Pull-out Section

DragonflyTV Educator's Guide

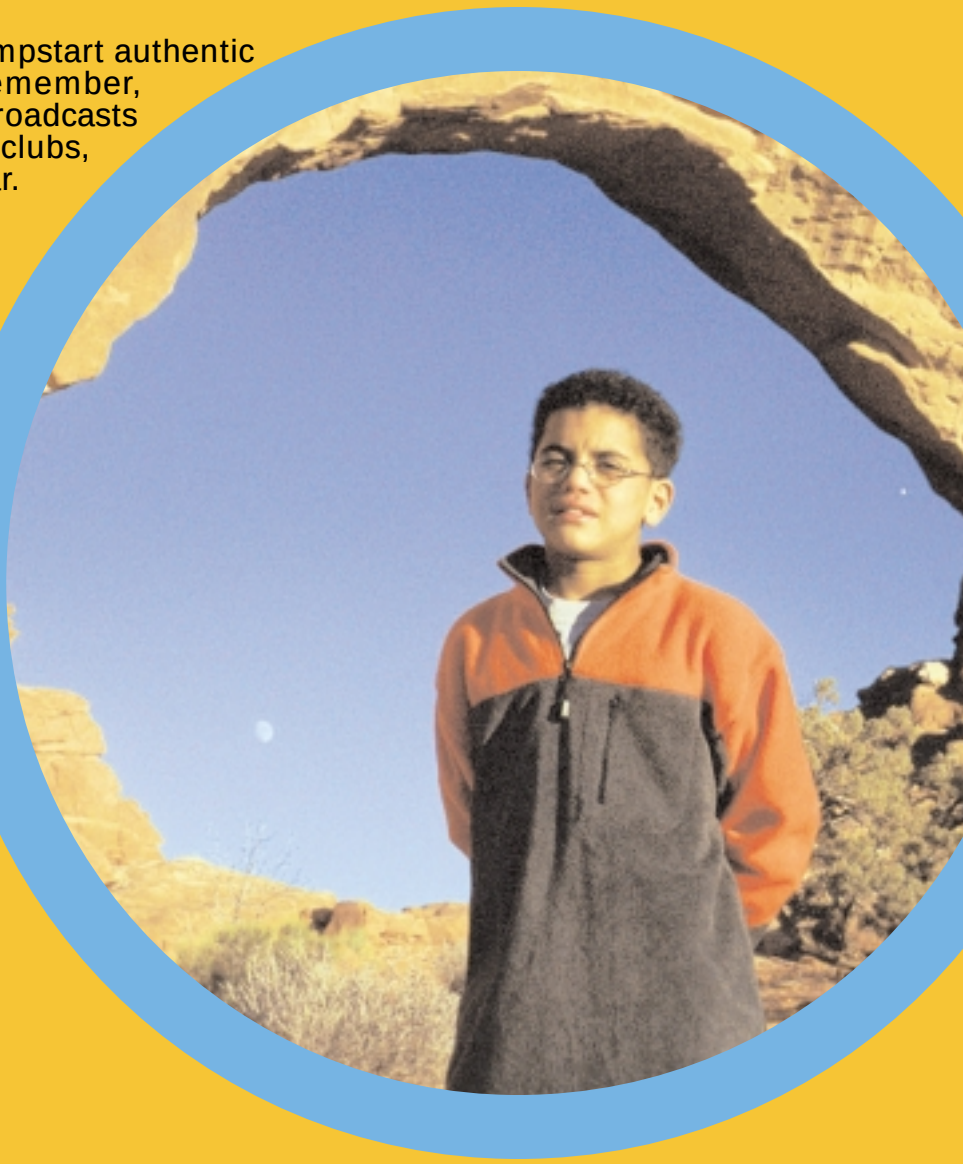
For use in classrooms, afterschool clubs, youth groups, museums, zoos, and more.

Are your students ready to find the real science behind their favorite activities? That's what's unique about DragonflyTV, PBS' newest science series: real kids, not actors, are the stars. That means all of your students have the opportunity to share their curiosity, creativity, and science with a national television audience.

Use these Educator's Guides to jumpstart authentic inquiry in your classroom. And remember, educators can tape DragonflyTV broadcasts and use the videos in classrooms, clubs, and other institutions for a full year. Plus, videotapes are also available from GPN. (See the back page of this guide for details.)

