Unit 2: Materials and Motion

Content Area: **Science**
Course(s):
Time Period: **Trimester 2**
Length: **10-12 Weeks**
Status: **Published**

Summary

Students investigate the anchor phenomenon that objects are made of materials—wood, paper, and fabric—and how material properties determine their use. Students use those materials to engineer structures, applying physical science ideas of energy transfer. After building a repertoire of practices with materials and objects, students investigate the effect of pushes and pulls on objects, and apply their intuitive notion of the concept of variables to change the speed and direction of rolling balls and balloon rockets to achieve specific outcomes. Students engage in science and engineering practices by asking questions, participating in collaborative investigations, observing, recording, and interpreting data to build explanations, and designing objects and systems to achieve outcomes. Students gain experiences with crosscutting concepts: patterns; cause and effect; scale, proportion, and quantity; systems and system models; energy and matter; and structure and function.

This unit follows a design that includes active investigation including; outdoor experiences, recording in science notebooks to answer focus questions, reading science resources through read alouds and shared reading and assessment to monitor progress and motivate student reflection on learning.

Revision Date: July 2020

Standards

9.1.2.CAP	Career Awareness and Planning
K-PS2	Motion and Stability: Forces and Interactions
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.
9.1.2.CAP.1	Make a list of different types of jobs and describe the skills associated with each job.
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).
9.4.2.CT	Critical Thinking and Problem-solving
PS2.A	Forces and Motion
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).
9.4.2.DC	Digital Citizenship
PS2.B	Types of Interactions
PS3.C	Relationship Between Energy and Forces
IC	Impacts of Computing
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.
LA.RI.K.1	With prompting and support, ask and answer questions about key details in a text.
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.
LA.RI.K.2	With prompting and support, identify the main topic and retell key details of a text.
LA.RI.K.3	With prompting and support, describe the connection between two individuals, events, ideas, or pieces of information in a text.
LA.RI.K.4	With prompting and support, ask and answer questions about unknown words in a text.
LA.RI.K.5	Identify the front cover, back cover, and title page of a book.
PS2.A	Forces and Motion
LA.RI.K.6	Name the author and illustrator of a text and define the role of each in presenting the ideas or information in a text.
LA.RI.K.7	With prompting and support, describe the relationship between illustrations and the text in which they appear (e.g., what person, place, thing, or idea in the text an illustration depicts).
ETS1.A	Defining Engineering Problems
AP	Algorithms & Programming
LA.RI.K.8	With prompting and support, identify the reasons an author gives to support points in a text.
LA.RI.K.9	With prompting and support, identify basic similarities in and differences between two texts on the same topic (e.g., in illustrations, descriptions, or procedures).
LA.RI.K.10	Actively engage in group reading activities with purpose and understanding.
K-PS3	Energy
K-PS3-1	Make observations to determine the effect of sunlight on Earth’s surface.
K-PS3-2	Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.
NT	Nature of Technology
ETW	Effects of Technology on the Natural World
K-ESS2-1	Use and share observations of local weather conditions to describe patterns over time.
K-ESS3-2	Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.
K-ESS3-3	Communicate solutions that will reduce the impact of climate change and humans on the land, water, air, and/or other living things in the local environment.
ETS1.B	Developing Possible Solutions

Essential Questions/Enduring Understandings

- How can we change the motion of an object?
- How can you change the path of an object in motion?
- What affects the speed and direction at which an object moves?
- What is made of wood, paper, and fabric, and how are the properties of those materials useful to us?

Objectives

Students will know…..

- What is made of wood, paper, and fabric
- How materials are useful to us
- Objects pull or push each other when they collide or are connected
- Pushes and pulls can have different strengths and directions. A bigger push or pull makes things go faster.
- Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it.
- An object sliding on a surface or sitting on a slope experiences a pull due to friction on the object due to the surface that opposes the object's motion
- When objects touch or collide, they push on one another and can change motion or shape.

