



STEM KIT

BUILD & LEARN
GUIDE

ENERGY
DRAGSTER



12+
AGES

PROJECT OVERVIEW

This project will focus on energy, forces, and how they work together to make the dragster move. Through building the Brainstorm STEM Dragster kit, students will learn how elastic potential energy becomes kinetic energy and watch how it races away. Students will also learn about how real drag racers work and the forces that are considered when they are built to make the fastest dragster.

SAFETY WARNINGS:

Please read all safety warnings before use:

Choking Hazard: Small parts not for children under 6 years or any individual who have a tendency to place inedible objects in their mouths.

Adult supervision required.

MATERIALS

Durable wooden construction pieces
Plastic Wheels
Wooden Axles
Bushings
Spool
Wing Nut
Thumb Screw
Ziptie
Cardboard Circles
Black Rubber Bands
Wheel Stickers
Rubber Grommets
Beige Rubber Band

ACTIVITY

The Brainstorm Dragster can be used to build, test, and have fun. If you'd like the dragster to be used as a more engaging classroom activity, it can be paired with the provided worksheets. There are both a beginner and an advanced worksheet in order to adjust to the level of your students understanding.

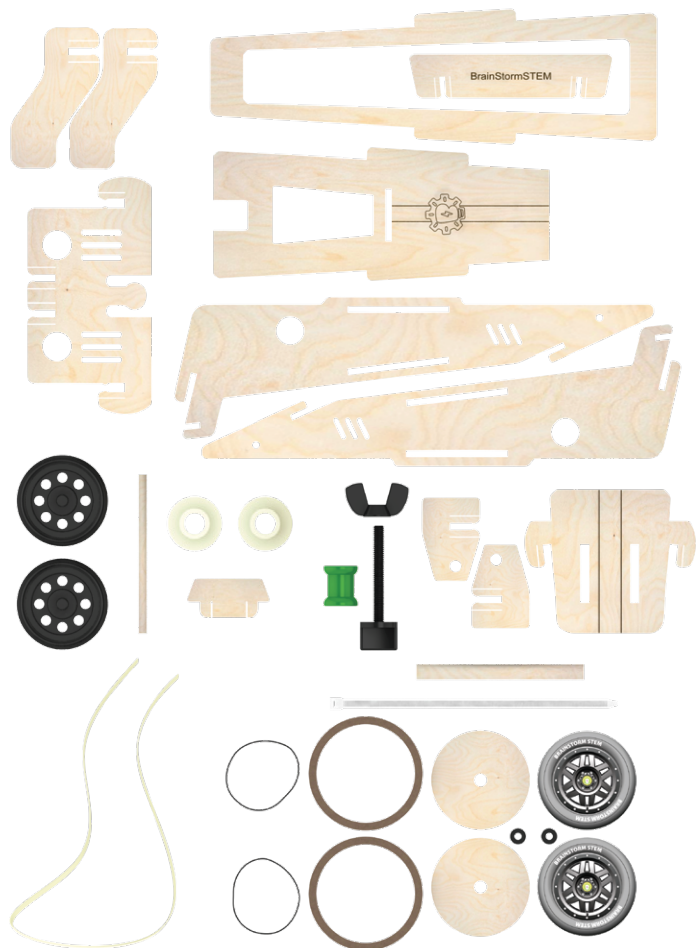
The Dragster will allow students to see elastic potential energy and its conversion to kinetic energy. Students will be able to build and test their dragster. They may also measure the distance the dragster is capable of, and calculate its speed.

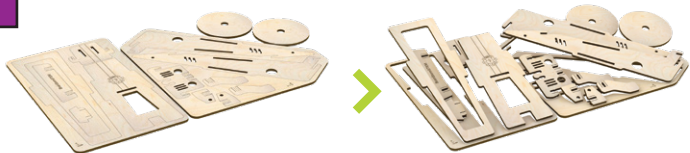


Each of the worksheets is geared towards having students identify the difference between tension and torsion, and observing how this moves the dragster. On the beginner worksheet, students will demonstrate their knowledge of the basics of force and energy. On the advanced worksheet, students will build and test their dragster, and calculate the speed of multiple tests.

