<table>
<thead>
<tr>
<th><strong>Driving Question</strong></th>
<th>What is Newton’s First Law of Motion?</th>
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<tbody>
<tr>
<td><strong>Grade group</strong></td>
<td>Laws of motion are prevalent in grades 1st, 3rd, and 7th.</td>
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<td><strong>Safety Considerations</strong></td>
<td>Experiments should be done with an adult. Check items for durability before attempting to test inertia as items will fall.</td>
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<td><strong>Materials</strong></td>
<td>Demo on Video: Hard boiled egg, Cup full of water, Cardboard or Index Card and a clear surface</td>
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|                      | Experiment 1:  
|                      |  ● Field Journal  
|                      |  ● A few objects to test Inertia (water bottles, cups, upright books, etc)  
|                      |  ● Pillowcase  
|                      |  ● Smooth surface |
|                      | Experiment 2:  
|                      |  ● Field Journal  
|                      |  ● Empty Can and a Full Can  
|                      |  ● Cardboard, a board of some sort, or something found around the home to make a ramp  
|                      |  ● A book to use to give the ramp height (but not too much height)  
|                      |  ● Measuring tape or string you can mark |
|                      | Tying it Together:  
|                      |  ● Construction Paper  
|                      |  ● Scissors  
|                      |  ● Markers, Crayons, Pencils for drawing |
Lesson Standards:

Arizona Science Standard:
1.P3U1.3 - Plan and carry out investigations which demonstrate how equal forces can balance objects and how unequal forces can push, pull, or twist objects, making them change their speed, direction, or shape.

Next Generation Science Standard:
3-PS2-1 - Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

Vocabulary:
Inertia
Force
Motion
Friction

Lesson Objective: Students will be able to explain Newton’s First Law of Motion through exploration of Inertia and Friction.

Schedule:
Days 1-2: Part 1 - Newton’s First Law of Motion. Watch Challenge Video and have fun doing experiments

Days 3-4: Bonus Challenge - Inertia Tower! Submit Inertia Tower Videos and Pictures!

Days 5-7: Part 2 - Newton’s Second Law of Motion. Watch Video and build Newton’s Car

Day 8: Submit videos and pictures of your Newton’s Car

Days 8-10: Part 3 - Newton’s Third Law of Motion. Watch Video and Build Balloon Car

Days 10-14: Part 4 - Design a Rocket Ship!

Days 13-14: Submit your rocket design to be showcased!

Instructions:
Science Challenge

Experiment One: Inertia

1. Find several objects in your house and decide if they are IN MOTION or AT REST
   a. You can have your student write down these observations
2. Once you’ve identified several objects you will now decide which has MORE INERTIA and which have LESS INERTIA
   a. To do this take two objects and place them on a pillowcase on a smooth surface and try to pull out the pillow case without knocking the items over.
      i. Objects with LESS INERTIA will fall over
      ii. Objects with MORE INERTIA will stay upright
   b. Have your student document these findings while exploring their observations of the objects like weight and size connecting these to mass
3. Another option for testing an object's INERTIA is to apply the same force to several objects and take note of if the objects stay up or are knocked over. One easy way is by flicking. (Be aware constant flicking can hurt your finger).
4. Have your student choose their favorite object to video tape their best Table Cloth Pull and submit these to us!
5. Answer this question: How much inertia (MORE, LESS, IN THE MIDDLE?) would you want your rocket ship to have and why?

Experiment Two: Friction

1. Identify different surfaces around your house (i.e. Wood floors, carpet, yoga mat, concrete driveway, etc.) and write them down in your field journal.
2. Build a low-rise ramp and choose a method for measuring distance from the bottom of the board out
3. Roll an empty-can and a full-can down the ramp.
4. Record in your field journal the distances for each can on the surface. Do multiple rolls to get extra data sets!
5. Repeat steps above on the different identified surfaces
6. Once you’ve completed at least 3 surfaces, rank these from MOST FRICTION to LEAST FRICTION in your journal.
7. Answer this question: Based on our research would we want a material for our Rocket Ship to have LESS FRICTION or MORE FRICTION and why? What materials would we want to use on our rocket ship?

Tying it Together:
Science Challenge

1. Fold construction paper in half and create two slits on one side to make 3 flip-up sections.
2. Write “Newton’s Laws of Motion: Science Challenge” on the top
3. On the top of the First flip-up section draw or write “Newton’s First Law of Motion” and it’s definition
4. Under the flip-up draw your favorite demonstration for Newton’s First Law and then how this Law will help your Rocket Ship.
5. Keep for the next part of the challenge in several days.

Resources:
Inertia Tower Idea:
https://www.perkinselearning.org/accessible-science/activities/inertia-tower

Taking it Further!

Inertia Tower (submit your videos by day 4!)

Steps:
1. Put your knowledge to the test by building an inertia tower.
   a. Use blocks or cups and build a tower with each divided by index cards
   b. Start your video recorder
   c. Get the whole family to try and remove the cards at the same time to keep the blocks in place or have cups stack each other.