 to 60 months*

### PK.PS.3

Explores and describes* (SEP) the properties and changes (CCC) in sound, light, and shadows by manipulating different objects and materials during play and investigations (SEP).

Alignment Pre-K3: C.STE.1, C.STE.2

Alignment *NGSS*: 1-PS4-1, 1-PS4-2, 1-PS4-3, 1-PS4-4, 4-PS3-2

**Examples**

- In response to the teacher's addition of flashlights to the science area and challenge to the children to create different size shadows with their hands, a child observes (SEP) that moving their hand closer to the light causes the shadow to become bigger, while moving it away from the light changes (CCC) it to a smaller size.
- In the sand table, a child pours sand into a metal container, shakes it, and notices the sound it makes. While changing (CCC) the amount of sand in the container, the child observes (SEP) a change (CCC) in the sound produced.
- While playing with the kitchen pans and utensils outside, a child states, "Listen! When I bang the spoon on the pan super hard, it makes a really loud sound!"
- As a child plays near a window, the sun is shining brightly into the classroom. After the teacher provides various materials, the child investigates ways to block the sun.

**In-Practice Strategies**

- Elicit and record questions (SEP) from children about the properties of change (CCC) in sound, light, and shadows. Leverage the children's questions to motivate an interest in learning.
- Provide children with materials that invite them to safely investigate (SEP) different ways to change (CCC) sound, such as providing a variety of instruments or offering a variety of materials that children may use to fill containers and make shakers.
- Provide materials that invite children to safely investigate (SEP) properties of light and shadows both independently and collaboratively, such as making different types of light sources available along with materials that are transparent, translucent, or opaque.
- Highlight examples of light, sound, and shadows throughout a typical day, such as shadows on the playground, sounds indoors and outdoors, or turning on and off lights.
- Invite families to send in photos of different shadows that are found in their home to elicit discussion on the properties of the object creating the shadow.
- Use open-ended questions that support children in communicating (SEP) their observations of changes (CCC) that occur (for example, "What type of tools might we use to tap the drum and make a soft sound and a loud sound?" or "How might we create something that will block the sun and make the book area less bright?") in English or their home language.

* Descriptions could include, but are not limited to, oral, pictorial, written, and kinesthetic.

## Strand: EARTH AND SPACE SCIENCE

**Pre-K4**
*48 to 60 months*

### PK.ESS.1

Explores and describes* (SEP) characteristics of familiar earth materials (for example, soil, water, and rocks) during play and investigations.

Alignment Pre-K3: C.STE.3

Alignment *NGSS*: 2-ESS1-1, 2-ESS2-2, 2-ESS2-3, 4-ESS2-1, 4-ESS2-2

**Examples**

- During an outdoor investigation (SEP) on the playground, a child collects rocks and organizes them into piles based on size.
- While being dropped off, a child shakes snow off their hat and communicates how the snow feels in Spanish, "*fría y crujiente*" (cold and crunchy).
- A child draws a picture in the art area and shares that it is a picture of their garden at home and points out all of the new dirt their parents put in to help the plants grow.
- While at the mud kitchen, the child mixes various combinations of dirt and water in a large bowl with a wooden spoon. The child turns to another child and says, "I made mud."

**In-Practice Strategies**

- Support children in making observations (SEP) of the various characteristics of earth materials.
- Ensure that children have safe direct experiences with earth materials by creating opportunities for play and investigations (SEP) indoors and outdoors. This may include adding various types of rocks in an outdoor space that vary in size or texture, changing materials in the sensory tables to include dirt or pebbles, or adding a collection of stones for children to compare (SEP) and contrast in the science center.
- Provide various ways for children to describe (SEP) their work that fits with the various developmental capacities of children in the learning space. For example, some children may be ready to create representational drawings while others may be encouraged to sort materials by type.
- Provide tools such as magnifiers, containers, and scales to support children in investigating (SEP) earth materials.
- Invite families to collect safe earth materials (for example, soil and rocks) from their homes or neighborhoods and bring them into the learning space for children to compare (SEP) and contrast. Invite children to retell details of their experience to the class.
- Take a neighborhood walk to build children's awareness of various safe earth materials in their community.