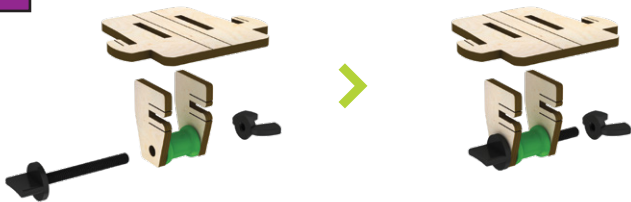
Students will be able to see how changes in the terrain will make the dragster faster or slower.

PARTS



1

NOTE: If you can not break out the pieces by hand, use a blunt tool or a small knife to cut or punch them out. If you have no experience with tools or use a knife, get help from an adult. If there are any burrs, points or rough spots due to breaking or cutting, smooth them with a piece of sand paper.

2**3**

4



5



6



7



8



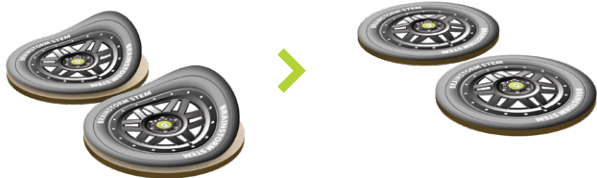
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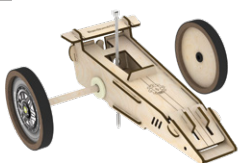
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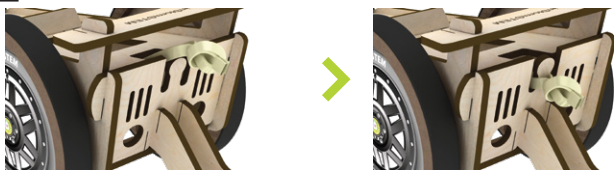
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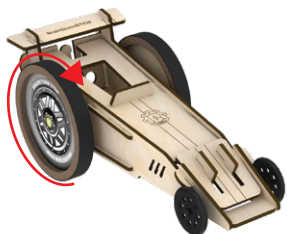
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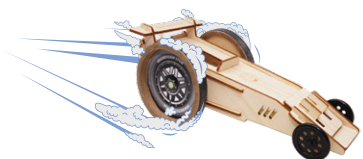
HOW TO USE



1. Hook it
Secure rubber band
to the ziptie.



2. Wind it
Rotate the wheels.

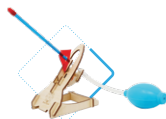


3. Release!

If you enjoyed this STEM Kit, check out some of our other Kits!



CATAPULT



AIR-POWERED
ROCKET



EARTHQUAKE
ENGINEER



AND
MORE!

TERMINOLOGY

ENERGY

The ability to do work.

KINETIC ENERGY

Energy of objects in Motion

POTENTIAL ENERGY

Stored Energy in object due to its position or state.

FORCE

A push or a pull. For example, if someone kicks a ball they are applying a force to the ball making it move forward.

TENSION

When a force acts on an object, making it stretch. This may cause the object to appear longer. When a rubber band is stretched, changing shape and elongating, it is building tension.

TORSION

When a force is applied to an object, making it twist. The more force applied, the more torsion is created. When twisting off a plastic soda bottle cap, the more the cap is twisted, the more torsion is created.

FRICTION

The measurement of how difficult it is to move one object over another.

MASS

Amount of matter an object is made of.

VELOCITY

The measurement of an object's speed and its direction.

ACCELERATE

cause to move faster.

ENERGY 101

Energy is the ability to do work. Energy comes in many different forms including movement, heat, light, sound and chemical.

The two main categories of energy are Kinetic and Potential.

Kinetic energy is the energy of movement.

Potential energy is stored energy due to position or state.

The Dragster STEM Kit uses potential energy in the form of elastic potential energy. Similar to potential energy, elastic potential energy looks at the energy stored in an item. In this case, the item is elastic materials. Because of how these materials stretch and compress, they hold a good amount of potential energy. Examples of materials with elastic potential energy include: rubber bands, springs, and bungee cords.

The Brainstorm Dragster works by using torsion to create a tension force in the rubber band. When the back wheels are twisted, it will wind up the rubber band around the back axle. This twisting creates a lot of tension in the rubber band. When the rubber band has tension it had a good amount of elastic potential energy. Then when the car is placed on the floor and let go, the tension will release and the potential energy turns to kinetic energy, making the car rush forward like a drag racer.

