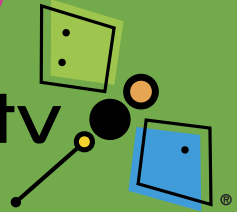


# SciGirls<sup>SM</sup>

from dragonfly tv



**ACTIVITY GUIDE**

# Table of Contents

- 1) Welcome
- 3) What is Science Inquiry?
- 4) The SciGirls Skills: Seven Parts of a Full Science Inquiry
- 7) Using the SciGirls Resources
- 9) DragonflyTV + Girls = SciGirls
- 12) Wild Water!
- 16) Wacky Weather!
- 22) Rollin' Robots!
- 26) Workin' Out!
- 30) Let's Get Loud!
- 34) Play with Sand!
- 38) Right or Left?
- 42) Ridin' On Air!
- 48) Slap Shot!
- 52) Hip-Hop Frogs!
- 56) Doggone It!
- 60) Anchors Aweigh!
- 64) Lift Off!
- 68) High Flyers!
- 72) The SciGirls Skills: Seven Parts of Inquiry Worksheet
- 73) Scientist Profile Worksheet
- 74) Appendix A: Graphing Examples
- 81) Scientist Profile Index



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# Welcome to DragonflyTV SciGirls!

Before you begin sharing these hands-on, girl-focused inquiry materials with your group, take a minute to learn a little about our program.

DragonflyTV is an award-winning multi-media science education program combining television, community outreach, the Web, and fun. Produced by Twin Cities Public Television (**tpt**), DragonflyTV engages tens of millions of children, parents and teachers in accessible, hands-on science activities. DragonflyTV is designed to appeal to children from diverse ethnic, socio-economic, and educational backgrounds, especially underserved girls. By modeling and celebrating girls' science capabilities, DragonflyTV has always shown that if girls can dream it, they can do it.

DragonflyTV's first step has been to attract children with a TV show unlike anything they've seen before. The DragonflyTV television program is broadcast nationwide on PBS stations. The show presents kids doing their own real-life science investigations in a style of television that captures the attention of today's MTV and video game generation, filled with pop music, high energy, and fun. And DragonflyTV also extends far beyond the television screen, offering a variety of standards-based video, print, and electronic learning tools for use in schools, homes, community organizations, or any place girls gather to explore, create, and discover.



## Science for Girls, by Girls!

Throughout its four seasons, DragonflyTV has become a unique showcase for girls in science. Tokenism is out and inclusiveness is in at DragonflyTV: girls are featured throughout our broadcasts, outreach materials, and Web site ([www.dragonflytv.org](http://www.dragonflytv.org)). In fact, over half of the DragonflyTV kid scientists are girls.

Because of our commitment to increasing girls' science literacy and interest, DragonflyTV created SciGirls. DragonflyTV SciGirls is a collaborative program funded by the National Science Foundation that empowers PBS outreach professionals to partner with local youth organizations, educators and parents to deliver hands-on science encouragement and career guidance to girls in their communities. SciGirls is based on existing standards-based DragonflyTV outreach resources, which teach the process of full inquiry.

SciGirls will empower your girls to ask questions, communicate, and encourage one another. This project supports collaborative, tactile learning, setting girls on the "science fast track" toward improved critical thinking skills, enhanced problem solving abilities, and ultimately, career success. We at DragonflyTV thank both the National Science Foundation and you for sharing the SciGirls program with your community.



# What is Science Inquiry?

Inquiry is a way of learning about the world around you. It's how scientists make discoveries, and how you and your girls can investigate your favorite activities. Inquiry is a process. It begins with **choosing** an interesting phenomena or activity and asking **questions**. It continues with **planning** what kind of experiment to do, grabbing materials and **predicting** what will happen. Next comes the heart of inquiry, **experimenting** or **observing**, which is where scientists gather and write down observations or data. Then it's time to **interpret** those results. Finally, there's the best part of all: **communicating** what you've learned and sharing your experience with others. There are other skills too, like building, graphing, writing, calculating, and drawing. But regardless of what skills your girls bring to inquiry, there's plenty of interesting activity for everyone.

