

RAMP UP – LIFTOFF Lesson Plan

Title of Lesson:	Measuring and Graphing Distances Using Straw Rockets
Grade Level:	3rd Grade
AL COS Standard:	<p>SC15.3.2 - Investigate, measure, and communicate in a graphical format how an observed pattern of motion (e.g., a child swinging in a swing, a ball rolling back and forth in a bowl, two children teetering on a see-saw, a model vehicle rolling down a ramp of varying heights, a pendulum swinging) can be used to predict the future motion of an object.</p> <p>MA19.3.17 - Measure lengths using rulers marked with halves and fourths of an inch to generate data and create a line plot marked off in appropriate units to display the data.</p>
NGSS:	3-PS2-2 – Make observations and/or measurements of an object’s motion to provide evidence that a pattern can be used to predict future motion.
Learning Targets/Objectives:	<ul style="list-style-type: none">● I can make a prediction about the distance that my straw rocket will travel after 3 test flights.● I can measure the distance that my straw rocket travels.● I can create a graph based on the data from my straw rocket flights.

<p>Materials Needed:</p>	<ul style="list-style-type: none"> ● Video <ul style="list-style-type: none"> ○ Force and Motion Science for Kids - https://youtu.be/1R6MxJpEjfs ● Worksheets <ul style="list-style-type: none"> ○ Straw Rocket Launch Observation Sheet ○ Straw Rocket Graph ● LIFTOFF RAMP UP kit <ul style="list-style-type: none"> ○ All materials needed for the LIFTOFF experiment are included in the kit. ● Other <ul style="list-style-type: none"> ○ Pencils ○ Measuring tape ○ Chart paper ○ Red, green, blue, and purple marker <p>All links to videos and worksheets can be found on the LIFTOFF Kit resources page https://uahrampup.org/liftoff/</p>
<p>Preparation:</p>	<ul style="list-style-type: none"> ● Assemble the straw rocket launchers using the directions in kit. ● Make sure all materials are accounted for and ready for students to use. ● Choose a location for students to be able to launch their straw rockets. ● Make sure you have copies of the charts and graphs for students to complete while launching their rockets.

<p>Lesson Logistics</p>	<ul style="list-style-type: none"> ● Students will work in pairs when designing and flying their rockets. ● Activity should be conducted in an area where students can shoot rockets (20-30 ft.) (e.g., gym or hallway) ● 3-day lesson
<p>Vocabulary Words:</p>	<ul style="list-style-type: none"> ● prediction ● launch ● motion ● force ● graph
<p>Safety Considerations:</p>	<p>See LIFTOFF RAMP UP guide for safety considerations.</p>
<p>Engage:</p>	<p>Day 1:</p> <p>Step 1: Engage students in a discussion about how things move. Guide the conversation into talking about how things cannot move unless something else comes in contact with it.</p> <p>Step 2: Show students the <i>Force and Motion / Science for Kids</i> video.</p> <p>Step 3: Explain to students that they will be conducting an experiment called Straw Rockets that will show us force and motion in real life. Show students an example of a Straw Rocket and explain how students will design and name their own rockets with a partner.</p> <p>Step 4: Follow the directions in the LIFTOFF RAMP UP guide explaining how to create their straw rockets. They can color their fins and name their rockets.</p> <p>Step 5: Show students the straw rocket launcher. Ask them</p>

	<p>what observations they have about the launcher. Show them how the launcher works without a rocket. Talk about how the launch rod pushes against the piston and spring to create a rush of air, which pushes the rocket off the brass tube. This is the FORCE acting on the rocket to set it in motion.</p> <p>Step 6: Have students write down their prediction about how far they will be able to launch their own straw rocket just by looking at the launcher and the rocket they created. After students have made their predictions, have them share with the class and make a class chart with student predictions before seeing the launcher with a rocket.</p>
<p>Explore:</p>	<p>Day 2:</p> <p>Step 1: Before taking students to the straw rocket launch location, explain the Straw Rocket Launch Observation worksheet. Tell students that they must leave their straw rocket launcher at the same angle for all 3 of their test launches. Explain that they will increase the number on the launch rod each time they launch their rocket. They should reserve the highest number on the launch rod for their final flight.</p> <p>Step 2: Students will work in partners to launch their rocket 3 different times using different numbers on the launch rod. <i>(Use the LIFTOFF RAMP UP Guide for launching directions.)</i> The student that launches the rocket will write down the number on the launch rod that they dropped from. They will stand at the launcher and hold the measuring tape at zero, while the other partner will walk the measuring tape out to where the rocket landed. They will write down the distance on the corresponding flight number on their observation page. Students will do this two more times with different numbers on the launch rod but THE SAME ANGLE, writing down the distances that they got from their flights.</p>

Step 3: After all students have completed their 3 test flights, bring students back together and have them consider their original predictions about how far the straw rockets would fly. Have them make a new prediction for their final flight using the chart that they completed from their first 3 test flights.

Step 4: Have students choose a new number on the launch rod and make a prediction about how far that will make the straw rocket fly and write that down on their papers. Have students complete their final flight and measure their distance, completing the observation page.

<p>Explain:</p>	<p>Day 3:</p> <p>Step 1: Engage students in a discussion about the straw rockets. Ask them to tell you their observations about how far their rockets flew. Review their initial predictions from the first day just looking at their rockets and the launcher.</p> <p>Step 2: Ask students if they were able to make a better prediction once they tested their rockets. Guide the conversations about what made them change their predictions leading the conversation into the students realizing that the higher they pulled the launch rod, the farther their rockets traveled (more force on the piston, creating more/faster air to the rocket, increasing the force acting the straw rocket).</p> <p>Step 3: Ask students to make a prediction about what would happen with a longer launch rod and write in on the back of their Straw Rocket Launch Observation worksheet.</p>
<p>Extend:</p>	<p>Day 3 Cont:</p> <p>Step 1: Pass out the Straw Rocket Graph to each student. Help students label the x-axis and y-axis as a group. Explain to students that they will use their Straw Rocket Launch Observation chart to graph their three flights. They will use a different color for each flight (red for flight</p>
	<p>1, green for flight 2, blue for flight 3, and purple for their final flight).</p> <p>Step 2: Have students independently graph their flights, then connect them to create a line graph. It should be a diagonal line up to show the increase of the number on the launch rod increasing the distance for each flight.</p>

Evaluation:**Day 3 Cont:**

Have students write on the back of their graph why they think that their graph looked like a diagonal line going up with the increase of the number on the launch rod and the distance traveled. Teacher discretion will be used as to whether students were able to make the connection between the force and the distance based on their explanation. Teacher can also look at the prediction they made for their final flight for student understanding.