Unit 3-Forces & Motion

Content Area: **Science**
Course(s): **Science K**
Time Period: **Marking Period 3**
Length: **MP 3**
Status: **Published**

Open Sci Ed

Lesson 1: Anchoring Phenomenon- How can we move things from one place to another?

- Phenomenon- Moving objects can be a challenge.
    - Make observations of ways to move an object.
    - Share our observations and ask questions on our Notice and Wonder chart.
    - Read a newsletter about the challenges of moving an object to win a game.
    - Discuss the challenges and add notices and wonders to investigate.

    .

Lesson 2: Investigation-Which direction do things move when they are pushed and pulled?

- Phenomenon-Things can be moved in different ways.
    - Read a book about planning an investigation.
    - Plan and conduct an investigation to figure out which direction objects move when we use pushes and pulls.
    - Share our observations.
    - Identify that pushes and pulls make objects move in different directions.

Lesson 3: Investigation-How does something move when we push and pull it in different ways?

- Phenomenon- Different strength pushes and pulls affect an object's speed and distance.
    - Use investigation cards to plan and conduct an investigation to figure out how different strength pushes and pulls affect an object's speed and distance.
    - Collect and analyze whole class data to identify that big pushes and pulls cause objects to move faster and farther, while small pushes and pulls cause objects to move slower and less far.

Lesson 4: Investigation- How does the toy car move when it bumps into things?

- Phenomenon- Collisions can cause an object's motion to change.
    - Plan and conduct an investigation to gather evidence on how collisions affect an object's motion.
    - Argue from evidence to make claims about how collisions affect an object's motion.

- Connect our claims to our lives and other cultures through sharing related experiences and reading a book.

Lesson 5: Putting Pieces Together- How can we change how a ball moves?

- Phenomenon-Balls can move in different ways.
    - Plan and conduct an investigation to change the motion of a ball.
    - Record and compare the results of our investigation.
    - Share our pushes and pulls experiences.
    - Read about how others around the world use pushes and pulls.

Lesson 6: Anchoring Phenomenon- How can we design a game to play in our classroom?

- Phenomenon- Ideas from previous problems can be used to solve a new problem.
    - Read a book about how engineers identify problems.
    - Identify our engineering problem.
    - Look at existing games to get ideas.
    - Determine a list of needs for our games.
    - Identify that we are ready to plan our game designs.

Lesson 7: Investigation- How can we plan a design for our game?

- Phenomenon- Designs can be created for games.
    - Read a book about how engineers brainstorm ideas and explore materials.
    - Determine where to place the obstacle, the starting point, and ending point on our game boards.
    - Draw a plan for the path for our balls.

Lesson 8: Investigation- How can we build our game board design?

- Phenomenon-Engineering involves using plans to build designs.
    - Read a book about how plans are used to build designs in engineering.
    - Use our plans to build our game board design.
    - Identify that our game board designs need to be tested.

Lesson 9: Investigation- How well does our game board design solve our engineering problem?

- Phenomenon- Game board designs can be tested to determine if they need to be improved.
    - Read a book about how engineers test designs.

- Analyze the results.
- Test the paths on our game board designs.
- Revise our game board designs.
- Identify that we are ready to communicate our design solutions.

Lesson 10: Putting Pieces Together- How can we share our game board design solutions with others?

- Phenomenon- Sharing engineering designs with others helps to compare how they work to solve a problem.
  - Read a book to find out how and why engineers share their design solutions.
  - Draw how our final game designs work.
  - Share how our games work as intended.
  - Compare designs to determine how various game board designs work to solve a problem.

Essential Questions

- How do machines help humans?
- What type of work can different machines do?
- What is the difference between a push and a pull?
- How can we move things to where we want them to go?

Big Ideas

In this unit, students are introduced to pushes and pulls and how those affect the motion of objects. Students observe and investigate the effects of what happens when the strength or direction of those pushes and pulls are changed.This unit begins with a shared experience of moving a box to hold and transport many objects at once. Students then read about carnival games and the challenges involved in moving objects within those games. Their observations and questions about how things move lead them to plan and carry out investigations to figure out how they can start, stop, and change the motion of objects using pushes, pulls, and collisions. Students explore how different strengths and directions of pushes and pulls affect an object's motion. Building on these investigations, students use the engineering design process to plan, build, and test a game where the goal is to move a ball from a starting point, around an obstacle, to an ending point to win. They apply what they have figured out about changing an object's direction of motion as they design, build, test, revise, and share their engineering solution.

Climate Change

Technology: Cross-Curricular

8.1.2.DA.3: Identify and describe patterns in data visualizations.

