PreK-PS1. Matter and Its Interactions

PreK-PS1-1. **Raise questions about the differences between liquids and solids and use their experiences to develop awareness that a liquid can become a solid and vice versa.**

PreK-PS1-2. **In their play and investigations of the natural and human-made world, describe, compare, sort and classify objects based on observable physical characteristics, uses, and whether something is manufactured.**

PreK-PS1-3. **Differentiate between the properties of an object and those of the material of which it is made.**

PreK-PS1-4. **Recognize through investigation that physical objects and materials can change under different circumstances.** (Clarification statement: Changes include building up or breaking apart, mixing, dissolving, or changing state.)

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 Solving Problems/Designing Things (Engineering)

- Observe and ask questions about observable phenomena (objects, materials, organisms or events). (PreK-PS1-1)

Planning and Carrying Out Investigations

- Use their senses and simple tools to observe, gather, and record data. (PreK-PS1-2, PreK-PS1-3)

Constructing Explanations/Theories and Evaluating Solutions

- Construct theories based in experience about what might be going on.
- Use evidence to support a theory or solution

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter

- Different kinds of matter exist (e.g., wood, metal, water), and many of them can be either solid or liquid, depending on temperature. (PreK-PS1-1)
- Objects and materials can be described and classified by their observable properties (e.g., visual, aural, textural), by their uses, and by whether they occur naturally or are manufactured. Different properties are suited to different purposes. A great variety of objects can be built up from a small set of pieces (e.g., blocks, construction sets). Objects or samples of a substance can be weighed, and their size can be described and measured. (Boundary: volume is introduced only for liquid measure.) (PreK-PS1-2), (PreK-PS1-3)

PS1.B: Chemical Reactions

- Materials and objects can change under different circumstances. Sometimes these changes are reversible (e.g., melting and freezing, taking something apart and putting it back together), and sometimes they are not (e.g., baking a cake, burning fuel, mixing certain substances.) (PreK-PS1-4)

Connections to other DCIs in Pre-K:

Articulation of DCIs across grade-bands:

Common Core State Standards Connections:

ELA/Literacy –

Speaking and Listening: Comprehension and Collaboration

- *Ask and answer questions in order to seek help, get information, or clarify something that is not understood (PK.SL.MA.3)*

Mathematics –

Measurement and Data: Describe and compare measurable attributes

- *Recognize the attributes of length, area, weight, and capacity of everyday objects using appropriate vocabulary (PK.MD.MA.1.)*
- *Compare the attributes of length and weight for two objects, including longer/shorter, same length; heavier/lighter, same weight; holds more/less; holds the same amount (PK.MD.MA.2.)*

Measurement and Data: Analyze, compare, create, and compose shapes

- *Create and represent three-dimensional shapes,(PK.MD. MA.3.)*

Geometry: Identify and describe shapes

- *Identify relative position of objects in space, and use of appropriate language (PK.G.MA.1.)*

Operations and Algebraic Thinking: Understanding addition as putting together and adding to, and understand subtraction as taking apart and taking from

- *Use concrete objects to model real-world addition and subtraction (PK.OA.MA.1.)*

PreK-PS2. Motion and Stability: Forces and Interactions

PreK-PS2-1. **Plan and carry out investigations of the behaviors of moving things.**

PreK-PS2-2. **Using evidence, discuss ideas about what is making something move the way it does and how some movements can be controlled.**

PreK-PS2-3. **Through experience, dDevelop awareness ~~through experience~~ of factors that influence whether things stand or fall.** (Clarification statement: Examples of ~~a~~ factors in children's construction play include using a broad foundation when building, ~~it clay~~, considering the strength of ~~strong~~ materials, and using balanced weight distribution in a block building~~,~~.)

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

Engaging in Discussion/Argument from Evidence

- Engage in discussion before, during and after

Disciplinary Core Ideas

PS2.A: Forces and Motion

- Objects pull or push each other when they collide or are connected. Pushes and pulls can

investigations (PreK- PS4-2) ▪ Support thinking with evidence. (PreK-PS2-2) **Planning and Carrying Out Investigations** ▪ Plan and implement investigations using simple equipment; designing/building a solution to a problem. (PreK-PS2-1), **Constructing Explanations/Theories and Evaluating Solutions (Engineering)** ▪ Look for and describe patterns and relationships (PreK-PS2-3)	have different strengths and directions. Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. (PreK-PS2-1), (PreK-PS2-2) **PS2.B: Types of Interactions** ▪ When objects touch or collide, they push on one another and can change motion or shape. (PreK-PS2-2)
Connections to other DCIs in PreK:	
Articulation of DCIs across grade-bands:	
Common Core State Standards Connections: *ELA/Literacy –* ***Speaking and Listening: Comprehension and Collaboration*** • *Participate in collaborative conversations with diverse partners during daily routines and play (PK.SL.MA.1)* *Mathematics –* **Geometry: Analyze, compare, create, and compose shapes** • *Create and represent three-dimensional shapes (PK.G.MA.3)*	

PreK-PS4. Waves and Their Applications in Technologies for Information Transfer	
PreK-PS4-1.	**Investigate different sounds made by different objects and different materials and reason about what is making the sounds.**
PreK-PS4-2.	**Apply understanding in their play of how to change volume and pitch of some sounds.**
PreK-PS4-3.	**Through investigation and using daily experience construct ideas about the relationships between the size and shape of shadows, the objects creating the shadow and the light source.**
PreK-PS4-4.	**Compare and sort materials into those that allow all, some, or no light to pass though them.**
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** ▪ Plan and implement investigations using simple equipment; designing/building a solution to a problem. (PreK-PS4-1) ▪ Using their senses and simple tools to observe, gather and record data. (PreK-PS4-4) **Engaging in Discussion/Argument from Evidence** ▪ Engaging in discussion before, during, and after investigations PreK-PS4-2) **Constructing Explanations/Theories and Evaluating Solutions (Engineering)** ▪ Construct theories based in experience about what might be going on. (PreK-PS4-3)	**Disciplinary Core Ideas** **PS4.A: Wave Properties** ▪ Sound can make matter vibrate, and vibrating matter can make sound. Different objects and materials make different sounds. The pitch and volume of sound can be changed. (PreK-PS4-1), (PreK-PS4-2) **PS2.B: Electromagnetic Radiation** ▪ Some materials allow light to pass through them, others allow only some light through, and others block all the light and create a dark shadow on any surface beyond them (i.e., on the other side from the light source), where the light cannot reach. The size and shape of a shadow depend on several factors(i.e. the orientation of the object, the location of the light source, and the distances between light source, object, and shadow. (PreK-PS4-3), (PreK-PS4-4)
Connections to other DCIs in first grade:	
Articulation of DCIs across grade-bands:	
Common Core State Standards Connections: *ELA/Literacy –* ***Speaking and Listening:Presentation of Knowledge and Ideas*** • *Speak audibly and express thoughts, feelings, and ideas (PK.SL.MA.6)* *Mathematics –* ***Measurement and Data: Describe and compare measurable attributes*** • *Recognize the attributes of length, area, weight, and capacity of everyday objects using appropriate vocabulary (PK.MD.MA.1.)* ***Geometry: Identify and describe shapes*** • *Identify relative position of objects in space, and use appropriate language (PK.G.MA.1)*	