HOW TO USE THIS GUIDE

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

2. If you have videotapes of the episodes featured in this guide, play the video segment to see how the DFTV kids investigated the questions 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!"

3. If your students develop investigations of their own, encourage them to visit the DragonflyTV Web site, pbskids.org/dragonflytv, and click on DFTV Boards. Kids can describe their investigations, and share their ideas with others.

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.

402 / Engineering: Ice Bikes

dragonflytv

Student Page

What's Up?

We're Bob and Brennan, and we're into a very cool, very slick sport: ice biking! Our school holds an annual ice bike race, where the goal is to design and build the winning bike. We know we want to modify one of last year's top models by adding studs to the tires. The studs will give us traction, kind of like cleats do on shoes. Our DragonflyTV question is: **How many studs should we add for maximum speed on ice?**

How Would You Investigate This Question?

Think about Bob and Brennan's idea of adding studs to the ice bike's tires. Do you think this is a good modification? If so, how many studs would you add? Will too many studs "crowd" the tire, actually slowing the bike down? What other design changes might you suggest to make a bike cruise quickly and safely across an icy surface? Think about other bicycle features, like the handlebars, seat, and frame. Write your ideas in your notebook and discuss them with your classmates. Then discuss them with your teacher, watch the DragonflyTV video, or go to pbskids.org/dragonflytv to see what Bob and Brennan did, what they learned about engineering, and finally, if their ice bike won the day!

Do It, Get To It

Do a friction study of your own. Get a board (like a plank or shelf) and some household objects to slide down the plank. Try things like a hockey puck, tissue box, soup can, CD case—anything that will slide, not roll. Lay the plank flat, set the object on one end of the plank, and lift the end slowly until the object begins to slide down the plank. Measure how high you have to raise the plank before each object slides. Before you begin, predict which things will slide at lower angles and which will slide at higher angles.

Take It Outside!

If you live where it snows, get outside with your snow sled and do some science! Find a good sliding hill, and make a sledding track in the snow. Do an experiment to see how the weight of the cargo in the sled affects how quickly it slides down the track. Start with an empty sled then fill it with more and more weight. Use a stopwatch to measure the times carefully. Don't have snow where you live? Try the same thing with cardboard on a grassy hillside!

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PBS KIDS GO!

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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.

About the DFTV Investigations
(for the educator)

dragonflytv

Educator Page

ICE BIKES

NATIONAL SCIENCE EDUCATION STANDARD

Science and Technology Grades K–4:
Understanding about Science and Technology
Physical Science Grades 5–8:
Motions and Forces

The boys acquired three rubber tires, installing 50 studs in the first, 100 studs in the second, and 150 studs in the third. They recorded the time it took to go around a 200 meter ice track once from a complete stop, doing several trials for each tire. For the conditions of the track (wet and slushy), they found the 100-stud tire gave them the shortest race time, and the most control.

As with many technology investigations, one looks for trade-offs. More isn't always better. Discuss with students the importance of identifying the limits of a technological innovation.

SEA LIONS

NATIONAL SCIENCE EDUCATION STANDARD

Life Science Grades K–4:
Organisms and Environments
Life Science Grades 5–8:
Regulations and Behavior

Robyn and Alex received permission from the zoo to select three types of fish to feed the sea lions at the next three feedings: frozen fish; small live trout; large live trout. They kept the weight of fish the same at each feeding, and recorded the time for the sea lions to consume all the fish. They also observed the sea lions for ten minutes after feeding, to monitor their activity levels. They found that feeding the sea lions live fish induced positive behaviors, keeping the sea lions active and alert. Discuss the challenges in controlling variables when conducted investigations into animal behavior. Time of day, age of the animal, changes in the animal's routine can all influence the observations one makes.

CURLING

NATIONAL SCIENCE EDUCATION STANDARD

Physical Science Grades K–4:
Motion of Objects
Physical Science Grades 5–8:
Motions and Forces

The girls first looked for the relationship between the direction of rotation of the curling rock and the direction of its curl. Secondly, they investigated the effect that sweeping has on the rock's motion. They used a digital laser timer to gauge the speed of the rock, then measure the distance of the slide, either sweeping it or not. They compared swept and unswept rocks of similar initial speed, and found that all rocks, regardless of speed, glide farther when the ice in front of them is swept. Encourage your students to look for science investigations in the sports they enjoy.

VOLLEYBALL

NATIONAL SCIENCE EDUCATION STANDARD

Life Science Grades K–4:
Organisms and Environments
Life Science Grades 5–8:
Regulations and Behavior

The girls scrimmaged with another team to test whether the number of players communicating influenced their team's success. They played ten serves where no player talked, ten serves where only the captain talked, and ten serves where all six players talked. They found that they did win more volleys once everyone was communicating, although they were aware that this is a skill that comes with practice.

Human behavior experiments are difficult to conduct, given all the factors that can influence an outcome. This investigation is a good example of a non-traditional investigation relating to a popular sport. Encourage your students to develop other creative investigations like this one.

For more details on these investigations, visit pbskids.org/dragonflytv.
Use the search option to quickly find the specific segment.

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