Students will be skilled at…..

- Asking questions and defining problems
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
- Constructing explanations and designing solutions
- Engaging in argument from evidence
- Obtaining, evaluating and communicating information

Learning Plan

- Preview the essential questions and connect learning throughout the unit.
- Gain students understanding and prior knowledge of materials and motion
- Read literature on different types of materials
- Read literature on motion
- Utilize FOSS kit with materials: Materials and Motion
- Introduce vocabulary throughout the unit: observe, compare, material, similar, different

- Material Vocabulary: wood, paper, fabric, smooth, rough, texture
- Motion Vocabulary: force, motion, push, pull, gravity, speed, direction, roll, collide, collision, ramp, slope, distance
- Introduce students to exploration of materials (wood, paper, fabric)
- Students observe and describe how a push or pull causes something to move using balls

from FOSS kit

- Students roll balls at different speeds (slow and fast) and determine the strength of the push required to achieve a certain speed. They are introduced to gravity as a pulling force.
- Students use balls and ramps to achieve different speeds. They explore what happens when a moving ball hits an object.
- Students change the speed of the ball by changing the slope of the ramp to knock over blocks. They apply their knowledge of ball motion to make a ball land in a particular spot.
- Students find slopes in the schoolyard that can be used to set balls in motion
- Class investigates balloon rockets and how changing the strength of the push (number of pumps of air in the balloon) changes the speed of the balloon rocket and how far it travels. Students also observe what happens to the system when it collides with an object on the flight line.
- Maintain observational journals with student note taking and drawings of experiments and activities
- Create a chart of forces and their effects
- Incorporate literature on materials and motion through shared reading, big books, and nonfiction books from classroom libraries

Assessment

Students will be assessed through a variety of methods. Teacher will use various types of assessments to gauge student understanding. Students will be required to have understanding and mastery of the following key concepts:

Science courses are designed to promote skill attainment. Student progression and pace through which they proceed through the performance tasks is based on their affinity for and ability to reach skill attainment. The teacher will determine formative and summative skill attainment; alternative assessments will be incorporated for each student based on their strengths and challenges.

Formative Assessments: Teacher observation, student responses during lessons,

Summative Assessments: Foss investigation checklists, science notebook

Benchmark Assessments: Investigation IChecks, science notebook

- FQ: Investigation 4.1: What causes objects to move?
- FQ: Investigation 4.2: What happens when objects collide?
- FQ: Investigation 4.3: Where can balls roll on the schoolyard?
- FQ: Investigation 4.4: How can we change how far a balloon rocket travels?

Alternative Assessments: Oral presentations, student produced projects

Materials

Core Book List

FOSS Kit: Materials and Motion

Different fabrics, paper, wood shavings, etc for student exploration

Different size balls, ramps and classroom objects for experimentation

BrainPop Junior

Discovery Education

Mystery Doug

Science notebook for assessment and journaling

Science spin, weekly reader magazine if applicable

Sid the Science Kid:

Season 1 Episode 21: Broken Wheel

Season 1 Episode 22: My Slide

Season 1 Episode 23: Sid's Amazing Invention

Season 1 Episode 25: Climb Ignatz Climb

Season 2 Episode 2: Slide to the Side

Season 2 Episode 3: That's the Way the Ball Bounces

Season 2 Episode 4: Ignatz Inertia

Season 2 Episode 5: Sid's Super Kick

The Magic School Bus

Season 1 Episode 10: Plays Ball

Available Shared Reading F&P Classroom: Bouncing Balls (NF), Rolling(NF), Spin, Spin, Spin (NF),

Slip and Slide (NF), Smash Crash (NF), Up Down and Around (NF), The Stuck Truck (F), The Right Tools (NF)

Available Interactive ReadAloud F&P Classroom: B is for Bulldozer (F), Float (NF), Building a House (NF)

F=Fiction, NF=Nonfiction, H=Hybrid