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*.



SEASON TWO, ISSUE THREE

210 / Underwater: ROVs

211 / Mammals: Pet Handedness

212 / Planet Earth: Mountain Bike

213 / Creepy Crawlies: Snakes

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HOW TO USE THIS GUIDE

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).

If you have a videotape of the episodes, play it to see how the DFTV scientists 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!"

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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210 / UNDERWATER: How healthy are two coral reefs?

What's Up?

We're Chris, Cory, Nikki, and Bruce, and we want to get to the bottom of things. Especially the ocean! We built an ROV, which stands for Remotely Operated Vehicle, and we use it to explore underwater. We control it from a boat on the surface, while it dives deep into the sea. It has an onboard video camera that sends pictures back to us on the boat. We live near the coast of Florida, and we were curious about how healthy the coral reefs are. Our question: How can we use our ROVs to determine the health of the coral reef?

HOW WOULD YOU INVESTIGATE THIS QUESTION?
So if the ROV is going to do the diving for you, you still have to think about what you are going to look for. How can you tell a healthy coral from a diseased one just by looking? A reef can extend for miles, so you'll have to decide how much of the reef to look at. Think about other factors, too, such as how close the reef is to sources of pollution, or whether the reef gets a lot of boat traffic. Describe your investigation in your notebook, and discuss it with your teacher, or go to www.dragonflytv.org to learn what Chris, Cory, Nikki, and Bruce discovered.

Do It, Get To It

You might not live near the ocean, but think about the challenges of exploring a place that's not easy for people to get to. How would you explore what's going on in a hard-to-reach place like, say, under the couch, or behind the book shelf? No fair moving the furniture! Find a difficult place to reach or see into, and invent a way to observe or measure what's going on there. Your invention might be a real device that works, or it can be an imaginary device. Either way, be as thorough as you can in describing how your device works, and what the difficulties are that you have to overcome.

Take It Outside!

Ask permission from your school principal to plant a butterfly garden on school property, or ask your parents if you can plant one at home. Research the kinds of wildflowers and plants that attract butterflies, and that will grow in your climate. If you can, plant two gardens, each with its own kinds of flowers. Watch each garden daily to see which one butterflies visit first. What other kinds of insects are attracted to these plants? Do other animals use the garden as their home?

Teacher Page

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211 / MAMMALS: Is my cat right- or left-pawed?

What's Up?

We're Brittany, Molly, and Cleo, and we're crazy about cats. We all know that people are either right, or left-handed, but we wondered if that goes for cats, too. Do they have their own "paw preference?" To find out, we recruited Cleo's cats Nudge, Cle-Cle, and Brooklyn, and put them through three tests. Did any of these cats turn out to be true "south paws"?

HOW WOULD YOU INVESTIGATE THIS QUESTION?
What types of tests would you create to indicate "handedness?" What do cats use their paws to do? Think about whether the age of the cat is a factor. Also decide how many tests it will take to get a result you are confident in. Should you repeat the tests on different days, to see if you cat is consistent? Describe your investigation in your notebook, and discuss it with your teacher, or go to www.dragonflytv.org to learn what Brittany, Molly and Cleo discovered.

Do It, Get To It

Does your classroom have a pet goldfish? You can do a simple investigation with your own class pet! Here's how. Watch your fish closely, and count the number of times you see its gills beat in one minute (you might watch its mouth open and close instead). Now, encourage the goldfish to "exercise" by gently swirling a clean straw or stick in the water. You don't have to scare the fish, just get it to swim around for a whole minute. Leave the fish alone again, and count the gill beats now. What did you notice? If the gill beats increased, then how many minutes have to go by before they slow down to the resting rate?

Take It Outside!

Test your dog's problem-solving abilities with some simple tests. Record how much time it takes your pet to complete these four tests: 1) crawl out from under a blanket; 2) find a treat under a blanket; 3) find a treat under a cup; 4) find a treat under a low shelf. When you hide the treat, let your dog see you do it. Use a stop watch to measure the time until the dog gets the treat in its mouth. Get your friend's dog involved, too, and do a comparison. Do big dogs perform better than little dogs in some tests? How does the shape of the dog's snout affect its ability to complete the tests? Does it matter what time of day you try the test?

Student Page

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212 / PLANET EARTH: How did these trails form?

What's Up?

