Gears	Grade 4 – Structures and Mechanisms

Lesson Plan

Safety Notes

If you choose to take apart an object to find gears, make sure it is ok if you might not be able to put it back together.

Description

Explore, investigate and dissect objects from home that have gears.

Materials

You'll need an object from home that has gears. Examples: can opener, egg beater, old toys (wind up, pull back, with motors or rotors), some LEGO sets, bicycle, kitchen scoop

Science Background

Simple machines make work easier for humans. There are only 6 kinds or groups of simple machines. Together, these simple machines make up all the more complicated machines that exist. One group of simple machines is the wheel and axle. Gears belong to this group. They are specialized wheels and axles that can transmit and change forces to different directions and speeds. There are a wide variety of different kinds of gears that are each specialized to do certain tasks.

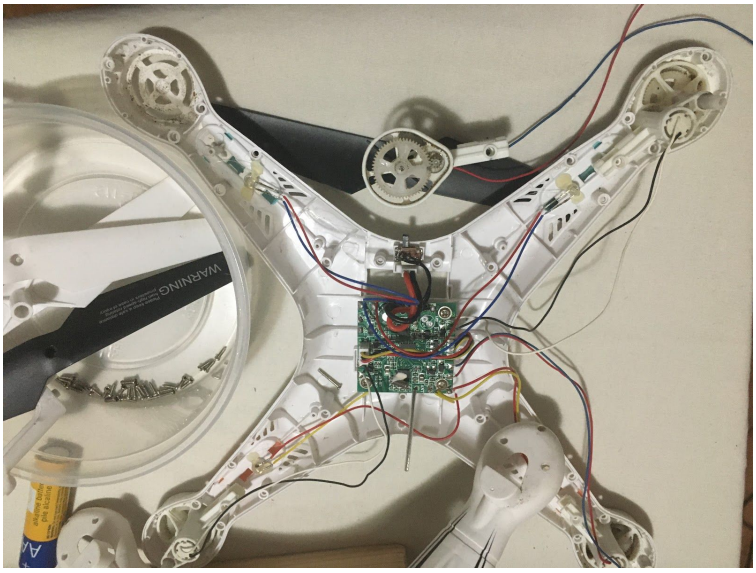
Activity Procedure

1- First, you'll need to find an object with gears to analyze. The best places to find geared items will be the kitchen, a tool closet or shed, maybe an old toy chest. Once you have an object with gears, you might have to open up a casing to see inside. Make sure it is ok for you to use the object since you might not be able to put it back together. Answer these questions about your object. See below for an example object and answers.

A) Is your object made of any other simple machines? What are they?

B) If you have more than one gear, count the teeth on each and compare. This is called your gear ratio. Do you notice how movement changes from one gear to the next? Does it speed up or slow down, change direction?

C) Where is the input force or motion? Where is the output force or motion?



A) Yes. There are also screws and levers.
B) There is one set of gears in each of the 4 corners of the drone. In each set, the smaller gear has 9 teeth. The larger gear has 54 teeth. The gear ratio is 1:6. That means the small gear must turn 6 times before the big gear turns once. The larger gear is moving slower than the smaller one.
C) The input is the motor (moving with the small gear) and the output is the rotor (moving with the big gear). The rotor moves slower than the motor.

Debrief

Many machines that move rely on gears to make their movement more efficient. Motor vehicles have a bunch of different gears that allow them to operate the way they do. In a car we call the gear system the transmission. If there was no transmission in a car, we wouldn't be able to travel at such a large range of speeds. The tools we use, from vehicles to kitchen implements, are specialized to take advantage of different mechanisms to do specific tasks. Try to find more objects with gears and think critically about how they work!