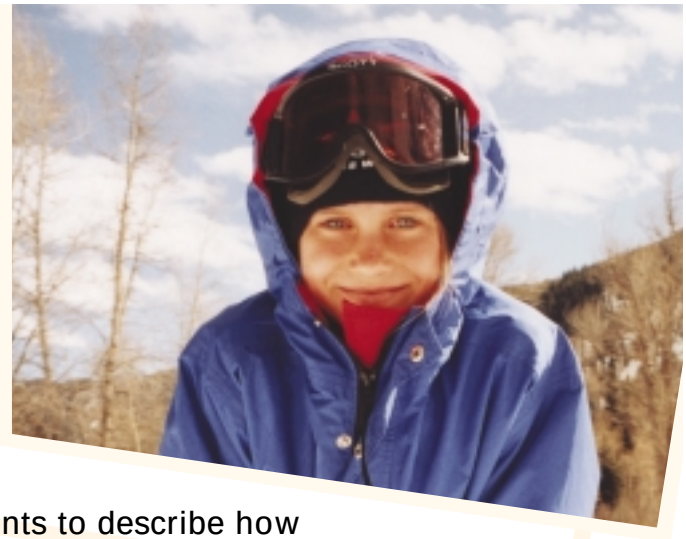


HOW TO USE THIS GUIDE

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.

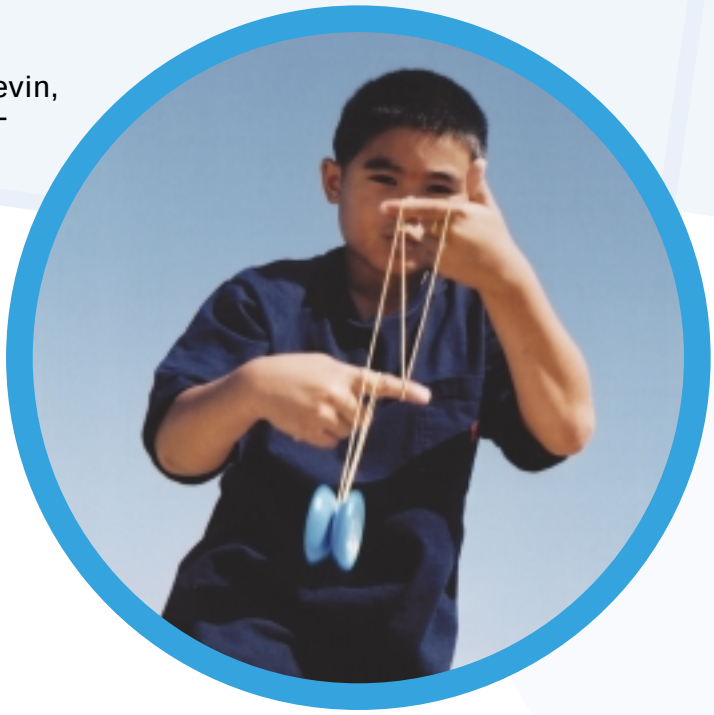
EXPERIMENTAL

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.

DragonflyTV is a production of Twin Cities Public Television (TPT), St. Paul/Minneapolis, and is made possible by major grants from Best Buy Children’s Foundation and the National Science Foundation.

204 / SPINNING: What makes a yo-yo sleep?

What's Up?



Yo! I'm John, and I love yo-yos! When my friends Kevin, Minna, and I are doing tricks, one of the most important skills to master is making our yo-yos "sleep." Sleeping is when you throw the yo-yo just right, and it keeps spinning when it reaches the end of the string without climbing back up. Since we want to perfect our tricks, we asked this question on DragonflyTV: How can we change our yo-yos to increase their "sleeping time?"

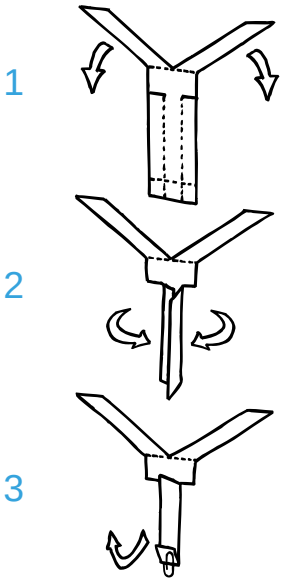
HOW WOULD YOU INVESTIGATE THIS QUESTION?
Look at several kinds of yo-yos. Some have ball bearings, others do not. Pick one kind of yo-yo, the variables you want to investigate, and describe what experiments you'd do. Write your investigation in your notebook, or go to www.dragonflytv.org to find out what John and his friends did.

Do It, Get To It

TOP THIS
There's a lot of science in simple toys, even a top. Make a simple top out of a pencil or toothpick and heavy paper. Try to find a design that spins a long time without tipping over. Try long and short pencils, or different shapes of paper. Test other variables like the mass of the whole top. Design an experiment to find the characteristics that produce the longest spinning top! Be sure to record your findings, and think about why certain designs make for better spinning.

Take It Outside!

CREATE-A-CHOPPER
Make a simple paper helicopter, like in the diagram to the right:



Now create an investigation that tells you how to design your helicopter to do the following things:
a) spin quickly, or spin slowly
b) drop slowly;
c) different combinations of the options above.

Try changing things like the length of the propeller arms; the width of the propeller arms; and the weight of the body. What happens?

Hold a helicopter drop contest. Find a safe place from which to drop your helicopters, and try to make them land in a target circle.

Student Page

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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.

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.

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.

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.

Teacher Page

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