Pull-out Section

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DragonflyTV Educator's Guide

For use in classrooms, afterschool clubs, youth groups, museums, zoos, and more.

DragonflyTV is the PBS show for kids interested in the science behind their favorite activities. What's unique about DragonflyTV? It features real kids **doing** their own science inquiries. In fact, any child who is exploring a science question or creating a science project has a chance to be on the show.

DragonflyTV is an ideal catalyst for inquiry in your classroom. **Educators can tape DragonflyTV broadcasts and use the videos in classrooms, clubs, and other institutions for a full year.** And even without the video, the activities in this guide will still show how much fun inquiry can be!

To learn more about DragonflyTV, go to www.dragonflytv.org.

Get a FREE DragonflyTV DVD!
Just visit www.dftvsurvey.org and give us your feedback on these DragonflyTV Educator's Guides. The first 100 respondents get a FREE DVD with four complete episodes!

SEASON THREE, ISSUE THREE

310/Habitats:
Malformed Frogs

311/Games:
Midway Games

312/Space:
Mars

313/Dogs:
Colorblind Dogs

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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.

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.

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310 / Habitats:
Why does our pond have funny-looking frogs?

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Student Page

What's Up?

We're Susie and Katie, and we love to hunt for frogs. We've got a pond in our backyard where lots of frogs live. This year, we noticed a lot of the frogs in our pond had missing legs, or sometimes, extra legs! That got us wondering: What's causing the malformations at our frog pond?

How Would You Investigate This Question?

To figure out how frogs develop malformations, make yourself familiar with the life cycle of a frog. What sorts of information should you gather about the malformed frogs' pond? Decide whether to focus your investigation on the frogs, or on the environment where they live, or both. How can the clues you gather by observing the frogs and their habitat explain why the animals are malformed? Write your ideas in your notebook, and discuss them with your classmates. Go to www.dragonflytv.org to see what Katie and Susie did, and what they learned about malformed frogs.

Do It, Get To It

Ask for your teacher's help in setting up an aquarium for tadpoles. Observe the tadpoles carefully each day, and write down the changes you see. How many days does it take for the legs to appear, and the tail to disappear?

Take It Outside!

Ask your local Department of Natural Resources (DNR) office if they are conducting frog studies. If you live near a frog pond, ask how you can help collect information about the kinds of frogs living in your pond, and whether the pond water is healthy for the frogs and other wildlife. Go to www.dragonflytv.org, "**Be On DFTV**," and tell us what happened!

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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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312 / Space:
Does life exist on the Red Planet?

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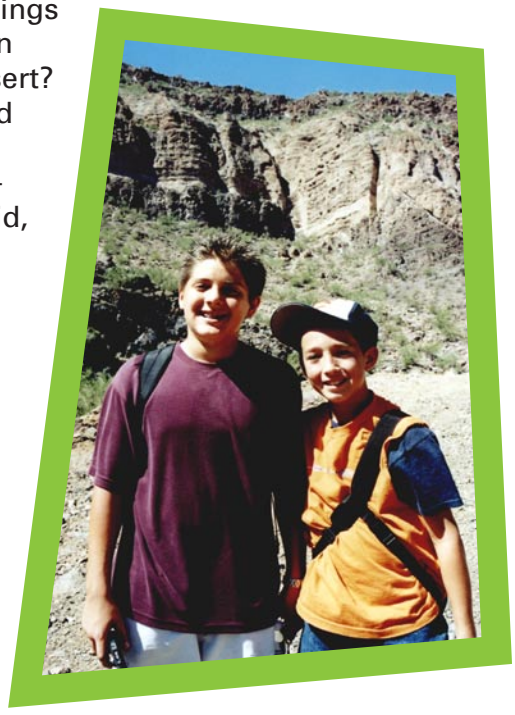
Student Page

What's Up?

We're TJ and Trey, and we're all about astronomy. We check out planets and stars through a telescope whenever we get a chance. We're especially into Mars. Everybody always talks about Martians, but have scientists ever really found any signs of life? We've heard that if you could find water on Mars, you might find life on Mars. Our question: How could you find evidence of water on Mars?

How Would You Investigate This Question?

No one has been to Mars yet, so focus your investigation on things you can do at places on Earth that resemble Mars. Mars is often described as a desert. How would you look for water in the desert? Is there special equipment you would want to bring? How could you find sources of water hidden just below the surface? Write your ideas in your notebook, and discuss them with your classmates. Go to www.dragonflytv.org to learn what TJ and Trey did, and how they learned to search for water on Mars!



Do It, Get To It

There are satellites orbiting Mars right now and you can look at those satellite images on the Web. Go to themis.asu.edu and look through thousands of images of the Mars landscape. These are the real images NASA scientists are using to study Mars. Join in and make your own discoveries!

