



HOW TO USE THIS GUIDE

- 1 Duplicate the DFTV student pages (pp. 3–6), and distribute them 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 them 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, 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.



Student Page

311 / Games: How can science help us score a carnival prize?

What's Up?

We're Mary Jane and Eliza. Each summer, we head to the Minnesota State Fair to check out the animals, gobble snacks, and go on every ride possible. We also hit the Midway to play the games, but we always seem to lose! We think we have our best chance at two throwing games: "break the plates," and "knock over the wooden blocks." Our question: Can we use science to improve our chances of winning?

How Would You Investigate This Question?

Consider the factors that might affect your chances of winning a ball toss game. Some examples might include: the mass of the ball, the speed of your throw, and distance to the target. Because there are many possible variables, design an investigation that allows you to control one variable at a time. Consider setting up your own experimental version of the game. Write your ideas in your notebook, and discuss them with your classmates. Go to www.dragonflytv.org to see what Mary Jane and Eliza did, and what they learned about the science of Midway Games!

Do It, Get To It

Come up with a carnival game of your own, and investigate how changes in the game set-up make it easier or harder. Try to think of a new game you haven't seen at a fair or carnival. What are the science principles the game uses?



Take It Outside!

Some carnival games, like "toss the ball into the milk can," are more easily won when you use the right throwing technique. Toss a ball at a bucket, and try putting no spin, top spin, and back spin on it. Does one type of spin seem to increase your chances of winning? How does spin affect the way the ball bounces? Go to www.dragonflytv.org, "Be On DFTV," and tell us what happened!

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About the DFTV Investigations

(for the educator)

MALFORMED FROGS NATIONAL SCIENCE EDUCATION STANDARD

Life Science Grades K–4:
Organisms and Environments
Science in Personal and Social Perspectives
Grades 5–8:
Natural Hazards

The girls collected almost 50 frogs out of their pond. Nearly one-third of them showed malformations, far above the “baseline” percentage. They classified the malformed frogs into categories: symmetrically malformed (missing or extra legs on one side only), or asymmetrically malformed (missing or extra legs on both sides). They found that all the frogs but one were asymmetrically malformed, suggesting that the cause of malformations in their pond was due to natural parasites. This led to further questions about why there were parasites present this year, but apparently not other years.

Frog malformations have been attributed to everything from UV radiation to chemical pollutants and, of course, parasites. Discuss with students the difficulties in positively identifying disruptions in the environment. For more details on this investigation, visit www.dragonflytv.org.

MIDWAY GAMES NATIONAL SCIENCE EDUCATION STANDARD

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

Mary Jane and Eliza investigated how balls of different mass and diameter could be used to either break or push something. They set up their own “break the plate” and “knock the blocks” booths to test three different kinds of balls. They learned that any ball thrown hard enough can break a plate, but plates that can wiggle in the rack absorb the impact and are less likely to break. They also learned that the arrangement of wooden blocks (stacking them on the diagonal) influences which blocks receive the impact of the ball.

There are a number of books available on the science of carnival games. Use them as a starting point for more student investigations into the science principles behind such games. For more details on this investigation, visit www.dragonflytv.org.

MARS NATIONAL SCIENCE EDUCATION STANDARD

Earth and Space Science Grades K–4:
Properties of Earth Materials
Earth and Space Science Grades 5–8:
Earth in the Solar System

TJ and Trey used an infrared camera to look for hidden water in the Arizona desert. They learned how different surfaces (fine sand vs. rock, for example) in the desert have different rates of heating and cooling. They also learned that infrared cameras see differences in surfaces that human vision misses. This helped them understand why NASA uses infrared imagery as part of its Mars Global Surveyor Project.

Take advantage of all the attention currently given to Mars and invite your students to join in the adventure. There are thousands of recently collected NASA Mars images on the Web. Invite students to look at them and try to recognize landforms on Mars that might resemble those on Earth. For more details on this investigation, visit www.dragonflytv.org.

COLORBLIND DOGS NATIONAL SCIENCE EDUCATION STANDARD

Life Science Grades K–4:
The Characteristics of Organisms
Life Science Grades 5–8:
Regulation and Behavior

Elizabeth and Caitlin used their dogs’ ability to fetch as a way to test their color vision. They covered a number of tennis balls in gray cloth, scattered them in the yard, then had the dogs retrieve another tossed gray ball from the bunch. They recorded the number of correct retrievals. They continued by tossing balls covered in different colors into the grays, and recording the number of correct retrievals of each of those colors. They got mixed results. Chime had difficulty retrieving the correct red and green balls but did okay retrieving yellows. Sassy began retrieving balls correctly using her sense of smell, so it wasn’t clear how well her vision allowed her to pick out colors.

Discuss with students how to improve this investigation to rule out that the dogs may have sniffed out the correct ball, rather than picking it out visually. Remind them that scientists once considered all dogs to be fully colorblind, but that recent research now indicates that they have partial color vision. For more details on this investigation, visit www.dragonflytv.org.