We're Ari and JR, and we bike on some of the most wild rock formations in the country. It's all sandstone here in Moab, Utah, but the terrain really varies: sometimes it's rolling hills, and sometimes it's ledges and drop-offs. No two trails are quite the same, which really keeps us on our toes (or our pedals)! For our DragonflyTV investigation, we wondered why, if everything is made of sandstone, are these trails all so different? We thought we could get to the bottom of this puzzle by hopping back on our bikes and collecting data. How do you think we did it, and what did we find out?

HOW WOULD YOU INVESTIGATE THIS QUESTION?
Mountain biking takes your full concentration, so how can you collect data while you ride? What sorts of things would you look or listen for? Think about what tools you have available, such as your bike trip odometer. Also think about things you do while biking, like braking, pedaling, and changing gears. Those things might reveal something about the geology, too. Describe your investigation ideas in your notebook, and discuss it with your teacher, or go to www.dragonflytv.org to learn what Ari and JR discovered.

Do It, Get To It

In order to navigate Moab, your bike tires have to "grip" the rock. That requires friction. Do your own study of how well the rubber meets the road right in class. Get a board that can be used as a shelf, about 4 feet long and 1 foot wide (1.3 meters by 30 cm). Then get a rectangular rubber pencil eraser, or even a hockey puck. Set the puck on one end of the board, and slowly lift that end up, making a ramp. Keep lifting, until the puck first starts to slide. Measure the height or the angle of the ramp. Repeat the procedure, changing the surface of the ramp. Cover the ramp's surface with different materials such as sand paper or aluminum foil. How high do you tilt the ramp before the puck slides now? Find the surfaces that give the best, and worst, grip.

Take It Outside!

Investigate how your legs and your bike work together. You'll need a gear bike equipped with a speedometer, and a flat stretch of road or playground. Mark off a distance of about 50 meters (you can estimate it by walking 50 long paces.) Shift your bike into a low gear, one where it feels easy to pedal. Start at one end of the 50 meters, pedal up to a maximum speed of 8 miles per hour (about 13 km/h). Count the number of times your pedals went around during the 50 meters. Shift into a middle gear, and start again, counting the turns of your pedals once more. Finally, shift to a high gear and repeat the procedure on last time. What do you notice? When is it better to be in a low gear, compared to a high gear? What if you tried the tests at 12 mph (19 km/h)? What if you were pedaling up hill?

Teacher Page

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213 / CREEPY CRAWLIES: What do snakes crave?

What's Up?

We're LeighAnne and Carmen, and we think snakes make perfect pets. Snakes have a super-strong sense of smell, and they actually sniff with their tongues. If they smell anything yummy on us, they'll think we're lunch! That's why we wash our hands before and after handling our pets. This got us thinking: can you tell what food a snake craves by the way it flicks its tongue? We tested the sense of smell of some of the snakes at the pet store where LeighAnne works. How do you think the snakes responded?

HOW WOULD YOU INVESTIGATE THIS QUESTION?
Think about the sorts of prey snakes hunt down. How would you make sure the snakes were detecting the smell of prey, instead of just seeing it? Would a snake be interested in human food? What would you look for to decide whether the snake smells something it wants to eat? Describe your investigation in your notebook, and discuss it with your teacher, or go to www.dragonflytv.org to learn what LeighAnne and Carmen discovered.

Do It, Get To It

How quickly do smells travel? Try a little experiment right in your classroom. Have your classmates spread out through the whole room, then have them cover their eyes and ears while you keep your eyes open. Have your teacher pour some perfume onto a piece of paper towel in one corner of the room. Begin timing with a stopwatch or clock, and have your friends raise their hands when they first smell the perfume. Make a kind of map that shows how the perfume scent spread across the room. What does the map tell you about how smells travel? Do the windows, doors, and vents in the room have anything to do with it?

Take It Outside!

Many insects are guided by their sense of smell. Set up an experiment to see what types of smells attract insects. Choose four things that have a strong smell, such as almond flavoring, vinegar, maple syrup, and pear juice. Pour a small amount of each onto its own paper towel. Set each towel outside on the grass (put a rock on it so it won't blow away!), and wait. Check on each towel every 15 minutes for an hour, or longer if you can. Write down what you see: type of bug, number of bugs, etc. Do the bugs prefer the same smells you do? Why are insects attracted to certain flowers?

