



UNIT 2

FORCES AND INTERACTIONS: PUSHES AND PULLS



Unit 2: Forces & Interactions: Pushes and Pulls

12 weeks

In this unit, students will explore how objects move and interact. They will investigate different strengths and directions of pushes and pulls. Investigations allow students to make sense of how pushing or pulling an object can change the speed or direction of its motion, and can start or stop the motion of an object. Students will begin to recognize factors, such as size, weight, and shape, which will affect an object's motions. Students may also observe that different types of surfaces can affect the object's motion, as well. However, the formal understanding of friction is not expected at this level.

Students will also investigate what happens to objects when they collide or connect with one another. They will explore the effects of different strengths or different directions of pushes and pulls on the motion of an object, and will apply this understanding to design solutions to problems that involve changing the speed or direction of an object using a push or pull.

Unit 2 Performance Expectations

- ❖ **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 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.

In Unit 2, students will understand...

- ❖ Pushes and pulls can have different strengths and directions.
- ❖ Pushing or pulling an object can change the speed or direction of its motion.
- ❖ Pushing or pulling an object can start or stop it.
- ❖ Size, weight, and shape affect an object's motion.
- ❖ Objects push or pull each other when they collide or are connected.
- ❖ When objects touch or collide, they push on one another and can change motion.
- ❖ A bigger push or pull makes things speed up or slow down more quickly.
- ❖ Effects of different strengths or different directions of pushes and pulls on the motion of an object and can apply this understanding to analyze a design solution.

Unit 2 Essential Questions:

- ❖ What causes an object to move?
- ❖ What happens if you push or pull an object with different amounts of force?



Additional Content Connections:

*These connections provide opportunities to score to other content standards with focused instruction.

ELA:

- ❖ Speaking and Listening
 - SL.K.3 Ask and answer questions in order to seek help, get information, or clarify something that is not understood
 - SL.K.1 Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups

Math:

- ❖ Classifying and Sorting Objects (*directions of an object's motion*)
 - K.G.A.1 Describe the positions of objects in the environment and geometric shapes in space using names of shapes and describe the relative positions of these objects.
(Positions could be: *inside, outside, between, above, below, near, far, under, over, up, down, behind, in front of, next to, to the left of, to the right of, or beside.*)
- ❖ Measurement and Data (*distance or direction of an object's motion or strength of push or pull*)
 - K.MD.A.1 Describe several measurable attributes of a single object, including but not limited to length, weight, height, and temperature. (Vocabulary may include short, long, heavy, light, tall, hot, cold, warm or cool.)
 - K.MD.A.2 Describe the difference when comparing two objects (side-by-side) with a measureable attribute in common, to see which object has more of or less of the common attribute. (Vocabulary may include shorter, longer, taller, lighter, heavier, warmer, cooler, or holds more.)

Science/Social Studies: (*ongoing weather observations of patterns over time*)

- ❖ Weather and Climate
 - K-ESS2-1 Use and share observations of local weather conditions to describe patterns over time.
- ❖ Geography
 - G.9.K.3 Identify ways weather and climate impact daily life

Unit Vocabulary:

observe/observation	push	straight
measure	pull	zigzag
investigate/investigation	motion	curve
predict/prediction	direction	collide
data	strength	connect
solution	force	speed

*Students should engage with these terms throughout this unit and within other units in Kindergarten.



Forces and Interactions: Pushes and Pulls

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	Disciplinary Core Ideas	Crosscutting Concepts
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)	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. (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. (K-PS2-2)	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)

