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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.

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411 / Human Body: Diving

Student Page

What's Up?

We're Jaq and Niki, and we always make a splash with our favorite sport: Diving! Actually, just the opposite is true; we try NOT to make waves. Since competitive divers are judged on form and entry into the water, less splash is better. We hit the water at a high speed, so we can't always tell why we make a lot of splash on some dives. So let's dive into our DragonflyTV question: **How can we figure out what's causing splash on our dives?**

How Would You Investigate This Question?

A lot of kids have tried a "cannonball" into a pool or lake, where the goal is to create the biggest possible splash. What makes a good cannonball? Is it how you place your legs or arms, how high you leap, what you do with your hands? Now that you've thought about splashing, how can you use these same methods to *not* splash? Write your ideas in your notebook and discuss them with your classmates and your teacher. Then watch the video segment, or go to www.pbskids.org/dragonflytv to watch Jaq and Niki solve their diving dilemma.

Do It, Get To It

Explore ways to observe things that happen slowly, such as the growth of a plant. Place a few bean seeds on a moist paper towel, and lay the towel in a plastic zipper bag. Line the inside of a clear cup with the bag, so you can see the seeds; a second cup placed inside the first helps hold the bag. Make drawings or take pictures of the seeds each day as they begin to sprout. How can you use the images to make a movie of the seeds sprouting and growing?

Take It Outside!

Use a home video camera to take an extraordinary look at ordinary events. Record the splash of a water balloon hitting the sidewalk, or of a baseball falling into a bucket of water. Play the video back one frame at a time to notice things about the event that you couldn't see in "real time." Use this technique to study other events, such as a model earthquake. Build a small village on a cardboard platform, then shake the platform back and forth to create an earthquake. Play back the video to look for details about how damage occurred.

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About the DFTV Investigations

(for the educator)

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Educator Page

MAKE-UP

NATIONAL SCIENCE EDUCATION STANDARD

Physical Science Grades K–4:
Properties of objects and materials

Physical Science Grades 5–8:
Properties and changes of properties in matter

The girls took a basic lip gloss recipe (found on the Internet), and modified the percentages of two ingredients to see the effects on the final product. They increased or decreased the proportion of beeswax and castor oil in the formulation, then did "consumer testing" to see which formulation had the most desirable properties. They found that a change of just a few percent in the formulation had noticeable results in the opinions of the consumer. Further, they learned how the physical properties of a substance in a mixture contribute to the properties of the entire mixture.

Discuss with students the challenges of making a homogenous mixture out of heterogeneous components. For example, when combining the liquids and solids of the lip gloss recipe, it is necessary to melt the solids, so all the ingredients can be thoroughly mixed? Also discuss how the inability of some materials to mix limits one's choices in making a formulation.

DIVING

NATIONAL SCIENCE EDUCATION STANDARD

Physical Science Grades K–4:
Position and motion of objects

Science and Technology Grades 5–8:
Understandings about science and technology

The girls have been well coached in their diving technique, yet questions remained about why a dive that felt right still resulted in a large splash. They employed a high-speed video camera to examine their dive entries more carefully. A high-speed video camera shoots video at 500 or more frames per second. In the playback, one can see details in quick-moving events that one might miss using conventional video (30 frames per second). In this case, it was the little things like hand and toe position that caused the most splash, things they weren't able to notice with the unaided eye.

Discuss with students the difference between high shutter speed still photography and high-frame rate moving photography. Many home video cameras have high shutter speeds, but low frame rates, so they aren't as effective as a high-speed video camera. This investigation emphasizes how technology can enhance scientific investigation.

CHEETAHS

NATIONAL SCIENCE EDUCATION STANDARD

Life Science Grades K–4:
Organisms and their environments

Life Science Grades 5–8:
Populations and ecosystems

The Cheetah Conservation Fund in Namibia is a wonderful place to go on a safari to observe cheetahs and their fellow inhabitants in their natural environment. The girls went on a wildlife observation trek out on the Namibian savannah, counting the numbers of cheetah prey animals present at different times of day. The found greater numbers of prey animals in the cool of the early morning, compared to in the heat of the late morning. This led them to consider what time of day the cheetah might try hunting for prey with the most success.

Even without traveling to the African plains, one can still study animal behaviors in a local habitat. Sometimes the habitat is as confined as in an aquarium or terrarium, or as open as in a schoolyard or park. Discuss with students what variables they should keep in mind when designing an animal observation inquiry.

TREBUCHETS

NATIONAL SCIENCE EDUCATION STANDARD

Physical Science Grades K–4:
Position and motion of objects

Science in Personal and Social Perpectives Grades 5–8:
Science and technology in society

The boys built a model trebuchet that they could easily modify. They looked at the effect of shorter and longer slings, and heavier and lighter counterweights. They found that heavier counterweights would throw an item farther than lighter counterweights, provided the entire trebuchet could withstand the strain of the additional weight. Longer slings didn't always result in farther throws, as a sling that is too long would dangle rather than fling something over the top.

Trebuchets have an interesting social history as well as an interesting technical history. They are ideally suited for discussions of how technologies advance in their societal context, and how they ultimately decline.

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

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