Student Page

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About the DFTV Investigations (for the educator)

ROVs

NATIONAL SCIENCE EDUCATION STANDARD

Science in Personal and Social Perspectives Grades K–4:
Changes in Environments
Science and Technology Grades 5–8:
Understandings about Science and Technology

The team compared the health of two parts of the reef: White Banks, which sees a lot of boat and human traffic, and Dino's Rock, which is not marked on most maps. At each location, they laid down a 50 foot (15 m) rope, with floating buoys every 5 feet (1.5 m). The rope and buoys provided a visual reference while they navigated the ROV from the boat. When they played back the videotape, they noticed more signs of damage and disease at White Banks compared to Dino's Rock. This could relate to the amount of human traffic at the sites, but other factors could also account for the damage.

Even if your students can't assemble their own ROV, it's a good exercise to get them thinking about what characteristics such a vehicle ought to have. Imagine some remote environments and have your students design "vehicles" to explore them. For more details about this investigation, visit www.dragonflytv.org.

PET HANDEDNESS

NATIONAL SCIENCE EDUCATION STANDARD

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

The girls chose three behaviors that required their cats to use their paws: 1) reaching for a treat in a clear tube; 2) batting at a dangly cat toy; 3) swiping at a dab of peanut butter on its nose. When they got the cats to cooperate, they found that a cat might use its right paw 9 out of 10 times to reach for the treat, but then use its left paw 7 out of 10 times to clean the peanut butter off its nose. They learned that it's difficult to make a strong conclusion about whether their cats were right- or left-pawed, without repeating the tests many times, and considering other factors.

Household and classroom pets make excellent subjects for scientific study. Animal studies also raise many issues about designing science investigations and paying attention to different factors. Caution your students about jumping to conclusions too quickly. For more details about this investigation, visit www.dragonflytv.org.

MOUNTAIN BIKES

NATIONAL SCIENCE EDUCATION STANDARD

Earth and Space Science Grades K–4:
Changes in Earth and Sky
Earth and Space Science Grades K–4:
Earth's History

The DFTV investigators rode their bikes along a one-mile (1.6 km) stretch of the Slick Rock Trail, and the Porcupine Rim Trail. They carried clip-on voice recorders and narrated their journeys, noting when they caught air, encountered debris, changed gears, and had to get off their bikes. When they played back their recordings, they found there were more dropoffs and rough trail debris on the Porcupine Rim trail, while Slick Rock was more hilly, with only some sand debris in the trail and fewer dropoffs. They concluded that Slick Rock's sandstone came from wind-borne sands, and Porcupine Rim's sandstone came from water-borne rocks, sand, and debris.

Encourage your students to think about how long it takes some geologic processes to occur. Also point out how a process like erosion can both build up new formations, and wear them down. For more details about this investigation, visit www.dragonflytv.org

SNAKES

NATIONAL SCIENCE EDUCATION STANDARD

Earth Science Grades K–4:
Organisms and Environments
Physical Science Grades 5–8:
Regulation and Behavior

The DFTV Scientists prepared three animal scents by putting minnows, a frog, and a dead mouse in separate jars of water. They also had a control jar of plain water. They dipped a cotton swab into each scent, and placed the swab into the snakes cage, counting the snakes tongue flicks for one minute. They found that the snakes flicked their tongues most often for the scent of their natural prey!

Discuss the difficulties in doing animal behavior investigations. Many factors must be considered in the snake study: time of day; date of last feeding. For more details about this investigation, visit www.dragonflytv.org.

Learn more about developing DragonflyTV investigations in your classroom, and earn college credit from Miami University of Ohio. Visit *www.dragonflyworkshops.org* for details.

Teacher Page

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DragonflyTV Season Two Themes

201 - Investigate
202 - Structures
203 - Sports Science
204 - Spinning
205 - Propulsion
206 - Human Body
207 - Sound
208 - Technology
209 - Ecosystems
210 - Underwater
211 - Mammals
212 - Planet Earth
213 - Creepy Crawlies

DragonflyTV Season One Themes

101 - Investigate!
102 - Wheels
103 - Animal Behavior
104 - Water
105 - Rocks
106 - Flight
107 - Weather
108 - Technology
109 - Plants
110 - Air
111 - Human Behavior
112 - Space
113 - Human Body

DragonflyTV's Premiere Season Videos Now Available!

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*, in the "About DragonflyTV" section.

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