Take It Outside!

Investigate night vision with infrared light. If you have a digital movie camera with a night vision option, use that to learn how things look in infrared light. Look at the appearance of plants, grass, water puddles, and rocks outside during the day using the regular camera option. Then go out at night and switch to night vision, and look at those things a second time. Pay special attention to the colors of things. What can you see with night vision that you miss with regular vision? Go to www.dragonflytv.org, "**Be On DFTV**," and tell us what happened!

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313 / Dogs:
Can our canines see colors?

Student Page

What's Up?

We're Elizabeth and Caitlin. Our pets Sassie and Chime are agility dogs, and they've been in training since they were puppies. We noticed that the target obstacles in their agility course have some of the same colors on them, like yellow and blue. We always thought dogs were colorblind. No one could say Sassie and Charm aren't colorful, but our DragonflyTV question is: Can our dogs see colors, or are they really colorblind?

How Would You Investigate This Question?

Think about how challenging it is to learn what an animal can see. Design a test that uses your dog's skills (playing fetch, for example) as a way to figure out what it can see. Should you begin by assuming dogs are colorblind, or should you assume they see colors? How does your assumption affect the design of your test? Write your investigation ideas in your notebook, and talk about them with your classmates. Go to www.dragonflytv.org to learn what Elizabeth and Caitlin did, and what they found out about their dogs' vision.

Do It, Get To It

Design a test to determine whether your dog "likes" different styles of music. Try to come up with a list of behaviors that you think indicate whether your dog is having a positive, negative, or neutral response to the music.

Take It Outside!

Test your pooch's other senses, like its sense of smell. Set three cups upside down on the grass with just one of them having a smear of peanut butter inside. Call your dog over and see which cup gets your dog's attention first. Did your dog find the cup that smells like peanut butter on the first try? Go to www.dragonflytv.org, "**Be On DFTV**," and tell us what happened!

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About the DFTV Investigations
(for the educator)

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Educator Page

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.

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DragonflyTV Themes

Show # & Theme: Featured Investigations

Season 1

101 Investigate!: Kayaking, Martial Arts, Robot Contest
102 Wheels: Motocross, Skateboards
103 Animal Behavior: Otters, Dog Behavior
104 Water: Surfing, Dolphins, Water Slides
105 Rocks: Kayaking, Rock Climbing
106 Flight: Model Airplanes, Paragliding
107 Weather: F-Scale, Tornado Model, Forecasting
108 Technology: Robot Contest, Solar Car
109 Plants: Weevils, Kelp Forest, Autumn Leaves
110 Air: Sailing, Hot Air Balloon
111 Human Behavior: Perception, Roller Coasters
112 Space: Coconauts, Moon Craters
113 Human Body: Martial Arts, Taste Test

Season 2

201 Investigate!: Ice Skating, Kart Racing, Baby Animals
202 Structures: Snow Shelter, Straw House
203 Sports Science: Waterskiing, Soccer Ball Kick, Circus Stunts
204 Spinning: Free-Ride Skiing, Yo-Yos
205 Propulsion: Model Rockets, Kart Racing
206 Human Body: Sunscreen, Ice Skating, Exercise & Memory
207 Sound: Hip-Hop Dancing, Extreme Sounds, Prairie Dog Calls
208 Technology: GPS vs Compass, Robot War Contest
209 Ecosystems: Salmon Spawning, Turtle Babies, Sand Dunes
210 Underwater: Coral Reef, Manatees, Fish Population
211 Mammals: Baby Animals, Sea Lions, Pet Handedness
212 Earth Systems: Mountain Bike, Sink Holes
213 Human Body: Crocodiles, Snakes, Worm Farm

Visit Great Plains National at www.gpn.unl.edu or call 1-800-228-4630 to order videotapes of DragonflyTV. Each program includes authentic investigations, supported by Teacher's Guides that will get your students doing their own inquiries. Each program is described in detail at www.dragonflytv.org.

Season 3

301 Investigate!: Whitewater Rafting, Hovercraft, Horse Ears
302 Sports Science: Ski Jumping, Hockey
303 Wind: Kites, Wind Tunnel
304 Forensics: Birthday Mystery, Coral Castle
305 Engineering: Hovercraft, Milk Carton Derby
306 Earth Systems: Whitewater Rafting Special, River Dynamics
307 Animal Behavior: African Penguins, Horse Ears
308 Speed: Speedskating, Mountain Boarding
309 Health: Pet Therapy, Glo Germ, Breakfast Science
310 Habitats: Caves, Lizards, Malformed Frogs
311 Games: Basketball, Midway Games, Tug o' War
312 Space: Exploring Mars, Microgravity, Space Probes
313 Dogs: Sled Dogs, Colorblind Dogs

For information about any investigation, visit www.dragonflytv.org and click on "the show."

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