Kindergarten Unit 4 - Pushes and Pulls

Content Area: **Science**
Course(s): **Science Grade K**
Time Period: **MP4**
Length: **24 days**
Status: **Published**

NJSLS - Science

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.
K-2-ETS1-1	Ask questions, make observations, and gather information about a situation people want to change (e.g., climate change) to define a simple problem that can be solved through the development of a new or improved object or tool.
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.
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.
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)

Asking Questions and Defining Problems

Ask questions based on observations to find more information about the natural and/or designed world(s). (K-2-ETS1-1)

Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1)

Developing and Using Models

Develop a simple model based on evidence to represent a proposed object or tool. (K-2-ETS1-2)

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. (K-2-ETS1-1)

Ask questions, make observations, and gather information about a situation people want to change (e.g., climate change) to define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1)

Before beginning to design a solution, it is important to clearly understand the problem. (K-2- ETS1-1)

ETS1.B: Developing Possible Solutions

Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions, such as climate change, to other people. (K-2-ETS1-2)

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)

Structure and Function

The shape and stability of structures of natural and designed objects are related to their function(s). (K-2-ETS1-2)

Rationale and Transfer Goals

In this unit, students investigate the basic physics of how things move. Students will discover that objects do not move on their own; they require a force, either a push or a pull, to start, stop, or change direction. Through collaborative play, active investigation, and simple engineering challenges, students will explore how changing the strength or direction of a push or pull affects an object's speed and path. Finally, students will apply their knowledge to test and evaluate a design solution to successfully guide a moving object from point A to point B.

Enduring Understandings

A push or a pull is a force that can start, stop, or change the direction of an object's motion.

Pushes and pulls can have different strengths (hard or soft) and different directions (straight, sideways, backward).

A bigger push or pull makes things speed up or slow down more quickly.

We can build simple tools (like ramps or walls) to intentionally change the speed or direction of an object.

Essential Questions

What makes things move, speed up, or stop?

How does changing a push or a pull change the way an object moves?

How can we use forces to solve a problem and control where an object goes?

Content - What will students know?

- Objects do not start moving, change direction, or stop on their own; they require an external action.
- A push moves an object away from you, while a pull brings an object closer to you.
- Rougher surfaces (like carpet) make objects slow down faster than smooth surfaces (like wood or tile).
- The size of a push or pull affects speed and distance. A stronger force (hard push) makes an object move faster and travel farther than a weaker force (gentle push).
- The direction of a push or pull determines which way an object will travel.
- When two objects collide: They can push on each other. They can change each other's speed. They can change each other's direction.
- People can design tools and structures to intentionally speed up, slow down, stop, or divert a moving object.
- A design might not work perfectly the first time, and testing it allows us to see why and make changes to solve the problem.

Skills - What will students be able to do?

- Physically demonstrate how to move an object using a push and a pull.
- Intentionally apply a "strong/hard" force versus a "gentle/soft" force to an object and compare how fast or how far it goes.
- Push or pull an object to make it go in a specific direction.

- Work with a partner or small group to follow a simple, guided science test.
- Look at an object's path and predict what will happen when it hits an obstacle.
- Watch two objects collide and describe the result using physics vocabulary.
- Use everyday classroom materials to create a path or slope that moves a toy.
- Design a simple setup to change an object's behavior.
- Test their design, observe if the object actually did what they wanted, and make small changes to fix it if it failed.

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

Formative 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
- Mystery Science Force Olympics Performance Task
- Teacher Observation
- Student projects/models
- Individual and Group Participation
- Exit Tickets

Summative Assessments - How will we know what students have learned?

- 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	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

to gather evidence to support or refute ideas about cause-and-effect relationships.		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.

Career Readiness, Life Literacies, and Key Skills

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).
9.1.2.CR.1	Recognize ways to volunteer in the classroom, school and community.
9.1.2.CAP.1	Make a list of different types of jobs and describe the skills associated with each job.
9.1.2.CR.2	List ways to give back, including making donations, volunteering, and starting a business.
9.4.2.CI.2	Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a).
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).
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).
9.4.2.CT.3	Use a variety of types of thinking to solve problems (e.g., inductive, deductive).

Interdisciplinary Connections

K.M.A.1	Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.
K.M.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.
2.DL.B.4	Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put together, take-apart, and compare problems using information presented in a bar graph.
RI.CR.2.1	Ask and answer questions to demonstrate understanding of key details in an informational text, referring explicitly to the text as the basis for the answers.
RI.CR.K.1	With prompting and support, ask and answer questions about key details in an informational text (e.g., who, what, where, when, why, how).
W.WR.K.5	With prompting and support, generate questions through shared research in response to a topic, text, or stimulus (e.g., event, photograph, video, book).
SL.ES.K.3	Ask and answer questions in order to seek help, get information, or clarify something that is not understood.

SL.UM.2.5	Use multimedia; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings.