

County Implementation Award Program (CIAP) Math and Science Lesson

Unit Title: Physical Science—Force and Motion
Lesson Title: Dynamic Dominoes
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Grade Level: Kindergarten
Time Frame: 50-60 minutes
<p>Targeted Standard(s):</p> <p><u>NGSS:</u> 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.</p> <p><u>Common Core:</u></p> <p>Math MP.2: Reason abstractly and quantitatively. (<i>K-PS2-1</i>) K.MD.A.1: Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (<i>K-PS2-1</i>) K.MD.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. (K-PS2-1)</p> <p>Literacy SL.K.1: Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups.</p>
<p>Short Description of Targeted Phenomenon: Students will observe the pushes and pulls involved in the video “Dizzy Dominos”. The video of 17,500 dominoes is an amazing sight to behold as they all push each other over. Students could watch this and try to identify if pushes or pulls are involved. Dominoes are just one of the many everyday items in the classroom that involves force of motion. Students could analyze various classroom items to identify pushes and pulls. https://www.youtube.com/watch?v=ZzRcGDJaxsU</p>

Three Dimensions of NGSS

Science & Engineering Practice/s (SEP):

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- With guidance, plan and conduct an investigation in collaboration with peers.

Crosscutting Concept/s (CCC):

Cause and Effect

- Simple tests can be designed to gather evidence to support or refute student ideas about causes.

Disciplinary Core Idea/s (DCI):

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.

PS2.B: Types of Interactions

- When objects touch or collide, they push on one another and can change motion.

PS3.C: Relationship Between Energy and Forces

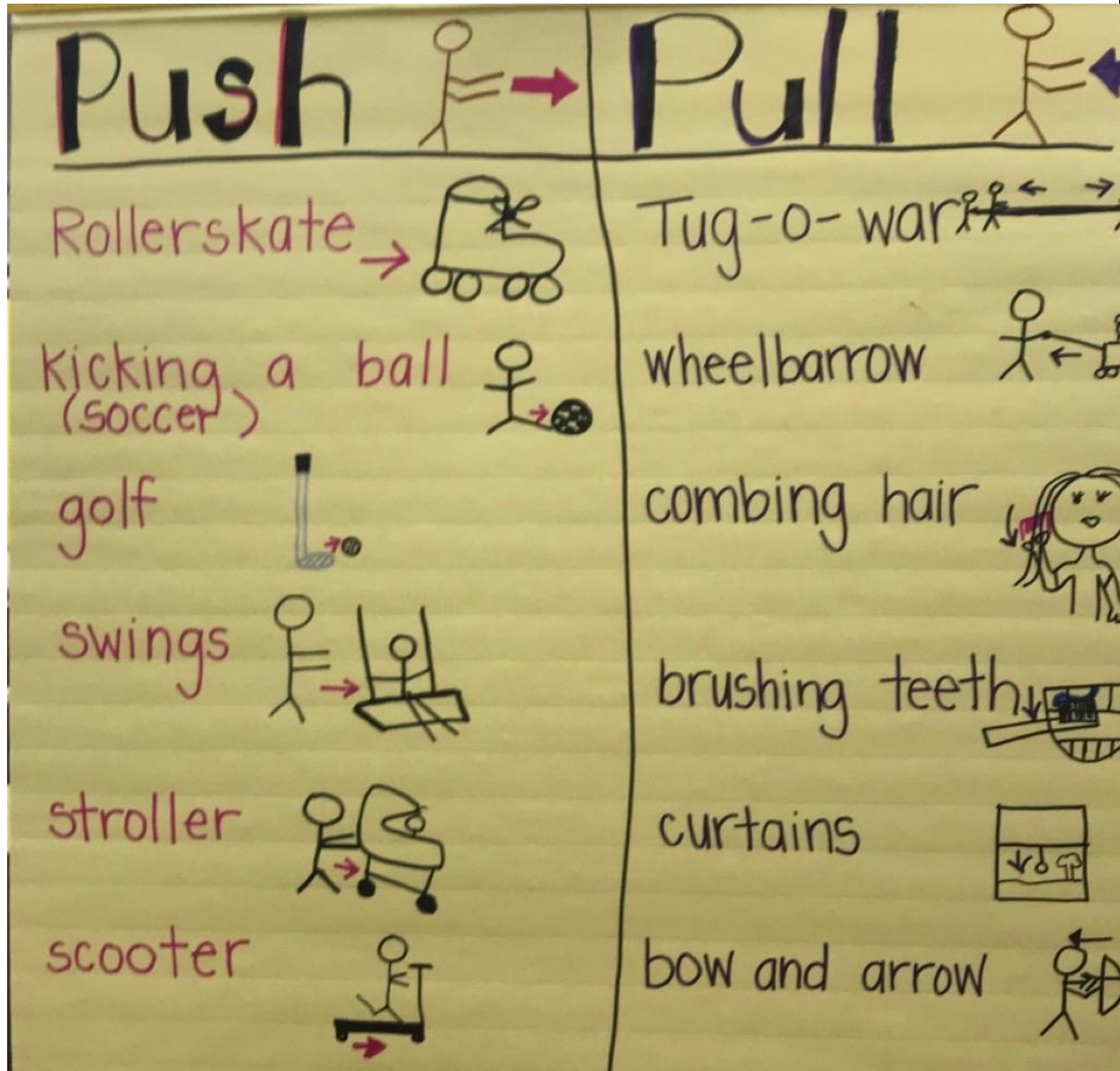
- A bigger push or pull makes things speed up or slow down more quickly. (*secondary*)