A full science inquiry will require girls to use all of the "SciGirls Skills" outlined above. However, sometimes it's fun to choose an activity that highlights only one or two "SciGirls Skills." As the girls progressively improve their abilities and gain confidence, they'll ultimately learn to combine all seven categories for larger, more sophisticated investigations.



# SciGirls Skills: Seven Parts of a Full Science Inquiry

We've broken down the inquiry process into seven easy steps. These steps, which are also highlighted on the "SciGirls Skills" worksheet included later in this resource manual, can be listed in this way:

- 1) Choosing
- 2) Questioning
- 3) Planning
- 4) Predicting
- 5) Experimenting/Observing
- 6) Interpreting
- 7) Communicating

Here's a little detail on these vital inquiry skills, or "SciGirls Skills:"

## 1 Choosing:

This is simply selecting the general subject of your inquiry. But it's an important first step. It is clear that girls engage themselves more fully in a science investigation when the topic is meaningful to them. Do your girls like to skateboard or sing, bike or bake? Encourage them to ask science questions about these activities.



## 2

### Questioning:

This is a statement of the research question within the chosen topic. Formulating a sound question is essential to a successful inquiry. Avoid questions that have yes/no answers. Coach girls to write questions that ask about relationships between things.

For example, consider these two questions on the same topic (rolling wheels):

- 1) "Which rolls faster down a ramp... a large diameter wheel, or small diameter wheel?"
- 2) "How does the diameter of a wheel relate to how quickly it rolls down a ramp?"

The first question doesn't really require a full inquiry project to find an answer; just grab a large and small wheel, roll them down a ramp, and you have your answer. While it's okay to investigate extremes (like "faster") scientists usually take the second approach. Scientists investigate how the speed *changes* when you change the wheels.

To form a strong research question, consider these two generic examples: "If I make a change in X, what will happen to Y?" and "How does this property in situation X compare to the same property in situation Y?"

## 3

### Planning:

Your girls must carefully think about what sort of equipment and materials they need to investigate the research question. Measuring devices, stopwatches, magnifiers, and other equipment all have a place in a full inquiry. So do recording materials, like computers or plain old pencil and paper! A sound scientific inquiry is characterized by a careful procedure and design. Hallmarks of a good design include: a) multiple trials; b) identification of variables, and control of those variables; and c) clear choice of which observations or measurements to make. Also, the procedure must directly address the research question.





4

### Predicting:

The next step is thinking about your question, and making an educated guess about the outcome to this question. Remind the girls that there isn't necessarily a "wrong" prediction. What do they think will happen? Why? Take time to discuss their ideas before beginning the experiment. And it's OK if they disagree; that makes the inquiry even more interesting!

5

### Experimenting/Observing:

Now it's time to do the experiment according to their plan, and to gather the outcomes. As they implement their agreed-upon process, encourage girls to do what might seem obvious to you: **WRITE THINGS DOWN!** Use a notebook, a computer, or whatever helps the girls collect their data. This is easily overlooked by young investigators, who try to rely on memory. Encourage your girls to make a SciGirls journal, where they can write down everything they do and discover.

6

### Interpreting:

This usually means tabulating (literally, putting findings into a table format), averaging (calculating an average of a set of numeric data), and graphing. This is a chance to bring out creative skills, because there are many ways to display data. Stickers, colored construction paper – whatever shows off the data and helps explain it. See examples of graphing techniques in Appendix A. Interpretation eventually leads to a conclusion. This is a statement that directly addresses the original question, and it should follow from the results of the inquiry. Remind girls that it is acceptable for results to be unclear or ambiguous. And it's OK – even recommended – to raise a brand new question. When this happens, it's just an invitation to further research!

7

### Communicating:

The final step is sharing their outcomes with others. There are many ways to tell a science story. Girls can write about their investigation, including plenty of interesting data. Or they can create a neat and eye-catching display that showcases their work. Finally, they can talk it out. Public speaking is scary for a lot of girls, but coach them on presentation skills, and have them rehearse in front of friends, family or even a mirror or video camera! Whatever way your girls choose to communicate their findings, encourage them to include information about all the stages of their investigation, from initial planning to analysis.





# Using the SciGirls Resources

## I. Activities

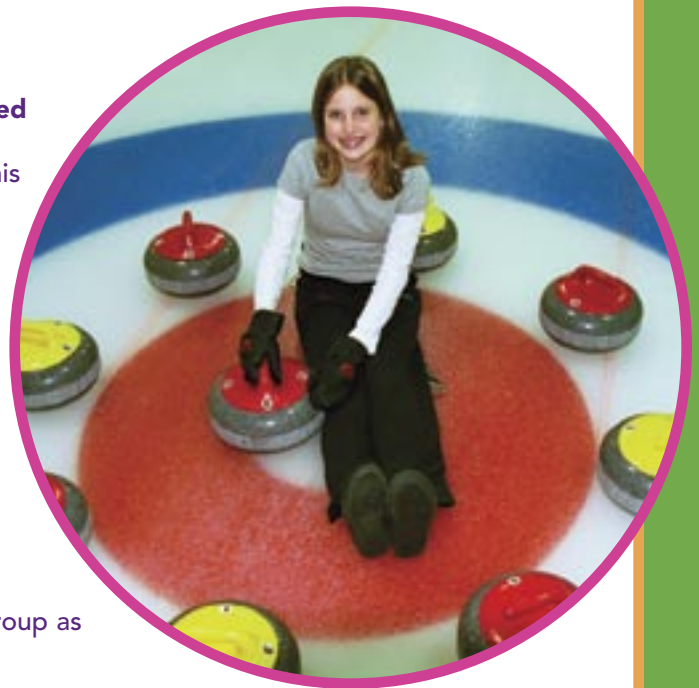
Each of the activities feature two parts:

**The first is an Icebreaker activity.** This is a quick and simple hands-on experiment. It will engage and even entertain your girls. Icebreakers in this manual are not full inquiries themselves. Instead, they're just short activities that can be used to highlight one of the essential skills of inquiry (or, as we call them, SciGirl Skills).

**The second part of each activity is a description of a full science inquiry featured on DragonflyTV.** This investigation is included in the video library accompanying this Activity Guide. The full inquiry is something you may wish to do with your students, or it can serve as a model for a related experiment you and your girls develop. The video segments are clearly numbered in the activity description, so you can easily find them on the accompanying videotapes. Each video segment runs a maximum of seven minutes.

Here's one step-by-step approach to using these materials. We've chosen a dog intelligence investigation as an example. As with all SciGirls materials, tailor it to your group as you see fit:

- 1) Conduct the Icebreaker activity.
- 2) Kick off a discussion by asking a question relating to the full inquiry activity. For example, you might ask, "Who among you has a dog? Do you think your dog is a smart dog? How would you investigate how smart a dog is?" Gather answers, and invite the girls to think about designing (even in rough form) an investigation related this discussion.



## Using the SciGirls Resources

- 3) Play the accompanying video for that investigation. You can also check out the Web page for each segment on [www.dragonflytv.org](http://www.dragonflytv.org).
- 4) Walk the girls through the parts of a full inquiry (choosing, questioning, planning, predicting, experimenting, interpreting, communicating). Ask your group to recall how the girls in the video fulfilled each part of the inquiry (e.g. "So if their topic was dog intelligence, what was their question? What stuff did they use while exploring this question? How'd they actually do their experiment, and how did they keep track of what they found out?" etc.). You may choose to have them fill out the "SciGirls Skills" worksheet as a guide. (Photocopy this worksheet freely.)
- 5) With the DragonflyTV investigation as a model, let the girls decide what they want to do. They can do their own version of the DragonflyTV inquiry, or make up their own related investigation. They might be curious about finding out how smart other animals are – from cats to hamsters.



### II. Appendix A: Graphing Examples

Each of the full inquiry activities in this Guide has an appendix page that shows how the data from the DragonflyTV video investigation can be graphed. There are examples of bar graphs and pie graphs. Use these examples as a guide, not as "law."

### III. Appendix B: Scientist Profiles

Girls love to see other strong girls and women in powerful roles, and this positive modeling often encourages them to pursue their own dreams. Included in the video library is a set of Scientist Profiles featuring smart, energetic female scientists who are currently researching, exploring, and breaking barriers. Play any of the Profiles as an inspirational stand-alone piece of video, or use the accompanying "Scientist Profile" worksheet to spark group discussion.

# DragonflyTV + Girls = SciGirls

As someone who educates, encourages, and empowers girls in your community, you know that they're curious. You know that girls love to explore, they're creative, and they're smart. In other words, you already know that your girls possess the qualities to be great scientists. At DragonflyTV, we honor these qualities by connecting science to girls' favorite activities. As a result, we've learned that girls are as eager and able to do meaningful inquiries as their male lab partners, teammates, and friends.

But researchers have actually identified that girls and boys differ in how they learn, experience, and enjoy science.

Here are some ways to make science engaging and fun for girls;

**Girls require communication and interaction among all group participants.** They're not fond of the "alpha-student" model, where one "smart kid's" hand is constantly in the air while other girls silently observe. Girls like to hear from everyone, and they enjoy collaborating. Take time to hear what everyone thinks.

**Discussion and participation must be harassment-free.** This seems obvious, but remember that one girl's perception of gentle encouragement may be another girl's definition of goading. Try to create a hassle-free zone for your girls.

**Girls enjoy real-life contexts of science content.** For girls, it's cool if an experiment works in a lab. But they want to see it work in their kitchens, backyards, or part-time job environments. Keep this in mind when designing inquiries.



## DragonflyTV + Girls = SciGirls

**Girls respond well to informal assessments, with open-ended tasks set in contexts familiar to all.** So propose a destination, but let girls figure out how to get there in the way that is best for them. And let them know how they're progressing along the way.

**Girls value diverse ways of knowing, viewing, and describing the world.** In other words, it's okay if everyone doesn't know or use the same terminology for everything, or if your girls want to "go with their guts" on certain decisions. Value these perceptions; even if they are ultimately incorrect, this trial and error is part of the scientific process for everyone.

**Girls like to challenge dominant ways of thinking about science, and consider how scientific knowledge is valued and legitimated.** Consider this: Some of your girls may have never had encouragement to disagree or argue a largely-accepted point, because the behavior "isn't nice." Give them permission to test boundaries. Give them space for brave thinking.

At DragonflyTV, we're big believers in empowering girls in their scientific explorations, and have "walked the walk" from the very beginning of our program. As you view DragonflyTV video segments and use our materials, please keep an eye out for these DragonflyTV essentials:

- DragonflyTV segments portray research questions drawn from the child's prior experiences and knowledge. For example, girls might notice that their cat uses her right paw more than her left one, and wonder if cats actually have a "paw preference."
- DragonflyTV segments start with questions about real-life activities and topics that girls enjoy. So even if you don't love hip-hop music or frog research, your girls might.
- DragonflyTV is gender-equitable in its language, illustrations, and examples. Period.

## DragonflyTV + Girls = SciGirls

- DragonflyTV includes some social and environmental applications of science, and puts its inquiries in a real-world context. As a result, we're doing science in the subways, science in the suburban parks, and science in the local wetlands.
- DragonflyTV portrays girls in all science disciplines (not just biology, where they tend to gravitate on their own). Check out our Scientist Profiles to meet women who create robots, design toys, and more.
- DragonflyTV emphasizes communication among its co-investigators. Disagree? That's fine. Talk it out.
- DragonflyTV investigations are open-ended (i.e., the outcomes are not pre-determined). So guess what? Sometimes they fly, sometimes they flop. Just like real science.



So now that you're armed with fun, girl-centered videos and materials, grab your gang and start investigating! And thank you from all of us at DragonflyTV for guiding, leading, and encouraging the next generation of astronauts, physicists, entomologists and other scientists (who just happen to be female).

