K-PS2 Motion and Stability: Forces and Interactions

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)

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)

Connections to Nature of Science

Connections to other DCIs in kindergarten: K.ETS1.A (K-PS2-2), K.ETS1.B (K-PS2-2)

Articulation of DCIs across grade levels: 2.ETS1.B (K-PS2-2); 3.PS2.A (K-PS2-1), (K-PS2-2); 3.PS2.B (K-PS2-1), 4.PS3.A (K-PS2-1); 4.ETS1.A (K-PS2-2)

E.L./Literacy -
RI.K.1 With prompting and support, ask and answer questions about key details in a text. (K-PS2-2)
W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-PS2-1)
SL.K.3 Ask and answer questions in order to seek help, get information, or clarify something that is not understood. (K-PS2-2)

Mathematics -
MP.2 Reason abstractly and quantitatively. (K-PS2-1)
K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (K-PS2-1)
K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has “more of”/“less of” the attribute, and describe the difference. (K-PS2-1)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.