8.1.2.DA.4: Make predictions based on data using charts or graphs.

- Activity: Students will watch the Brain Pop Jr video: Float and Sink. Students will make predictions on whether objects will float or sink using the graph on Google Slides.

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.

- Activity: Students will be able to use engineering techniques to create a trap that demonstrates their understanding of forces and motion.

- Activity: Students will engineer a leprechaun trap. Students will use classroom materials to build and create a trap.

Science and Engineering Practices

Planning and Carrying Out Investigations:

- With guidance, plan and conduct an investigation in collaboration with peers (for K).
- Make predictions based on prior experiences.
- Make observations (firsthand or from media) and/or measurements to collect data that can be used to make comparisons.

Analyzing and Interpreting Data:

- Record information (observations, thoughts, and ideas).
- Use and share pictures, drawings, and/or writings of observations.
- Compare predictions (based on prior experiences) to what occurred (observable events).
- Use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems.

Social Justice

See Social Studies Appendix C for more details

The Lorax - Kids Books Read Aloud

Question:

- Who chops down the trees? (the Once-lers)
- Who speaks for the trees? (The Lorax)
- Why does the Lorax speak for the trees? (trees do not have tongues, he speaks about their needs)

Activity: color a Lorax tree. Lorax Tree

Technology Connection

8.1.2.NI.1: Model and describe how individuals use computers to connect to other individuals, places, information, and ideas through a network.

CSDT Technology Integration

8.1.2.DA.4: Make predictions based on data using charts or graphs.

8.1.2.DA.3: Identify and describe patterns in data visualizations.

Activity:

Students will watch the Brain Pop Jr video: Float and Sink. Students will make predictions on whether objects will float or sink using the graph on Google Slides.

Enduring Understandings

Next Generation Science Standards

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
- 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

K-2-ETS-1- Engineering Design

- K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to 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-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.

Disciplinary Core Ideas

K-PS2.A: Forces and Motion

- 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.
- K-PS2.B: Types of Interactions
    - When objects touch or collide, they push on one another and can change motion.

  K-PS3.C: Relationship Between Energy and Forces

    - A bigger push or pull makes things go faster.

  ETS1.A: Defining and Delimiting an Engineering Problem

    - A situation that people want to change or create can be approached as a problem to be solved through engineering.
    - Asking questions, making observations, and gathering information are helpful in thinking about problems.
    - Before beginning to design a solution, it is important to clearly understand the problem.

  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 to other people.

  ETS1.C: Optimizing the Design Solution

    - Because there is always more than one possible solution to a problem, it is useful to cpm are nd test designs

Student Learning Standards

Mathematics

K.MP.2- Reason abstractly and quantitatively.

K.MD.A.1- Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.

K.MD.A.2- Directly compare two objects with a measurable attribute in common to, see which object has more of or less than, the attribute and describe the difference

English Language Arts

RI.K.1- With prompting and support ask and answer questions about key details in a text

W.K.7- Participate in shared research and writing projects

SL.K.3- Ask and answer questions in order to seek help, get information, or to clarify something that is not understood.

Focus Areas

Essential Knowledge

- 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 start or stop it.
- When objects touch or collide, they push on one another and can change motion.
- A larger push or pull makes things go faster

Essential Skills

- With guidance, students will plan and conduct an investigation of forces and interactions, in collaboration with peers. They will be able to design solutions (through engineering) to change the speed or direction of an object with pushes or pulls. The students may include tools (such as a ramp or structure) to solve this problem.
- Analyze data from force and interaction tests (with tools) to determine if plan work as intended.

Understandings

- 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 to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.

Resources

Primary Resources

- BrainPop, Jr
- OpenSci Ed
- Mystery Science

Scientific Inquiry

Core

- Pushes and Pulls Lab
- BrainPop, Jr. Pushes and Pulls
- BrainPop, Jr. Sink or Float
- Sink or Float Experiment
- BrainPop, Jr. Magnets
- Magnet Experiment
- Mystery Science - Force Olympics "What's the Biggest Excavator?"
- Mystery Science - Force Olympics "How Can You Knock Down a Wall of Concrete?

- Mystery Science- Force Olympics “How Can We Protect a Mountain Town from Falling Rocks?

Supplemental

- Investigation and Analyzing Data –Changing Direction (Problem Solving) Lab
- Different Forces Lab
- Transferring Energy – Types of Interactions Lab
- Relationship of Energy and Force -Changing Speed Lab
- Investigation and Analyzing Data – Changing Speed (Problem Solving) Lab