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Data Integration Assignment
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Methods of STEM Education (Secondary)

# Using Rockets to Investigate Newton's Laws of Motion
## (7th-8th Grade Physical Science)

Data Source:
NASA Rockets for Educators Guide
https://www.nasa.gov/pdf/153412main_Rockets_Newton_Car.pdf

Lesson Enhancement:
I typically introduce Newton's Laws of Motion to students in a one-at-a-time format (i.e. First Law, Second Law, Third Law on separate days) using a demonstration (one in front of the class performed by me, or one done in pairs by the students, or a video). We discuss what we see happening before we even talk about the Law. After getting through all three laws, there is some type of formative/ summative assessment, similar to this: an event is demonstrated or described (for example, a ball is tossed into the air) and the task is to indicate which one of Newton's Laws of Motion is in effect with an explanation. The result is that many students choose the one obvious law, but others can see that all three laws are often involved. The Newton Car activity, which I see as being a culminating lab (but perhaps could also be an introductory lab?), is an excellent demonstration of how all three laws are at work. I feel that the use of rocketry is almost universally engaging; if time would allow, I would have the students construct their own cars.

Using Data in the Classroom:
Data in this activity will be collected by the student groups themselves. Collecting and analyzing data, whether qualitative or quantitative, is part of the scientific process. The connection to rocketry and space exploration is an example of a real-world application of the physical science topics explored in the classroom. Graphing results and recognizing patterns and relationships are mathematical skills that are inherent in this activity. The careful collection of data and their relationship to the performance of this investigation support active and mindful engagement by the students and also give them an idea of the value of accurate data in developing an argument from evidence. The opportunity to explain their results using argument or C-E-R frameworks allow students to think critically and use scientific reasoning to support their claims.

In a society/culture that is increasingly data-driven, analyzing and interpreting data become skills that are necessary in order to understand

and to critique the information with which the average person is inundated on a daily basis.

Rationale for Use of Data Source:
I have had students use data sets generated by others (for example, from websites such as the American Museum of Natural History, NASA, NOAA, IRIS) when there is not an opportunity for students to collect such data themselves. However, I feel that there is
always a plus when students generate their own data—greater ownership and the experience of taking careful measurements, designing fair tests, etc. Having stated this, I think using any type of data is

Interdisciplinary STEM:
Math—problem solving, reasoning, communication
Verbal Communication—oral—in class whiteboarding and discussion
—written—Claim-Evidence-Reasoning
History of Science/Social Studies—history of rocketry and U.S. space program
Cultural Connections—books and movies (Ray Bradbury, The Martian, Apollo 13, October Sky (movie) and Rocket Boys (book); many others