Marietta City Schools

District Unit Planner

Grade 2 Science

Theme	*Unit 2 Forces at Work*	**Unit duration**	*10 weeks*

Mastering Content and Skills through INQUIRY (Establishing the purpose of the Unit): *What will students learn?*

GSE Standards

S2P2. Obtain, evaluate, and communicate information to explain the effect of a force (a push or a pull) in the movement of an object (changes in speed and direction).
a. Plan and carry out an investigation to demonstrate how pushing and pulling on an object affects the motion of the object.
b. Design a device to change the speed or direction of an object.
c. Record and analyze data to decide if a design solution works as intended to change the speed or direction of an object with a force (a push or a pull).

Unit Objectives:
Demonstrate interactions between any two objects can cause changes in one or both objects.
Demonstrate that pushes and pulls can have different strengths.
Record and analyze data on the speed and direction of objects resulting from a force
Design a device to change the speed or direction of an object.

Unit Phenomena:
Pinball Machine Video Clip
Ask students what they notice. Record on a chart. Ask students what they are wondering. Record on chart.

Guiding Questions:
1. How does push and pull affect the ball in the pinball machine?
2. Does the ball change direction in the pinball machine? How does this happen?
3. Does the ball change speed in the pinball machine? How does this happen?
4. Does friction play a part in this pinball machine?

Page Keeley Probes: : ***Click here for an introduction to Page Keeley Probes.*** These probes can be used as phenomena. They are intended to elicit student understanding about science concepts. Starting a unit or lesson with a probe will help you uncover misconceptions and see what students already know about a topic. Using a probe at the beginning of a lesson and then at the end of the lesson serves the purposes of pretesting and then formatively evaluating student thinking. **Below is a list of probes from Page Keeley's book Uncovering Student Ideas in Primary Science, that are appropriate for this unit.** This book has been purchased for your grade level by the Office of Academic Achievement.

• **Marble Roll**

Science & Engineering Practices:	**Disciplinary Core Ideas:**	**Crosscutting Concepts:**
• Asking questions and defining problems • Planning and carrying out investigations • Developing and using models • Obtaining, evaluating, and communicating information • Constructing explanations and designing solutions • Using mathematics and computational thinking • Analyzing and interpreting data	• Forces and Motion • Pushes and pulls • Energy transfer • Size of the object impact force and motion	• Structure and Function • Cause and Effect • Scale, Proportion, and Quantity

Misconceptions:
People cannot tell ahead of time where something will land
Things move by themselves
When something is moving it always moves in a straight line
Things stop moving because they are tired

Math/ELA Connections/STEM Connections
ELAGSE2RI5: Know and use various text features (e.g., captions, bold print, subheadings, glossaries, indexes, electronic menus, icons) to locate key facts or information in a text efficiently.
ELAGSE2RI6: Identify the main purpose of a text, including what the author wants to answer, explain, or describe.
ELAGSE2RI7: Explain how specific images (e.g., a diagram showing how a machine works) contribute to and clarify a text.
ELAGSE2RI8: Describe how reasons support specific points the author makes in a text.
ELAGSE2W2: Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points, and provide a concluding statement or section.
ELAGSE2W7: Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations).
ELAGSE2W8: Recall information from experiences or gather information from provided sources to answer a question.
ELAGSE2SL1: Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups.
ELAGSE2SL2: Recount or describe key ideas or details from written texts read aloud or information presented orally or through other media.
ELAGSE2L4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 2 reading and content, choosing flexibly from an array of strategies. a. Use sentence-level context as a clue to the meaning of a word or phrase. c. Use a known root word as a clue to the meaning of an unknown word with the same root (e.g., addition, additional). e. Use glossaries and beginning dictionaries, both print and digital, to determine or clarify the meaning of words and phrases.

MGSE2.MD.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.
MGSE2.MD.7 Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.
MGSE2.MD.10 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 5 using information presented in a bar graph.