What is force?

A force is a push or pull. The push or pull can cause an object to change shape, change direction, and/or change speed. In the dragster, the force applied is stretching the rubber band to make it so that the car has energy to drive forward.

The stronger the force is or the more the rubber band is wound up/ stretched, the more acceleration the car will have when it is released. This concept applies to Newton's Second law of Physics.

NEWTON'S LAWS OF MOTION

Sir Isaac Newton was a brilliant physicist and mathematician that is recognized among the most influential scientists in history. Along with developing the theory of gravity in 1666, he was able to present his three laws of motion in his book titled, "Principia Mathematica Philosophiae Naturalis" in 1687. These laws of motion are the basis of modern physics describing how an object reacts to the forces that act upon it.

First Law of Motion: Law of Inertia

An object at rest will stay at rest, and an object in motion will stay in motion until acted upon by an outside force. When an object has a tendency to resist a change in its state of motion it is called inertia. If all the forces on an object are equal with no net force, the object will continue doing what it is doing. When an outside force changes the net force acting on the object the object will change its motion. In order for a car to accelerate, the forward force needs to be stronger than the drag caused by air resistance and friction.

Second Law of Motion : Law of Force/ Acceleration

The acceleration of an object is dependant upon the mass of the object and the amount of force applied to the object. This law states that the speed of an object can be determined by the mass of an object and the amount of force that is applied to the object. If 2 objects, one heavy and one light, are given equal forces, the lighter object will experience more acceleration than the heavier one. This law explains how the more force that is applied to a lightweight car will allow the car to accelerate more than a larger, heavier car.

Third Law of Motion : Law of Reaction

Every action has an equal and opposite reaction. If you have a ball that exerts force on a wall by hitting it, the wall exerts an equal and opposite force on the ball causing it to bounce back. This law explains how the backwards force of the tires pushing against the ground pushed the car forward.

DRAG RACING

Drag racing is a type of racing competition in which two vehicles complete a set distance in a short period of time. These races are usually between cars, known as dragsters, or “diggers.” The average distance of each race is 1,000 to 1,320 feet where the cars reach an average speed of 300 mph. Dragsters are classified by the type of fuel they use. The three types of fuel used are: gasoline, methanol, or nitromethane.

When designing a dragster, here are three main things to consider: Weight, Friction, and Drag.

Weight

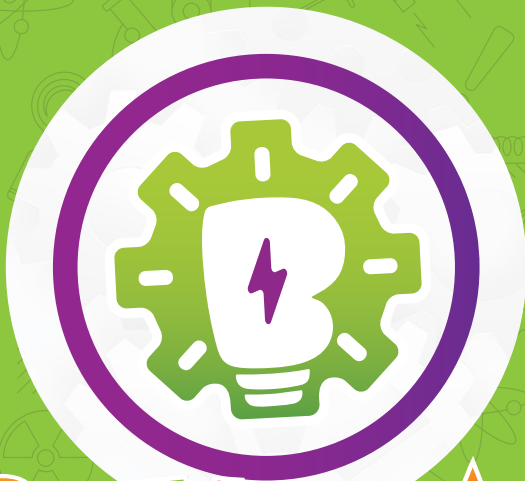
The heavier the vehicle, the more thrust will be required for it to propel itself forward. It is best to keep a dragster as light as possible during the design process. To keep the cars as light as possible, they are constructed with a strong steel frame and a lightweight fiberglass or aluminum cover to keep the weight of the car down.

Friction

Friction on and in the vehicle must also be considered. Besides the friction acting on the vehicle from the ground, there is friction from parts of the vehicle acting on itself. When designing a dragster, designers must be mindful to keep the axles free of any additional parts, so they may move smoothly, and to keep the wheels at the correct distance from the vehicle so that they don't rub against it.

Drag

The final thing to consider is drag, which is a bit difficult to test for, but not impossible. Drag takes into account how air is affecting the drive and speed of the dragster. The dragsters are built with the front low to the ground so that the air can pass easily over the dragster to reduce as much drag as possible.



STEM KIT

For more information on our STEM Kits

Visit: www.brainstormedu.com/stem-products

Have Questions? Contact us: info@BrainStormedu.com


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STEM EDUCATION

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