Marietta City Schools
2023-2024 District Unit Planner

2nd Grade

Topic Title:	*Unit #6 Force and Motion*	**Unit Duration**	*3 weeks*

Mastering content and skills through KNOWLEDGE-BUILDING (establishing the purpose of the unit):

What enduring understandings will students gain from this unit? How are force and motion related? How do forces change an object's motion?

GSE Standards

ELA

ELAGSE2RI2 Identify the main topic of a multi-paragraph text as well as the focus of specific paragraphs within the text.

ELAGSE2RI3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text.

ELAGSE2RI7 Explain how specific images (e.g., a diagram showing how a machine works) contribute to and clarify a text.

ELAGSE2L1f. Produce, expand, and rearrange complete simple and compound sentences.

ELAGSE2L5b. Distinguish shades of meaning among closely related verbs (e.g., toss, throw, hurl) and closely related adjectives (e.g., thin, slender, skinny, scrawny).

Science

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).

Essential Questions

Factual—
Does pushing something harder increase or decrease its speed?
Does pushing something sideways change its direction toward or away from the source of the push?

Inferential—
How can you change the speed of an already moving object?
How can you change the direction of an already moving object without stopping it?

Critical Thinking-
When during your day do you change the speed of an object's motion?
When during your day do you change the direction an object is moving?

Tier II Words- High Frequency Multiple Meaning	**Tier III Words-** Subject/ Content Related Words
force, motion, direction, increase, decrease, change	angle, proportional

Assessments

Transfer of Integrated Skills:

Identifying Changes in Direction and Speed in Text

1. Display the book Move Your Body! on Epic and provide students with a simple chart with space for two changes in direction and speed.

CHANGE IN DIRECTION	CHANGE IN DIRECTION
CHANGE IN SPEED	CHANGE IN SPEED

2. Have students write a sentence in each box that reflects the cause and effect of the change in motion. (*The frisbee moves faster when you throw it harder.)*

   ELAGSE2RI3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text.
   ELAGSE2RI7 Explain how specific images (e.g., a diagram showing how a machine works) contribute to and clarify a text.
   ELAGSE2L1f. Produce, expand, and rearrange complete simple and compound sentences.

ReadWorks "Maria Hits the Puck"

Provide students with a copy of the passage and scaffold decoding of words with unintroduced letter-sound spelling patterns as needed in small groups.

ELAGSE2RI2 Identify the main topic of a multi-paragraph text as well as the focus of specific paragraphs within the text.
ELAGSE2RI3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text.
ELAGSE2L1f. Produce, expand, and rearrange complete simple and compound sentences.

Writing Task and Rubric:

Kid Moves

1. Brainstorm different ways that students change the speed and direction of objects throughout the day.
2. Provide students with Divided Writing Paper and additional Writing Lines to draw and write sentences for an example of a time during the day they change an object's speed and another time during the day that they change an object's direction.

   ELAGSE2W8: Recall information from experiences or gather information from provided sources to answer a question.
   ELAGSE2RI2 Identify the main topic of a multi-paragraph text as well as the focus of specific paragraphs within the text.
   ELAGSE2RI3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text.
   ELAGSE2RI7 Explain how specific images (e.g., a diagram showing how a machine works) contribute to and clarify a text.
   ELAGSE2L1f. Produce, expand, and rearrange complete simple and compound sentences.

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Content	Accurately depicts a specific age-appropriate change in speed and direction	Accurately depicts a general age-appropriate change in speed and direction	Accurately depicts a general change in speed or direction	Does not depict change in speed or direction
Coherence	Phrases or labels align with and add to the drawing	Phrases or labels align with the drawing	Phrases or labels conflict with the drawing	Does not provide phrases or labels
Complexity	Writes in expanded sentences (I slow the door down so it doesn't slam.)	Writes in simple sentences (I slow the door down.)	Writes in single words or phrases	Does not write in words or phrases

Objective or Content	Learning Experiences	Differentiation Considerations
Daily Lessons for Text Comprehension	*15-Day Plan: Forces and Motion*	
Connected Structured Literacy Activities	*Phonics Strategy:* Refer to the Tool 4 handouts to lead students through Building Words (pg. 30) activities using key words from this unit that feature known letter-sound spellings--*force, fast, slow, change* *Fluency Strategy:* Refer to the Tool 7 handouts to lead students through Spin, Say, Write (pg, 17-19) using key vocabulary as the basis for reviewing a previously taught skill. For example, r-controlled syllables--*force, farm, fur, first, forward, further*	
Connected SS/Sci Experiences *(omit this row if KBU does not contain SS or Sci connections)*	***Exploration I*** Materials: • an assortment of toy cars and trucks • a way to measure distance (tape on the floor, yardstick, hand lengths, tiles, etc) Student Investigation Sheet (Optional) Distribute an assortment of toy cars and trucks among student groups. Ask each group to find and agree on a way to measure the distance their toy cars will go (tape on the floor, yardstick, hand lengths, tiles, etc.). Have small groups work in their own space in the classroom to determine a starting point from which to roll the toy cars along the floor. Then, have each group push a toy car hard. The groups should record the distance their toy car rolls. They may choose to record their findings in pictures, words, or numbers. ***Communicating and Evaluating*** Ask each group to predict and agree on what they think will happen if they push their toy car very gently. Then have the groups push softly to see if their prediction was correct. The groups should record the distance their object went. They may choose to record their findings in pictures, words or numbers.	

	What will happen?	Distance traveled
Hard Push		
Gentle Push		

Exploration II

Materials for each group:

- 4-6 toy cars of varying sizes.
- Two yard sticks or blocks
- Two yard sticks, blocks or pieces of stiff cardboard (to form track)
- Cardboard from the recycling bin or recycled cardboard.
- Student activity sheet

Have students first investigate the cars and talk about the differences between them, such as size, weight, and wheel size. Point out that these toy cars are models of actual cars, and have students describe how the models are different from cars that they see on the street.

Discuss the cardboard material used for this investigation. Tell students that the cardboard was gathered from the recycling bin and that reusing it is an environmentally responsible use of materials. Reusing and

	recycling paper items helps reduce the number of trees that are cut down, conserving this resource. Use the Teacher Observation Checklist to take anecdotal notes that the students are using resources correctly. Then have them set up the track. Students should take the largest car and place the yard sticks, blocks, yard sticks, blocks, and or recycled cardboard on either side of the car. Then students should move the car back and forth on the track, making sure it does not bump into either side. Then have them investigate what happens when they try to push big cars and little cars down the track. Model asking wondering questions, such as “I wonder which car takes more pushes to get across?” or “I wonder which cars go farther on the track on their own?” or “I wonder how the way the car is pushed affects its movement?” Then have them investigate what happens when they push cars from each end of the track so that they crash. What do they notice about the crashes? In which direction do the cars go? Have students describe what happens. Assess and record student responses as anecdotal notes. ***Exploration III*** In this activity, students will investigate how friction affects the movement of objects. First, students will test the amount of force required to move objects across rough and smooth surfaces. Then, students will use what they learned to design a method for reducing friction. Students will test and evaluate their designs. Materials Per Group: rough grit sandpaper, approximately 25 x 40 cm shag carpet, approximately 25 x 40 cm linoleum, approximately 25 x 40 cm finished wood, approximately 25 x 40 cm heavy glass cube, approximately 7–10 cm square solid plastic game cube, approximately 7–10 cm square cardboard cube or box, approximately 7–10 cm square wood box, approximately 7–10 cm square rock, approximately 10 cm diameter and 0.5 kg (1 pound) (for Part 2)	

	Before the activity, have students view Paul the Penguin: Moving Things full video. Explain that students will be performing a similar investigation and recording and analyzing their own results. Then, students will design a way to make things easier to move by lowering friction. Part 1: Friction and Force Divide students into small groups. Distribute a data chart like the one below to each group. The first two columns have been filled in with sample data. Note that there is space in the chart to make a notation of the different objects students push in each trial (for example, in trial 1, below, the object is a wooden block). You may fill in the object field for your students to reflect the materials you have available for each trial, or you may allow students to fill in this field for each trial they conduct. Talk with students about how to use the chart to rank the amount of force it takes to push a block across a surface from 1 to 4. Be sure students understand that 1 means the least force and 4 means the most. Talk about what it means to make a prediction (guessing based on experience and understanding). Have students talk about which object–surface combinations they think will require the least force, and have students fill in a 1 in the appropriate places in the chart to indicate those predictions. Check students' charts to be sure they are filling them in correctly or model making a prediction and filling in the chart using an overhead projector or chalk board. Then, ask which object–surface combinations they think will require the most force and have students fill in a 4 in the appropriate places in the chart to indicate those predictions. Guide students to think about which object–surface combinations they think will rank a 2 or 3. Remind students that it's okay if predictions do not turn out to be correct. In fact, scientists learn a lot from experiments that do not turn out exactly as expected.	

Friction Data Chart

	Object 1: Block		Object 2:		Object 3:		Object 4:	
	Prediction	Actual	Prediction	Actual	Prediction	Actual	Prediction	Actual
Carpet	1	2						
Linoleum	2	1						
Wood	4	3						
Sandpaper	3	4						

When students have completed their predictions, have them follow the steps of the procedure to carry out the investigation. Then, have students answer the analysis questions that follow.

Friction and Force
1. Take turns pushing the blocks across each surface.

2. After each turn, record the amount of force it took to move the block. Rank the amount of force from 1 to 4. 3. Continue until each block has been tested on each surface.
a. Which object needed the most force? b. Which needed the least? Is the pattern the same for moving the different objects across each surface? Describe the pattern.

3. What characteristics of surfaces make more friction? What characteristics make less friction?

4. What characteristics of the objects make more friction? What characteristics make less friction?

Part 2: Lowering Friction

	Have students work with their groups to design a way to make things easier to move by lowering friction. Explain that their task will be to move a rock across the ground. They may place the rock in a container (or on a surface) and cover the ground with another surface. Students may use any of the materials they used in the first part of the investigation. You may wish to do this part of the activity outdoors on grass or a rough surface (dirt or concrete). Have students take turns pushing their rock to see how much force it takes. Instruct students to try to push the rock with about the same force as they did in the first part of the activity—rocks should be traveling no more than one meter along the ground. You may wish to set up cones or other visual markers to serve as a boundary for students. Once students have each had a turn pushing the rock on the bare ground, have students sit with their groups (away from the rocks and other materials) to make and record their plans before testing their designs. Have students complete the planning chart on their student sheets before beginning their tests. Then, have students complete their data chart while doing their tests. Students should then answer the analysis questions that follow. Once students have completed their tests and analyses, invite each group to share their results with the class. 1. Complete the planning chart on the student sheet. 2. Conduct your test. 3. Complete the data chart. ***Communicating and Evaluating*** 1. How did you plan to lower friction? 2. Did your design make it easier to move the rock? Why or why not? 3. Do you think another design could make it even easier to move the rock? How?	
Connected Writing Activities		
Additional Planning Resources		

MCS K-5 KBU Overview	KBU as a 15-day Plan (Template)	MCS Structured Literacy Repository	Berger Framework for Comprehension (Template)	The Writing Revolution (Templates)
Additional Instructional Resources				
Suggested High Quality Complex Texts **Suggested Experiential Resources**				