Language Supports:

Students will have participated in an intro discussion about content-specific vocabulary needed for this activity. This can be done a day prior or right before this lesson. Explain to students that science helps us understand the world around us. In real life, we use things called “pushes” and “pulls” to help us move, do work, and play. **Create a gesture** for push (arms moving away from you) and pull (arms moving toward you) to help students understand the difference between the two. Prepare an **Anchor Chart** illustrating the difference between “push” and “pull” as can be seen in the photograph below (use real life examples: roller skating, swimming, combing hair, brushing teeth, playing soccer, etc.).

Materials Needed:

Computer, projector, speakers, Push/Pull Anchor Chart (see photo below), dominoes (at least one set per small group), marble, golf ball, stress ball, Domino lineup card (at least one per small group), object to use as ramp (must be the same size and used from the same angle in each group)



Objective(s):

1. Students will construct lines of varying length out of dominoes.
2. Students will use different size balls to push dominoes over.
3. Students will try a soft push and a hard push (using a ramp to make balls roll faster) on a domino structure to see if that makes a difference in knocking over the dominoes.
4. Students will participate in a group discussion to decide whether the number of dominoes, the attributes of a certain ball, or a hard push (ball going down ramp) has a greater effect on knocking over dominoes.

How Math and Science concepts/skills/practices were integrated in this lesson:

In this lesson, students are asked to use Mathematical Practices such as making sense of a question and persevering in solving it. They must reason abstractly and quantitatively and attend to precision in order to answer the initial question.

Scientific concepts and practices that are explored in this lesson are planning and carrying out an investigation, analyzing and interpreting data, and asking questions and defining problems.

Possible Challenges /Misconceptions:

Setting up dominoes in a way that will allow the dominoes to knock over.

*You can have students line up dominoes on the line-up cards included at the end of this lesson. Make sure the dominoes are vertically aligned. Demonstrate how to do this with the whole group.

Hands-on group work can be hard for children of this age. Make sure classroom rules/expectations are well-established.

Depending on the students in your class or the time of year, you may want to forgo partnerships and do domino demonstrations in a whole group setting.

Formative Assessment: Oral questioning—Ask each student:

What is a push? Can you demonstrate?

Count the number of dominoes you are using. How many do you have?

What are some describing words about the marble?

What are some describing words about the golf ball?

What are some describing words about the stress ball?

Each question counts as one point. If students are able to give a correct and or logical answer to each question, they get the point. Possible 5 points total.

Lesson Opening	
<p>Teacher Actions</p> <ul style="list-style-type: none"> -Tell students that since scientists' study about the world, we are going to use some real world toys we have in our classroom to do science today. -Tell students to watch this video from YouTube titled "Dizzy Dominoes" to guess what we will use as our science tool today: https://www.youtube.com/watch?v=ZzRcGDJaxsU 	<p>Student Actions</p> <ul style="list-style-type: none"> -Watch video and try to guess what science tool they will be using
Lesson Introduction	
<p>Teacher Actions</p> <ul style="list-style-type: none"> -Ask students what they noticed in the video. What do they wonder? -Tell students we are going to do an experiment today using dominoes, ramps, and balls. -Show students the dominoes and Domino Line-Up cards. Explain to them how to use the card to help build the line of dominoes. They must stand each domino in a rectangle. The rectangles on the card will help with how many dominoes they need and will make sure the dominoes are not too close or too far away from each other. Remind them to stand dominoes vertically. -Demonstrate how to roll a ball to knock dominoes over. Show students how to roll the ball down a ramp to knock dominoes over. -Explain that students need to build ALL lines and try knocking them over. -Everyone in the group must have a turn to roll a ball AND everyone must have a chance to set up the dominoes. 	<p>Student Actions</p> <ul style="list-style-type: none"> -Share what they notice in the YouTube video -Listen to instructions and ask clarifying questions.

Body of Lesson

Teacher Actions

- Divide students up into groups of four. Provide groups with materials for experiment.
- Monitor each group.
- Ask each student to demonstrate a push, ask students to count dominoes, ask students to name attributes of different balls; record as you see fit.
- Ask Guiding Questions:
 - “Why did the dominoes fall?”
 - “What made dominoes fall faster?”
 - “Did the number of dominoes have an effect on how dominoes fell?”
 - “Did the attributes of a ball change the way the dominoes fell? Why?”
- Answer individual or group questions.
- Extension: Count number of dominoes you are knocking over.

Student Actions

- Work in a small group to construct domino lines.
- Build domino lines and use balls and ramp to knock over shapes.

Lesson Closure

Teacher Actions

- Have students clean up materials and come to the rug.
- Ask students to find a partner, go knee to knee, and share what they found in their experiment with the dominoes.

- Ask students to share out ideas with the class. Record on the board.

- Have students vote on a chart by placing sticky notes with their initials on a column. The first Anchor chart should be “dominoes: Push or Pull?” Next, students could vote on which ball made dominoes fall best? The last vote could be if the ramp or no ramp was better in knocking the dominoes over (See Sample Anchor Chart Pictures).

- Help students come to the conclusion that dominoes fall because of an initial “push.” When dominoes touch, they push each other over. The balls pushed at different speeds based on the use of the ramp. The attributes of a ball affected the initial push of the domino.
- Share the Anchor Chart from the previous day with students. Go over the motions for “push” and “pull.”
- Ask students why you are sharing this poster with them after the domino experiment. Tell them it is because you have to push the ball to push the dominoes over! Practice the push gesture. Add dominoes to the “push” section of the Anchor Chart.

Student Actions


- Clean up.
- Share thoughts and observations with neighbor partner.
- Share thoughts with whole group.
- Vote on anchor charts.

- Practice “push” gesture.

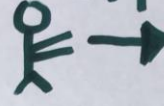
Summative Assessment:


Have students draw a picture to illustrate an example of “push” and draw an example of “pull.” They can label if they are able or dictate the action for an adult to write down. It is developmentally appropriate to leave up the anchor chart pictured in this lesson plan as students complete their assessment.

Other Teaching Resources

Dominos: 




Push or Pull

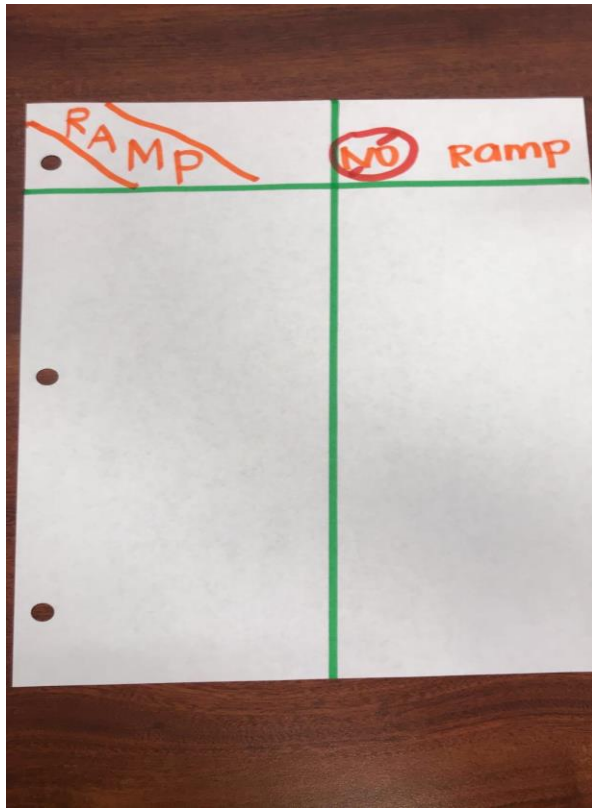
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Ethan	
Stella	
Andrew	
Lyla	Malena

Which Pushed Best?

Marble 	Golf Ball 	Stress Ball 



Domino Line-Up Card

