



HOW TO USE THIS GUIDE

Duplicate the DFTV student pages (pp. 3–6), and distribute them to your students. Read the question posed by the young scientists. Encourage your students to describe how they would investigate the question. Guide them through the steps of developing an inquiry (see below).

If you have a videotape of the episode, play it to see how the DFTV scientists investigated the question, and what their results were. The investigations are also described on page 7 of this guide and on the DragonflyTV Web site. Apply the ideas learned in the DFTV example to the classroom activity "Do It, Get to It!", or encourage students to do the investigation described in "Take it Outside."

If your students develop investigations of their own, encourage them to visit the DragonflyTV Web site, www.dragonflytv.org. On the link titled "Be on DFTV" they can describe their investigation and they'll be considered for the next season of DragonflyTV!

OBSERVATIONAL

1. Write the question: How does A compare to B? Make a hypothesis.
2. Decide what to measure or observe for both A and B, and how to do it.
3. Make multiple observations when possible. Record all results.
4. Organize the data in a table or chart, looking for differences or similarities.
5. Write an answer to the original question. Also write down any new questions that come up during this investigation.

EXPERIMENTAL

1. Write the question: If I change A, what happens to B. Make a hypothesis.
2. Choose the independent variable (the thing you change) and dependent variable (the thing that is affected), and how to measure them.
3. Do multiple trials when possible.
4. Organize the data into a table, and prepare a graph. Look for patterns or trends.
5. Write an answer to the original question. Also write down any new questions that come up during this investigation.

203 / SPORTS SCIENCE: How do I kick a soccer ball farther?



What's Up?

I'm Dana, and I get my kicks playing soccer. I'm a strong player, but I want to figure out how to really boot the ball the length of the field! My question: if your legs are bigger, can you always kick the ball farther? For my DragonflyTV investigation, I invented a machine to answer this question.

HOW WOULD YOU INVESTIGATE THIS QUESTION?

Brainstorm with other students ways to build a machine that can kick a soccer ball. Draw a design of your machine in your notebook, and share it with the class. You can also go to www.dragonflytv.org to see Dana's machine and find out what she discovered.



Do It, Get To It

THAT'S THE WAY THE BALL BOUNCES!

Pressure certainly makes us behave in certain ways, but did you know it also affects basketballs and volleyballs? Pressure is the push of the air on the surface of the ball, both inside and out. Air pressure inside a basketball or volleyball changes the way it bounces. Design an investigation to show this influence. Your gym teacher might have an air pump with a pressure gauge on it. Measure how the ball bounces when you drop it from a certain height. Also, ask a friend to dribble the basketball (or serve the volleyball), and get his or her feedback about how well the ball performs when inflated to different pressures. What is the best pressure to inflate the ball? How will you decide? Is more air pressure always better?

Take It Outside!

GOING BATTY

How do you choose the right baseball bat for you? Baseball bats come in many different lengths and weights. Design an investigation where you and a friend test some different bats. Set up a ball on a tee, and swing different bats. You could measure how far the ball flies, or how accurately the batter hits the ball. Make a scatter-chart showing where the ball landed. Can you see differences in the scatter-chart for short bats compared to long ones, or heavy versus light ones? What features are best for one particular person? Relate bat choice to the person's height or arm length.

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About the DFTV Investigations (for the educator)



SNOW SHELTER

NATIONAL SCIENCE EDUCATION STANDARD

Earth Science Grades K-4:

Properties of Earth Materials

Physical Science Grades 5-8:

Transfer of Energy

The DFTV scientists built a snow shelter (quinzhee), and used an electronic thermometer to record the temperatures inside and outside all night long. They found that even though the outside air temperature dipped to a chilly 20° Fahrenheit (-6° C), the temperature inside stayed a comfortable 32° Fahrenheit (0° C). Their body heat kept the inside air temperature warm, and the quinzhee wall kept the heat in!

Get your students thinking about why the temperature inside didn't climb above 33° Fahrenheit (1° C) degrees, or what result you might get if nobody stayed inside during the night. For more details about this investigation, visit www.dragonflytv.org.

BABY ANIMALS

NATIONAL SCIENCE EDUCATION STANDARD

Earth Science Grades K-4:

Life Cycles of Organisms

Physical Science Grades 5-8:

Reproduction and Heredity

The DFTV scientists measured the weights of a chick, a pig, and a cow from birth until four weeks of age. The cow gained the most weight, but it didn't even double its birth weight. The pig increased its weight by seven times, and the chick beat them all by increasing its body weight 14 times! It appears that small animals grow at faster rates than large ones.

Work with your students to clarify the difference between absolute growth rate (pounds per month) and relative growth rate. For more details about this investigation, visit www.dragonflytv.org.

YO-YOS

NATIONAL SCIENCE EDUCATION STANDARD

Earth Science Grades K-4:

Position and Motion of Objects

Physical Science Grades 5-8:

Motions and Forces

The DFTV scientists tried three different lengths of string (24", 36", 48" or 60 cm, 90 cm, 120 cm) on their yo-yos, and measured the sleep time in each case, doing several trials to get an average. They found that the 48" strings gave a longer sleep time than the other two. Strings longer than 48" were too hard to control to be useful. The longer string allows more rotational energy to develop, giving the yo-yo a longer sleep time.

There are other yo-yo properties to consider, too, like mass, axle bearing, and shape, all of which can influence the yo-yo's rotational inertia. For more details about this investigation, visit www.dragonflytv.org.

SOCCER KICK

NATIONAL SCIENCE EDUCATION STANDARD

Earth Science Grades K-4:

The Characteristics of Organisms

Physical Science Grades 5-8:

Structure and Function in Living Systems

The girls built a spring-loaded soccer ball kicking machine out of 2x4's, and used springs to simulate leg muscles. The girls learned that the distance of the kick depends on the mass of the leg, *and* how quickly it swings.

This investigation illustrated not only the concept of transfer of momentum, but inertia as well. The girls didn't anticipate that the heavier leg's inertia required more "spring" muscle to make it swing fast. Use this investigation to discuss inertia, momentum and kinetic energy. For more details about this investigation, visit www.dragonflytv.org.

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