RAMP UP - REACT Lesson Plan

Title of Lesson:	Experimenting with Variables Using a Coke and Mentos Activity
Grade Level:	3
AL COS Standard(s):	SC15.3.1 - Plan and carry out an experiment to determine the effects of balanced and unbalanced forces on the motion of an object using one variable at a time, including number, size, direction, speed, position, friction, or air resistance (e.g., balanced forces pushing from both sides on an object, such as a box, producing no motion; unbalanced force on one side of an object, such as a ball, producing motion), and communicate these findings graphically. MA19.3.19 - Estimate and measure liquid volumes and masses of objects using liters (l), grams (g), and kilograms (kg). MA19.3.19a - Use the four operations to solve one-step word problems involving masses or volumes given in the same metric units.
NGSS:	3-PS2-1 Motion and Stability: Forces and Interactions - Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
Learning Targets/Objectives:	● I can plan an experiment changing different variables to see the different results. ● I can measure liquid volume using a scale before and after an experiment.
Materials Needed:	● **RAMP UP REACT Kit** ○ All materials needed for the REACT experiment are included in the kit ● **Video** ○ Coke and Mentos Science Experiment For Kids | Science experiments for kids | Sema's Lab | Super Sema - https://www.youtube.com/watch?v=CRAE1jf_y3s

	● **Other Materials** ○ pencils ○ paper for recording results of experiments ○ kitchen scale ○ chart paper ○ markers ○ materials students plan in their groups (steps 2-3 in Engage phase) ○ permanent marker to mark sodas with number of experiment A link to the video can also be found on the REACT Kit Resources page https://uahrampup.org/react/
Preparation:	● Find a grassy area that is flat to conduct your experiment. ● You may want another teacher or adult to assist with the experiment.
Lesson Logistics:	● Whole group lesson with some group work ● 3-day lesson
Vocabulary Words:	● plume ● altitude ● formula ● variable
Safety Considerations:	Have safety goggles and ponchos available for those dropping mentos.
Engage: **Day 1**	**Step 1:** Talk with students about science experiments and variables, explaining that variables of the experiment are things that can be changed. Show them the video, Coke and Mentos Science Experiment For Kids and ask students what the variables of the experiment were, making a chart. *Make sure that students say what kind of soda, what kind of candy, number of mentos at least, can also talk about the size of the*

	hole that the soda escapes out of. **Step 2:** Tell students they will work in groups to come up with 2 ideas of how to change the variables in this experiment. Give students about 5-10 minutes to talk and plan their new experiment as a group. Walk around making sure that their ideas are doable with the class. **Step 3:** Ask each group to share their ideas for how to change the variables in this experiment and add their ideas to the variable chart.
Explore: **Day 2**	**Step 1:** Revisit the chart and show the students the materials they will be using to see how the variables change the result of the plume height. **Step 2:** Talk with students about the vocabulary words **plume** and **altitude**. Explain that they will be using a formula to find the height of the plume since they won't be able to measure the height in real time. **Step 3:** Take students and all materials to the decided upon location and use the REACT kit guide to conduct the experiment. Use the suggested variables first, then allow student groups to use the variables that they changed. The teacher will record the data from the altitude finder. A class chart will be created for students to look at. *SAVE THE 2-LITER BOTTLES WITH THE AMOUNT OF SODA THAT IS LEFT BY PUTTING THE TOPS BACK ON THE BOTTLES AND MARKING WHAT NUMBER EXPERIMENT IT WAS WITH A PERMANENT MARKER ON THE TOP FOR THE EXTEND ACTIVITY.*

<table>
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<td>Explain:
Day 3</td>
<td>Step 1: Create a class chart that shows all the results from the experiment. Show students the formula you will use to get the plume height and use a calculator to find each height from the experiment (formula in REACT guide).

Step 2: Review the powerpoint on the UAH RAMP UP website explaining the science of the experiment (see REACT Background Information at https://uahrampup.org/react/). Continue the conversation with students about which variables made the highest plumes and which ones made the lowest. Ask students what things surprised them about the experiment.

Chart Example
<table><tr><td>Soda</td><td>Candy</td><td># of Candy</td><td>Nozzle</td><td>Height of Plume</td><td>Amount of Soda Left</td><td>Amount of Soda Sprayed</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table></td>
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<td>Extend:
Day 3</td>
<td>Step 1: Use the kitchen scale to determine how much soda in mL was left in each bottle. Use a formula to figure out how much soda left the bottle using the different variables. Have different students come up and measure each bottle and verify the number on the scale.

Step 2: Make the connection with students that the higher the plume went, the less soda was left in the bottle.

Step 3: Have students draw a picture of the experiment and write a paragraph including what we did in the experiment, what their favorite part was, and anything that surprised them from the experiment.</td>
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Evaluation: **Day 3**	The teacher should evaluate student understanding throughout the lesson and can use their drawing and paragraph as a more formal tool of evaluation.