County Implementation Award Program (CIAP) Math and Science Lesson

Unit Title: Physical Science—Force and Motion

Lesson Title: Ready, Aim, Fire: Marshmallow Slingshots!

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Grade Level: Kindergarten

Time Frame: 50-60 minutes

Targeted Standard(s):
NGSS:
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.
Common Core:
Math
MP.2: Reason abstractly and quantitatively. *(K-PS2-1)*
K.MD.A.1:
Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. *(K-PS2-1)*
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)

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.

Targeted Phenomenon:
The video of Angry Birds Slingshot 101 is a silly and engaging sight introduction to one version of a slingshot. Students could watch this to familiarize themselves with how a slingshot works and also to try to identify if pushes or pulls are involved. Angry Birds are just one of many familiar ways to involve force of motion in a primary classroom. Students could come up with other video games that use slingshots or pulls.

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 important vocabulary necessary 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” (use real life examples: roller skating, swimming, combing hair, brushing teeth, playing soccer, etc.)

Materials Needed: Paper Cups (with bottom part cut out), Balloons (with a knot tied at the end), Scissors, Masking Tape, Mini Marshmallows, paper bowls, Computer, projector, speakers, Push/Pull Anchor Chart (see photo below), pre-measured chalk or tape lines so students may compare distance

Objective(s): Students will be able to:

1. Build a marshmallow slingshot in a partnership or group.
2. Execute different pulls on the balloon portion of the slingshot to see if they have an effect on how far the marshmallow travels.
3. Complete a graphic organizer recording data from this activity.
4. Analyze data to come up with a conclusion at the end of the activity.

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. Also, students are comparing the distances their marshmallows have travelled, using terms like shorter and farther or longer and shorter.

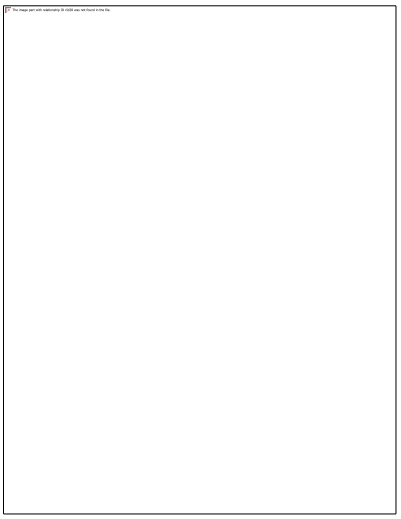
Possible Challenges /Misconceptions:
Working with food can be tricky! Perhaps save some marshmallows for eating at the end of the experiment.

You may think sling shots will be too crazy to manage in a group of five-year old's. If you feel this way, you can do this lesson as a whole group, where the teacher launches the marshmallows. You can also take children outside and/or pair them up with an upper grade buddy.

Formative Assessment:
Oral questioning—Ask each student:
What is a pull?
How many marshmallows does your group have? Count them and use your finger to point to each one.
What are the steps you have to do to build the marshmallow slingshot?

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.

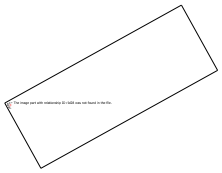
Lesson Opening	
Teacher Actions -Ask students to raise their hand if they like to play the game "Angry Birds" -Have volunteers explain why they like to play it. Continue until someone mentions the slingshot. -Show "Angry Birds Toons | Slingshot 101": **https://www.youtube.com/watch?v=lI-u0pJ-XEM** -Explain to students that they might not realize, but when they are playing "Angry Birds," they are being scientists. -Tell students that previously, they explored the idea of "push" in a science experiment, but today, we will explore the OPPOSITE of "push." -Have students pair up to see if they can come up with the opposite of push (pull). -Call on a student to share with the class.	**Student Actions** -Raise hands if they have seen or played Angry Birds -Participate in Class Discussion -Watch video -Think, Pair, Share
Lesson Introduction	
Teacher Actions -Tell students that for science today, they are going to explore the idea of a "pull" by building their very own slingshot -Gather materials and demonstrate how to build a marshmallow Slingshot: -Cut off the top part of the balloon -Stretch the balloon over the top of the hole at the bottom of the cup -Use tape to secure the balloon in place (pre-cut tape strips for students) -Demonstrate how to put the marshmallow inside the cup and pull back the balloon to sling the marshmallow	**Student Actions** -Listen to directions and watch the demonstration

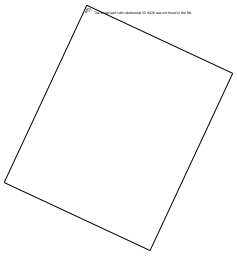
(see picture below to see how it looks after it is constructed. Image: http://www.thisheartofmineblog.com/2011/11/15/cup-o-fun-marshmallow-shooter/) 	
Body of Lesson	
Teacher Actions -Divide students into partners, distribute materials, and pass out one graphic organizer per partnership (remind students they are not launching marshmallows to hit each other, but to see how far we can launch them) -Guiding questions: "What kind of pull makes the marshmallow go further?" "How do you know we are using a pull and not a push in this experiment?" "Do you think we could launch other materials with this slingshot?" "A pompom, a marble, an orange?"	**Student Actions** -Build marshmallow slingshots with partner -Explore which type of pull launches marshmallow the furthest -Think about what other materials could be used in the slingshot -Complete graphic organizer

Lesson Closure	
Teacher Actions -Ask students to clean up and bring their graphic organizers to the rug (they can sit with their partner or at an assigned seat if you prefer) -Each partnership can share their discoveries (When did the marshmallow travel to the farther measurement lines? Why did it go a short distance sometimes?) and share what materials they would like to use next time. -Help students come to the conclusion that the further back you pull the balloon, the farther the marshmallow will launch. -Review the Push/Pull Anchor Chart -Ask students to decide if we should put slingshotting on the push or pull side of the Anchor Chart	**Student Actions** -Present findings and listen to others -Listen to review of push/pull -Determine that using slingshots requires a pull action
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: Graphic Organizer (see below)	
Lab Safety: You can have students wear glasses/goggles if you feel like their eyes need to/should be protected.	
Extensions (if any): Bring some of the materials students suggested to launch in the slingshot. See what works! Help students come to the conclusion that bigger objects need a bigger pull, and some may need a bigger slingshot.	

Name: _____

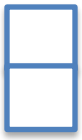
Marshmallow Slingshot





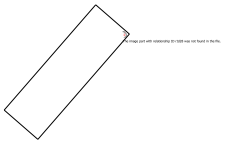
Draw the materials

I can use a:



push

pull



Write one sentence about what you did in the activity.

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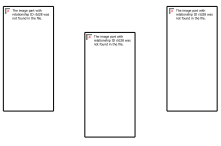

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Solano County Office of Education

I think we should launch: