SEASON FOUR, ISSUE TWO

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# DragonflyTV Educator's Guide

## Pull out this booklet and use it to ignite inquiry in your classroom or club!

406/Canines: Wolves

408/Earth Systems: Rivers

407/Science at Play: Double Dutch

409/At the Zoo: Tigers and Otters

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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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# 406 / Canines: Wolves

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Student Page

## What's Up?

We're Zachary and Gerit, and we're NOT afraid of the big, bad wolf! In fact, we love pack animals so much that we volunteer at our local wildlife science center. By helping out with chores and feedings, we've learned that wolves have strong family bonds. Although all pack members have special and important roles, each pack has an alpha member who acts as the leader. As we spent more time with the science center's wolves, we started wondering: **Which wolf is the pack's alpha?**

## How Would You Answer This Question?

To figure out which wolf is the leader of the pack, make yourself familiar with how the creatures interact during their daily activities. For example, how do they play together? What are their grooming and sleeping rituals? Who cares for the pups, and what happens at mealtime? Write your ideas in your notebook and discuss them with your classmates and your teacher. Then watch the video segment, or go to pbskids.org/dragonflytv to see how Gerit and Zachary determined who was "top dog."

## Do It, Get To It

Use your classroom aquarium to study fish schooling behavior. Stock your aquarium with several kinds of fish, such as neon tetras, angels, or guppies. Observe which kind of fish tend to stay in schools and which swim alone. Also study which part of the tank the fish swim in. Do the fish swim around the entire tank, or do they tend to hang out at the bottom? Come up with a possible explanation for the behaviors you see.

## Take It Outside!

Look for groups of animals at your zoo and spend some time observing their behaviors. Especially watch for social animals, like monkeys or other primates, large cats, or even birds. Does it appear that one animal in the group is "the boss?" What kinds of things do you see that make you think so? Look and listen for behaviors like growls or snarls or chasing.



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# 407 / Science at Play: Double Dutch

## Student Page

## What's Up?

We're Francesca, Precious, and Marnicka, and we jump for joy whenever anyone mentions Double Dutch. Double Dutch jump roping dates back to the 1600s, and uses two ropes instead of one. Special moves like the "washing machine," the "mamba," and "pop-ups" make Double Dutch cool, and competitions keep things interesting! One of the most important things in Double Dutch is to sense the rope's beat. Although you can both hear and see the ropes, it's easy to get distracted by the music, lights, or other kids at a competition. This got us thinking: **Does hearing or seeing the ropes have a bigger effect on our performance, or are both senses equally important?**

## How Would You Investigate This Question?

To answer the girls' question, do a little digging on Double Dutch. What kind of ropes do jumpers use? How do they turn them, and how fast do they go? Once you're familiar with the mechanics of Double Dutch, think about sight and sound. Which sense seems more important to keeping the beat, and why? Which sense provides a better filter for distractions? Write your ideas in your notebook and discuss them with your classmates and your teacher. Then watch the video segment, or go to pbskids.org/dragonflytv to check out how the girls sorted out their senses.

## Do It, Get To It

Try an investigation of the jump rope itself. Get a long piece of rope, say about 16 feet (almost 5 meters), and stand 12 feet away from a friend. Twirl the rope between you, as slowly as possible without letting the rope droop. Count the number of times the rope slaps the floor in a minute. Now step closer, about 10 feet apart, and twirl again, as slowly as possible. Count the slaps, then move still closer. Does the distance between the twirlers affect the rhythm of the rope?

## Take It Outside!

Instead of jumping rope, do an investigation into another kind of jump – the standing broad jump. Make a "start line" on the playground with chalk. Gather a bunch of friends, and one at a time have them stand with their toes at the chalk line and jump as far as they can. Make a mark where their toes land. Measure the distance from the start line to the jump mark. Do taller jumpers jump farther than shorter ones? What other characteristics might explain why some people jump farther than others?



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# 408 / Earth Systems: Rivers

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Student Page

## What's Up?

We're Margaret and Elizabeth, and we're hitting the links…at the Science Museum of Minnesota! This science museum actually has a mini-golf course that was designed so kids can learn about rivers while putting. As we played on this specialized course, our minds wandered from holes-in-one to how real rivers work. Our DragonflyTV question: **What do rivers do to the land?**

## How Would You Investigate This Question?

To dive into this river investigation, start brainstorming what you already know about rivers, or think about a river in your community. How are rivers formed, and how do they differ from other bodies of water, like a lake or ocean? How do they change over time or with the season? What are the "contents" of a typical river? Once you've gathered information about rivers, think about what river features would really affect the land, what types of impact these features might cause, and why. Write your ideas in your notebook and discuss them with your classmates and your teacher. Then watch the video segment, or go to pbskids.org/dragonflytv to learn how Margaret and Elizabeth's day of golf turned into a load of learning about rivers.

## Do It, Get To It

Collect some sand and pebbles, and do a sediment investigation. Make sure you have pebbles and sand grains of various shapes and sizes. Mix them all up. Get a clear jar or bucket with water in it. Pour in the mixture of sand and pebbles. Watch them settle to the bottom. Which grain size settles farthest down? Why? Stir up the sand and pebbles with a stick and let them settle again. Do the same size grains always settle farthest down?

## Take It Outside!

Study how water meanders on your driveway. This works best if your driveway isn't perfectly level but has a slope to it. Stand at the top of the driveway, then slo-o-o-wly pour water from a small bucket onto the driveway, letting it run down the slope. Watch the path the water takes. The water won't carve a path in the driveway, of course, but it will "choose" a path to follow. Watch the leading edge of the water as it runs into obstacles (cracks, dips, or pebbles) and see how it moves left or right to get past the obstacles. Draw a picture of the path the water leaves behind.



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# 409 / At the Zoo: Tigers and Otters

## Student Page

## What's Up?

Hi! Chelsea and Camille here, checking out the fur, feathers, and fun at our local zoo. We love animals, and we like to make them feel as happy as possible. One way to accomplish this is through "zoo enrichment." Zoo enrichment involves giving animals interesting objects and making their environments seem like home. Good enrichment stimulates the animals to use their natural skills and behaviors and keeps them from getting bored. So when we decided to design an enrichment for tigers and otters, we wondered: **How do you decide if an enrichment works?**

## How Would You Investigate This Question?

To create a comfortable and fun environment for tigers and otters, you'll need to know what animals enjoy in their natural habitat. How do they hunt and play? What are their favorite snacks, and how do they get their paws on them? Where and when do they sleep or rest? What items or activities are not in these animals' native environment, and could actually be harmful to them? When your research is complete, get creative. Match the animals' natural preferences to items, surroundings, or "games" you think they might enjoy. Write your ideas in your notebook and discuss them with your classmates and your teacher. Then watch the video segment, or go to pbskids.org/dragonflytv to learn how Chelsea and Camille "went wild" and built an effective, safe, and fun zoo enrichment.

## Do It, Get To It

Write a letter to your local zoo asking their help in selecting an enrichment toy for an animal at that zoo. Have the zookeeper tell you what kinds of things they would allow you to put into a certain animal's exhibit. For example, you might be permitted to use wood but not plastic. Have several classmates come up with different ideas, then submit them to your zookeeper to be judged. If possible, get permission to actually put the winning project in the animal exhibit.

## Take It Outside!

You've seen clever toys in the store for your dog or cat. Why not develop your own? Think of a toy your pet loves most. Come up with three ways to modify the toy. For example, if your cat loves to chase string, is there a color or texture of string that your cat prefers? Develop a toy, do some tests with your pet, and examine your results. Maybe you'll come up with a toy that will keep your pet occupied for hours!



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# About the DFTV Investigations
(for the educator)

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Educator Page

## WOLVES

### NATIONAL SCIENCE EDUCATION STANDARD

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

The boys received permission to throw chunks of meat into the wolf pen, then observed how the wolves competed for the meat. The pen contained three females and three males, including a young female and male. The boys threw out several pieces of meat, one at a time, looking for behaviors or gestures such as fighting, growling, chasing, or tail position. They concluded that the leader, or "alpha" in this pack was actually an older female wolf. It's not always the largest or oldest wolf, nor always a male who is the top wolf.

Discuss with students how animals compete in their social groups for their status. Also point out how pets, especially dogs, live in a kind of pack… with their human owners. A dog's ear position can tell a lot about its status in the family.