* Descriptions could include, but are not limited to, oral, pictorial, written, and kinesthetic.

## Strand: EARTH AND SPACE SCIENCE

**Pre-K4**
*48 to 60 months*

### PK.ESS.2

Investigates (SEP) and describes* (SEP) characteristics and changes (CCC) of objects in the sky (sun, moon, stars, clouds) and weather over time.

Alignment Pre-K3: C.STE.3

Alignment *NGSS*: K-ESS2-1, K-ESS3-2,1-ESS1-1, 1-ESS1-2, 3-ESS2-2, 5-ESS1-1, 5-ESS1-2

**Examples**

- After having traced the outline of a shadow of a small tree with support from their teacher in the morning, a child notices the shadow is no longer inside the outline later in the day. The child then traces the tree's shadow again.
- A child draws a picture of the snowman they built at home and then asks the teacher to write, "I made a snowman with the winter snow. The wet snow sticks together."
- After the teacher invites families to describe (SEP) the weather for a week at home by adding a sun, cloud, raindrop, or snow sticker to a calendar, a child points out that it was sunny for four days and then the weather changed (CCC) and became rainy.

**In-Practice Strategies**

- Elicit and record how and why questions (SEP) from children regarding the sun, moon, stars, clouds, or weather throughout the learning process. Leverage these questions (SEP) to motivate a need for learning.
- Support children in making safe observations (SEP) of changes (CCC) that occur in the sky and weather. Remind children to not look directly into the sun.
- If possible, ensure children have appropriate clothing to allow them to directly experience all types of weather.
- Use a variety of ways to describe (SEP) weather in a concrete way, including children's drawings, photos, and charting.
- Support children in having conversations with peers about what they have noticed about the moon. Encourage children to use time-related (for example, before, after) and spatial (for example, above, below, behind) words.
- Support children in making basic predictions (SEP) about changes (CCC) in weather or objects in the sky.
- Emphasize the characteristics of seasons as they occur in your area rather than typical depictions of them that may not apply to what children experience. For example, there tends to be a large amount of snow in the mountains and very little, if any at all, along the coast during the winter.
- Invite families to share the words they use for different types of celestial objects (for example, sun, moon, stars) and/or weather in their home language.
- Post key vocabulary after observations (SEP) and investigations (SEP) have occurred, labeled in English and children's home language, when possible, paired with images to help illustrate the vocabulary.
- Use a variety of picture cards and both fiction and nonfiction books that accurately depict objects in the sky and the weather during whole-group read aloud and choice or center time to support children's understanding. When texts do not represent the natural and built environment in a scientifically accurate manner, engage children in a conversation about the difference between fiction and real-world scientific phenomena.
- Chorally read aloud rhyming poems or sing songs that accurately represent or describe objects in the sky or weather.

* Descriptions could include, but are not limited to, oral, pictorial, written, and kinesthetic.

## Strand: EARTH AND SPACE SCIENCE

**Pre-K4**
*48 to 60 months*

### PK.ESS.3

Investigates (SEP) and proposes solutions (SEP) to reduce human impact on the earth and living things.

Alignment Pre-K3: C.STE.3

Alignment *NGSS*: K-ESS3-3, 2-ESS2-1, 4-ESS3-1, 5-ESS3-1

**Examples**

- While on the playground, a child finds a piece of trash on the ground and immediately disposes of it in the trash barrel, saying aloud to themselves in their home language, "This could make the birds sick," reflecting the program's mission to responsibly dispose of trash.
- While planning the class garden, a child shares that they put a lot of flowers in their garden at home because their grandmother told them the bees depend on them for food.
- A child reminds a peer in Spanish to turn off the faucet "so we don't waste water."
- Children cooperatively create a class poster with the teacher about reduce, reuse, recycle that is then shared with families in both English and Spanish.

