Remote Lesson: <u>Aerodynamics</u>

Grades: 6-8

Learning Objectives

Students will be able to:

- Build a homemade wind tunnel.
- Understand how an object interacts with the air as it moves through it

Background Information:

A wind tunnel is a great way to demonstrate the concept of aerodynamics. The more aerodynamic a car design is, the easier the car will move through the air. There are four basic forces that interact with a car as it moves; weight is the downward force, lift is the upward force, thrust is the forward force, and drag is the backward force. Improving the aerodynamics of a car not only makes it easier to move through the air, it also increases fuel efficiency resulting in less harmful emissions to the environment.

Purpose:

To build your own wind tunnel and use it to determine aerodynamics of different shaped cars.

Supplies:

For the wind tunnel:

- cardboard
- duct tape
- cardboard tubes
- box fan
- glass or plexiglass (about 8" by 8")
- scissors
- hobby knife or box cutter (parent job)
- tape measure
- hot glue gun w/ glue sticks
- saw (parent job)

For the car activity:

- toy car
- paper
- tape
- timer

Procedure:

Building Instructions:

Instructables: https://www.instructables.com/id/Cardboard-Wind-Tunnel/

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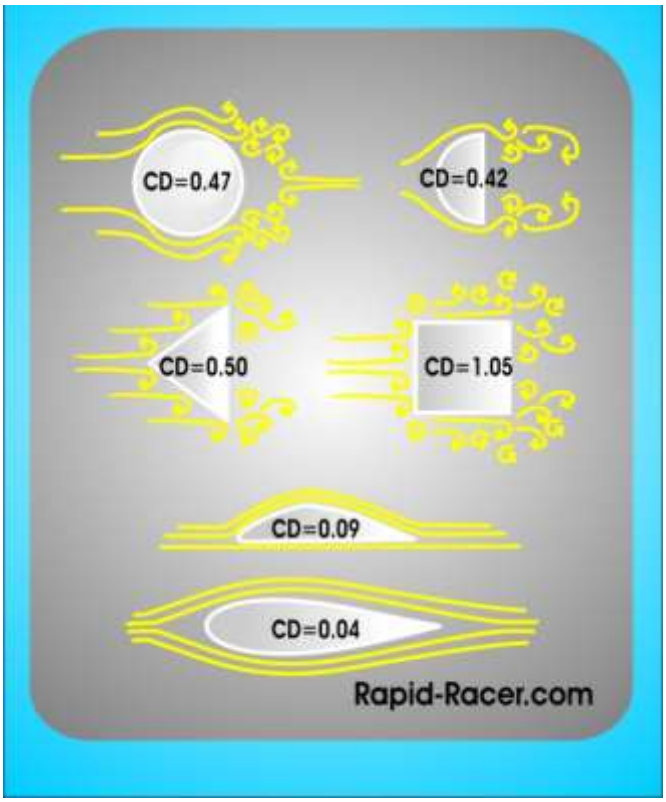
Activity:

1. For the activity students will build a small car to test in the wind tunnel. Use a toy car that you have in the house. Use a piece of paper to make a “top” to your car. Manipulate the paper to make any shape you want with two exceptions. There must be a surface that the wind can make contact with, and not flow through and the shape on top of the car must be 3-Dimensional. Here are some shapes to try:



2. Once students have built their cars, but before they are allowed to put their car into the wind tunnel, they should test it to make sure that it can actually roll. Once they pass this test they can put their car into the wind tunnel, turn it on, and take note of how it interacts with the air that is moving through the tunnel.

3. You can either create a “start” and “finish” line inside the tunnel and have the student’s time how long their car can last inside the tunnel without it being moved to the finish line. Or you can have the students clip their car to something inside the tunnel and just observe how it interacts.

4. Record your data and observations in a table.

Trial #	Car Shape	Time	Observations

Results/Critical Thinking:

Look at your data and observations.

- Which shape worked best? Why?
- Which shape worked worst? Why?
- If you were to work for a company that designs cars, what design would you use to get the best fuel economy (the most miles per gallon of gasoline)?

Regarding the wind tunnel:

- What did you learn about air flow while building the wind tunnel? Why do you think it is important that the air flow in a straight line?
- Do you have suggestions to improve the building and performance of the wind tunnel?

Conclusion:

The shape of a car affects its aerodynamics or ability to move through the air. One way to test aerodynamics is by using a wind tunnel. A wedge shaped car is the most aerodynamic shape which explains the shapes of many of the cars that we see on the roads every day. The more aerodynamic a car is, the easier it is to travel through the air (less drag) and the less fuel is needed to propel that car through the air. More aerodynamic vehicles help to reduce air pollution as a result of their improved fuel efficiency. Even cars that use alternate fuels such as electricity use aerodynamic car shapes to reduce the amount of power they require to move. This means that they have to be charged less often.

Curriculum Standards

Health & Physical Education • 2.1.8.A.3 • 2.2.8.A.2 • 2.2.8.B.2 • 2.2.8.C.1

Technology • 8.2.8.B.[1-3] Science • 5.2.6.E.3 • 5.1.8.A.2 • 5.1.8.B.[1&2] • 5.1.8.D.[1-3] • 5.2.8.E.1

Mathematics • CCSS.Math.Practice.MP4 • CCSS.Math.Practice.MP7 • CCSS.Math.Content.6.NS.B.3 • CCSS.Math.Content.6.G.A.4 • CCSS.Math.Content.7.G.B.6 • CCSS.Math.Content.8.G.B.7