## DOUBLE DUTCH

### NATIONAL SCIENCE EDUCATION STANDARD

**Life Science Grades K–4:**
*The Characteristics of Organisms*
**History and Nature of Science Grades 5–8:**
*Nature of Science*

The girls used a popular technology 'a personal mp3 player' to provide a musical distraction for the jumpers. They played a highly rhythmic piece of music in the jumpers headphones, which played at a beat which did not match the rhythm of the jump rope. They conducted a similar test using a strobe light as a visual distraction. They found that for some jumpers, auditory distractions were harder to ignore than visual ones. Still, their results showed that they couldn't make a general conclusion. They learned that each jumper on their team handles distractions differently.

Discuss with students the difficulties in controlling variables when conducting human performance investigations. In this case, how can you be sure the jumpers are trying equally hard in each circumstance?

## RIVERS

### NATIONAL SCIENCE EDUCATION STANDARD

**Earth and Space Science Grades K–4:**
*Changes in Earth and Sky*
**Physical Science Grades 5–8:**
*Structure of the Earth System*

The girls spent time at the museum exhibit on rivers and found three things there that made them want to learn more. They left the museum and headed for a local river to learn about a) how rivers meander; b) how sediment layers develop in water; c) how humans change river flow with dams. For example, they canoed down a meandering river, noticing how the water deposits rocks and pebbles on the inside of each curve.

On your next field trip to a science museum or nature center, ask your students to consider the exhibits more carefully. Look for some exhibits that encourage them to go into the field and investigate things for themselves.

## TIGERS AND OTTERS

### NATIONAL SCIENCE EDUCATION STANDARD

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

The girls received permission from their local zoo to develop play objects for two animals: river otters and tigers. For the otters, they make a six-sided hoop out of bamboo and inserted food into holes drilled in the hexagon. For the tigers, the made a papier-mache warthog and again put meat inside to make it attractive to the animals. The zookeepers put each plaything into the appropriate exhibit, while the girls observed the animals' responses. Each object seemed to occupy the animal's attention for several minutes, bringing out natural behaviors and keeping the animals active.

Discuss with students the challenges of keeping zoo animals physically active and mentally challenged.



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

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## Here's how the DragonflyTV investigations of Season 4 align with the National Science Education Standards (NSES), Grades 5–8.

| Investigation | Show # | Subject Area | NSES |
|---|---|---|---|
| Fencing | 401 | Physical Science | Transfer of energy |
| Martial Arts | 401 | Life Science | Structure and function in living systems |
| Ice Bike | 402 | Technology | Understandings about science and technology |
| Robot War | 402 | Technology | Understandings about science and technology |
| Rabbits | 403 | Life Science | Regulation and behavior |
| Sea Lions | 403 | Life Science | Regulation and behavior |
| Curling | 404 | Physical Science | Motions and forces |
| Hovercraft | 404 | Technology | Understandings about science and technology |
| Volleyball | 405 | Nature of Science | Nature of science |
| Extreme Sounds | 405 | Physical Science | Transfer of energy |
| Wolves | 406 | Life Science | Populations and ecosystems |
| Sled Dogs | 406 | Life Science | Regulation and behavior |
| Jump Rope | 407 | Life Science | Regulation and behavior |
| Perception | 407 | Life Science | Regulation and behavior |
| Rivers | 408 | Earth Science | Earth's history |
| Sand Dunes | 408 | Earth Science | Structure of the earth system |
| Tigers and Otters | 409 | Life Science | Regulation and behavior |
| Prairie Dog Calls | 409 | Life Science | Regulation and behavior |
| Lip Gloss | 410 | Physical Science | Properties of matter |
| Forensics | 410 | Physical Science | Properties of matter |
| Diving | 411 | Technology | Understandings about science and technology |
| Ski Jumping | 411 | Physical Science | Motions and forces |
| Cheetahs | 412 | Life Science | Populations and ecosystems |
| Baby Animals | 412 | Life Science | Reproduction and heredity |
| Trebuchets | 413 | Technology | Understandings about science and technology |
| Kart Racing | 413 | Technology | Understandings about science and technology |

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

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