STEM:
Discovery Education Science Techbook – STEM in Action – there are 2 great STEM challenges in this section of the Science Techbook
Discovery Education STEM Project: Slippery Design

Discovery Education Science Techbook Resources: *(You will need to be logged into your Discovery Education account using your Google credentials to access these links*) You will find station rotation activities such as leveled reading passages, interactives, hands-on labs, virtual labs, video clips, and more on the **Explore** page of each Techbook unit.

Force and Motion – Click the Explore tab, then Explore More Resources to find video clips, reading passages, hands-on activities, computer interactive activities, and a fun song.

Hands-on Activities
Cars in Motion
Gravity Experiment
Flickering with Force Lab
NASA Simple Rocket Science Lab
Tug of War Game Investigation
Playground Science Guide for Pushes and Pulls
Pendulum Investigation

More Activity Ideas:
• Use ramps to see which objects travel faster or further. Estimate and then measure distance traveled.
• Build paper airplanes and see the length they travel (based on force, gravity, etc.).
• Drop a unifix cube onto tables (or other solid), through the air, and into a cup of water to show that solids stop motion, liquid slows it down, and air doesn't affect it.
• Use a balance to put different objects on either side (paper clips, cubes, other manipulatives) to learn how to balance the forces of gravity on either side.
• Drop two objects at the same time from the same height to see which hits the ground first. Compare and contrast in regards to shape, size, weight, etc. (Hint: All should hit at the same time, except depending on the shape.)
• Build a racecar (can buy kits from craft stores) and students race them on ramps.
• Compare/contrast two objects' force on gravity (based off of another activity) or elsewhere. Use magnets to see whether you can move a paperclip when the magnet is placed between an object. (For example, can you move a paperclip across a table when the magnet is being used from underneath the table?)

Essential Questions

Factual—

How is force and motion related?

Provide examples of forces: Push and Pull.

Provide examples of motion.

Inferential—

How does gravity affect force?

How does gravity affect motion?

Critical Thinking-

Does mass affect the rate of motion? Why or why not?

Does friction affect the rate of motion? Why or why not?

Tier II Words- High Frequency Multiple Meaning	**Tier III Words-** Subject/ Content Related Words
push, pull, fast, slow, object, direction	force, motion, fast, slow, speed, friction, collision

Assessments

Discovery Education Describing Motion Constructed Response

Out of Gas Constructed Response

Force and Motion Anticipation Guide

*Teachers can access the anticipation guides and assessments via the grade level Schoology Course.

Objective or Content	Learning Experiences	Differentiation Considerations
CLE 1: S2P2. Obtain, evaluate, and communicate information to explain the effect of a force (a push or a pull) in the movement of an object (changes in speed and direction).	Forces at Work GaDOE Instructional Segment In this Georgia DOE 5-E lesson, students will explore forces. Students will design ways to push and pull objects. Students will record and analyze data to decide if design solutions work.	Student Choice Performance Tasks Reflection and Goal Setting Learning Stations Choice Boards Formative Probes Science Journaling Multi-sensory activities Assistive Technology Flexible Grouping Multiple Means of Representation
CLE 2: S2P2. Obtain, evaluate, and communicate information to explain the effect of a force (a push or a pull) in the movement of an object (changes in speed and direction).	Falling Objects Investigation Student Sheet Children are introduced to the term, "gravity." By conducting an experiment with a ping pong ball and a golf ball, they explore what effect gravity has on weight.	
Recommended High Quality Complex Text By Lexile Band		
What is Motion? By Natalie Hyde *What are Newton's Laws of Motion?* By Denyse O'Leary *Push and Pull with Big Machines* By Nicola Lopetz *Stone Age Science: SImple Machines* By Gerry Bailey and Felicia Law *Force and Motion Through Infographics* By Rebecca Rowell *Science Lab: Motion and Force* By Rebecca Hirsch		