**In-Practice Strategies**

- Engage children in program missions around caring for our planet such as utilizing recycling bins in the learning space, composting food after lunch for the school garden, or utilizing reusable water bottles to minimize the use of paper cups.
- Ask families to share their approaches and practices around protecting the environment to inform investigations (SEP) and learning experiences.
- Invite in local experts, such as a trash collector, beekeeper, or wild animal rehabilitator, to share their expertise around supporting the environment.
- Support children in understanding the effect (CCC) humans have on the environment through safe, hands-on investigations (SEP) around concepts such as decomposition and water filtration, along with related solutions.

# Strand: ENGINEERING, TECHNOLOGY, AND APPLICATIONS OF SCIENCE

## Pre-K4
*48 to 60 months*

### PK.ETS.1

Identifies a simple problem (SEP) in the classroom, their daily life, or community, designs a solution (SEP), and tests (SEP) and refines the solution with adults and peers.

Alignment Pre-K3: C.STE.4

Alignment *NGSS*: K-2-ETS1-1, K-2-ETS1-2, K-2-ETS1-3, 3-5-ETS1-1, 3-5-ETS1-2, 3-5-ETS1-3

**Examples**

- Interested in creating a "roadway" for the tricycles outside, a child uses paper and crayons to illustrate a potential design that the teacher and other children then help to implement using chalk on the pavement.
- Worried about a baby bird that fell out of a tree on the playground, a child and their teacher collect materials to design (SEP) a cozy nest for the bird to be safe and place the nest in a nearby bush to keep it out of reach of cats.
- After the hose that is used to water the class garden breaks, a child suggests using containers from the sandbox to water the garden. With the support of their peers, the child tests (SEP) out various sized containers to determine the easiest way to move the water.
- After feeling very hot in the sunny playground, the children collaborate with the help of their teacher to design (SEP) and build a shaded corner using large pieces of fabric, string, and other available tools and materials.

**In-Practice Strategies**

- Engage children in problem solving issues collaboratively that are familiar and relevant to their daily lives and communities.
- Have a variety of safe materials (for example, popsicle sticks, paper, scissors, glue, tape, markers, recyclable materials) accessible for children to create structures and solution (SEP) s of their choice.
- Vary the challenge levels for children's engineering designs to best meet their individual interests, strengths, and abilities. For example, provide pattern cards displaying unit blocks for some children to re-create and photos of local buildings for others.
- Support children in representing their thinking and/or a concept related to their developing plans as a two- or three-dimensional model (SEP), using a variety of forms or safe materials (for example, drawn pictures, digital images, blocks, clay, natural items).
- Provide families with engineering challenges to complete together, such as creating a catapult to be used with pom-poms, that they can then bring in and test (SEP) out which one projects the pom-pom the furthest.
- Invite children to describe (SEP) their ideas in their home language or English when planning, explaining, and documenting their solutions.

# ENDNOTES


1 Maryland State Department of Education. 2024a. *Maryland Early Learning Standards: 0–48 Months*. Baltimore: Maryland State Department of Education. https://marylandpublicschools.org/Documents/MD-EarlyLearning-Standards-2024-a.pdf

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3 Greenfield, D.B., Alexander, A., and Frechette, E. 2017. "Unleashing the Power of Science in Early Childhood: A Foundation for High-Quality Interactions and Learning." *Zero to Three* 37 (5): 13-21. https://eric.ed.gov/?id=EJ1143042. National Academies of Sciences, Engineering, and Medicine (NASEM). 2022. *Science and Engineering in Preschool Through Elementary Grades: The Brilliance of Children and the Strengths of Educators*. The National Academies Press. https://nap.nationalacademies.org/read/26215

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5 Maryland State Department of Education. 2024b. *Science High-Quality Instructional Materials Identification Framework*. Office of Teaching and Learning. Baltimore: Maryland State Department of Education. https://hqim.marylandpublicschools.org/wp-content/uploads/sites/21/2024/09/Science-HQIM-Identification-Framework-A3.pdf

6 CAST. 2024. "UDL Guidelines." Accessed October 1, 2024. https://udlguidelines.cast.org/

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