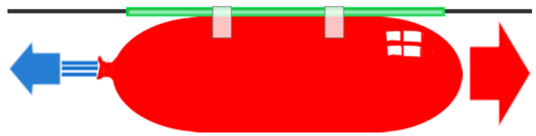
# Science and Superheroes Differentiation



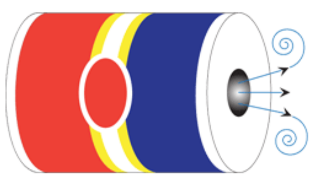
**Balloon Rocket**

**Confirmatory**

In order to give maximum support to students, the teacher can adapt this balloon rocket lesson described in the article by following a confirmatory instructional approach. Using this approach, the teacher will first describe the science behind the balloon rocket while simultaneously modeling how it functions. Then the teacher will allow students to assemble and try launching it on their own. During the teacher's initial instruction, he/she will show that the more air you add to the elastic balloon the more potential energy will be stored inside the balloon. The teacher will then describe that when the balloon rocket is released energy transfers to kinetic energy (i.e. energy of motion) as it moves forward, and thrust occurs: the force the balloon puts on the air pushing it out and the opposite and equal force the air puts on the balloon moving the rocket forward. Once the teacher has modeled these principles, the students will then repeat the same activity for themselves adjusting the amount of air in the balloon for each launch. The lesson will wrap up with the teacher reviewing the science of thrust and energy.

**Guided**

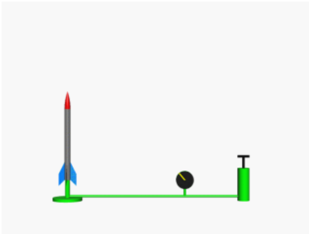
For advanced students who need less support, the teacher may scaffold this balloon rocket lesson by using a guided approach. The teacher will set up a series of three or more balloon rockets across the room. Small groups of students will blow up their balloon, attach it to the rocket, and race. Afterward, students will develop reasoning behind why the winning balloon rocket reached the end first. Next, a new set of students will race, adapting their balloon rockets based on observations made from the first race. Students will repeat testing and data collection until they agree on a theory they have formed relating to how the amount of air blown into the balloon affects how the balloon travels across the room. The student will conclude that the more air in the elastic balloon leads to balloon rocket traveling farther across the room. The teacher will then lead students in a discussion about thrust, potential energy and kinetic energy.



**Vortex Cannon**

**Guided**

The vortex cannon lesson described in the article may be adapted for more advanced students by using a guided instructional approach. To do this, the teacher will give students three vortex cannon boxes, each of noticeable size difference. The teacher will demonstrate how to use them, but will ask the students to make observations and comparisons as to how each box can move air. The students will then use the vortex cannons to knock down cups at various distances and using various forces of striking the sides of the boxes. The students will use their own trial and error to determine which air cannon is most efficient in different situations. The teacher will conclude by leading the students in a discussion about the relationship between force, area, and pressure



## Stomp Rocket

**Confirmatory**

The teacher can adapt this stomp rocket lesson to provide maximum support by following a confirmatory instructional approach. First the teacher will describe the science behind the stomp rocket while simultaneously modeling how it functions. Then the teacher will allow students to launch stomp rockets on their own. In the teacher's initial instruction, he/she will model how applying a force on the plastic bottle (i.e. stomping on it) will cause air to flow through the pvc piping. The teacher will then show how the pressure of the air flowing through the pvc piping will push the foam rocket into the air. Once the teacher has modeled these principles, the students will then repeat the same activity for themselves. The lesson will conclude with the teacher launching rockets at various angles (e.g. 20, 30, 40 degrees) to show how angle can affect the trajectory of the rocket.

**Guided**

The teacher may also scaffold this stomp rocket lesson for more advanced students by using a guided approach. The teacher will provide the question, "At what angle will your stomp rocket travel the farthest?" However, the students will be responsible for exploring the range of angles to test from 0 to 90 degrees. In addition, students will be required to answer formative questions regarding how the stomp rocket functions. The lesson will conclude with a class discussion on force, area, and pressure.

**Open**

In order to adapt this lesson for very advanced or older students, the teacher might use an open instructional approach. In this approach, the students will take on an engineering role by designing the rockets themselves. Students will be given a length of foam tubing, construction paper, tape, and scissors. They will consider weight, aero dynamics, and flight path in designing their rockets. After creating their own rocket, students will initially test their rockets set at the same angle. Then, once students are done testing and altering their rocket designs for maximum distance, they will determine "At what angle will their stomp rocket travel the farthest?" Here, students will follow the Guided approach exploring the range of angles to test from 0 to 90 degrees. The lesson will conclude with students explaining how the stomp rockets function by using terms such as "force," "area," and "pressure."