Kindergarten Unit 4 - Pushes and Pulls

Content Area: **Science**
Course(s): **Science Grade K**
Time Period: **MP4**
Length: **22 days**
Status: **Published**

NJSLS - Science

SCI.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.
SCI.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.
SCI.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.

Science and Engineering Practices

Planning and Carrying Out Investigations

With guidance, plan and conduct an investigation in collaboration with peers. (K-PS2-1)

Analyzing and Interpreting Data

Analyze data from tests of an object or tool to determine if it works as intended. (K-PS2-2) (K-2-ETS1-3)

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)

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)

ETS1.C: Optimizing the Design Solution

Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (K-2-ETS1-3)

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)

Rationale and Transfer Goals

What happens if you push or pull an object harder?

During this unit of study, students apply an understanding of the effects of different strengths or different directions of pushes and pulls on the motion of an object to analyze a design solution. The crosscutting concept of cause and effect is called out as the organizing concept for this disciplinary core idea. Students are expected to demonstrate grade-appropriate proficiency in planning and carrying out investigations and analyzing and interpreting data. Students are also expected to use these practices to demonstrate an understanding of the core ideas.

Enduring Understandings

Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it.

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.

Essential Questions

Why do scientists like to play soccer?

How can you design a simple way to change the speed or direction of an object using a push or pull from another object?

Content - What will students know?

- People use different ways to study the world.
- Simple tests can be designed to gather evidence to support or refute student ideas about causes.
- Pushes and Pulls can 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.
- When objects touch or collide, the object's motion can be changed.
- A bigger push or pull makes things speed up or slow down more quickly.
- 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.

Skills - What will students be able to do?

- With guidance, design simple tests to gather evidence to support or refute ideas about cause-and-effect relationships.

- With guidance, plan and conduct an investigation in collaboration with peers.
- With guidance, collaboratively 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.
- Analyze data from tests of an object or tool to determine if it works as intended.
- Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Activities - How will we teach the content and skills?

- Mystery Science Force Olympics Lesson 1
- Mystery Science Force Olympics Lesson 2
- Mystery Science Force Olympics Lesson 3
- Mystery Science Force Olympics Lesson 4
- Mystery Science Force Olympics Lesson 5
- Mystery Science Force Olympics Lesson 6
- Read Alouds
- Modeling/Think Alouds
- BrainPop Jr. Pushes and Pulls
- Push Pull-Changing Directions
- Marble Roll
- Roller Coaster
- Ramps 2: Ramp Builder
- Forces and Motion Unit
- The Wonder of Science

Evidence/Assessments - How will we know what students have learned?

- Mystery Science Force Olympics Lesson 1 Assessment

- Mystery Science Force Olympics Lesson 2 Assessment
- Mystery Science Force Olympics Lesson 3 Assessment
- Mystery Science Force Olympics Lesson 4 Assessment
- Mystery Science Force Olympics Lesson 5 Assessment
- Mystery Science Force Olympics Lesson 6 Assessment
- Teacher Observation
- Student projects/models
- Individual and Group Participation
- Exit Tickets
- Quizzes
- Grade K Unit 4 Benchmark

Spiraling for Mastery

Content or Skill for this Unit	Spiral Focus from Previous Unit	Instructional Activity
Pushes and Pulls can 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. With guidance, design simple tests to gather evidence to support or refute ideas about cause-and-effect relationships.	Students tend to think of force as a property of an object ("an object has force," or "force is within an object") rather than as a relation between objects. In addition, students tend to distinguish between active objects and those objects that support or block or otherwise act passively. Students tend to call the active actions "force" but do not consider passive actions as "forces"	Students determine the objects that will move/be moved (balls, ramps, blocks, counting chips) and the types of structures (ramps or barriers) and materials (rubber bands, paper tubes, cardboard, foam, wooden blocks) that can be used to meet this challenge. Groups of students develop a simple drawing or diagram and use given materials to build their design. Groups should be given a predetermined amount of time to draw and build their designs. Students make and use observations to determine which of the designs worked as intended,

		based on the criteria determined by the class.

21st Century Life and Careers

WRK.9.1.2.CAP.1	Make a list of different types of jobs and describe the skills associated with each job.

Career Readiness, Life Literacies, & Key Skills

TECH.9.4.2.CI.1	Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2).
TECH.9.4.2.CI.2	Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a).
TECH.9.4.2.CT.1	Gather information about an issue, such as climate change, and collaboratively brainstorm ways to solve the problem (e.g., K-2-ETS1-1, 6.3.2.GeoGI.2).
TECH.9.4.2.CT.2	Identify possible approaches and resources to execute a plan (e.g., 1.2.2.CR1b, 8.2.2.ED.3).
TECH.9.4.2.CT.3	Use a variety of types of thinking to solve problems (e.g., inductive, deductive).

Interdisciplinary Connections/Companion Standards

NJSLS ELA

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)

NJSLS Mathematics

MP.2 Reason abstractly and quantitatively. (K-PS2-1)

MP.4 Model with mathematics. (K-2-ETS1-3)

MP.5 Use appropriate tools strategically. (K-2-ETS1-3)

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)

English Language Arts

In order to integrate English Language Arts into this unit, students need the opportunity to participate in shared research that will enhance their understanding of the effect of forces (pushes and pulls) on objects. This could include exploring simple books and other media or digital resources. With prompting and support, students should ask and answer questions about key details in texts in order to seek help, get information, or clarify something that they do not understand. With support from adults, students will also recall information from experiences to answer questions and clarify their thinking. With support and/or collaboration, they can use digital tools to produce and publish simple informative writing or to document their observations of the simple force and motion systems they design and build.

Mathematics

During this unit of study, students will make connections to Mathematics in a number of ways. Kindergartners can use simple nonstandard units to measure the distances that two different objects travel when pushed or pulled or the distances that an object travels when varying the strength of a push or a pull. If using two objects, students can compare them using a measurable attribute, such as weight, to see which object has "more of" or "less of" the attribute, and describe the effect that increased weight has on the distance that an object travels. As students conduct multiple trials with the two objects (or with a single object, varying the strength of the push or pull), they can document the distance traveled in a simple graph. Then they can analyze the data in order to describe the cause-and-effect relationship between forces and motion of objects. As students collect and analyze data, they are learning to reason abstractly and quantitatively and use appropriate tools strategically.