Science Inquiry Elements, *DragonflyTV*-style

While the elements of science inquiry are generally agreed upon, the science education community has developed numerous strategies for **teaching** science inquiry to children. Each of these teaching methods has its own merits. The members of your staff probably have a favorite strategy already. Let us present to you the model of science inquiry that you will see in the *DragonflyTV* video series, so that you can evaluate how best to incorporate it into your teaching methods.

We've boiled the inquiry process down into these seven steps:

1) Choose a topic.
2) Develop a question.
3) Plan an investigation.
4) Predict an outcome.
5) Experiment and observe.
6) Interpret results.
7) Communicate findings.

Here's a little detail on these vital inquiry skills, or what we call "SciGirls Skills."

1 Choose a topic

This is simply selecting the general subject of your inquiry. 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 Develop a question

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 (surface tension):

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 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. The second statement really outlines a research agenda, leading to a richer and more interesting inquiry project.

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?" You'll see investigation questions written in these styles throughout this guide, and throughout the *DragonflyTV* video collection.

3 Plan an investigation

Your girls must think carefully about what sort of equipment and materials they'll need to investigate the research question. Measuring devices, stopwatches, magnifiers, pen and paper, 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. The procedure must directly address the research question.

Given the time constraints of a typical field trip session, you will probably have these items preselected for your students to use. In that case, have students focus on the procedural issues during this part of the inquiry process. You will see and hear students discussing this part of the process in each *DFTV* video segment.

4 Predict an outcome

In the *DFTV* model of inquiry, this is not the same as forming a hypothesis. We recommend distinguishing predictions from hypotheses. Encourage students to make a prediction before the experiment or observation begins. Encourage them to make a hypothesis after they have completed some initial data gathering. Remind students that a prediction that comes out wrong does not signify a failed experiment. On *DFTV*, you'll often hear students discussing why their experimental results differed from what they expected. Encourage your students to do the same.

5 Experiment and observe

Now it's time to essentially 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. Young investigators easily overlook the recording step, trying to rely on memory. Encourage your girls to make a SciGirls journal where they can write down everything they do and discover.

6 Interpret results

This step usually means tabulating, averaging, and graphing. Your girls will have the chance to bring out creative skills, because there are many ways to display data. Presenting data clearly is a hallmark of *DragonflyTV* investigations. Encourage your students to be equally inventive.

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 kids 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! This is another hallmark of *DragonflyTV* video investigations.

7 Communicate findings

The final step is sharing their outcomes with others. There are many ways to tell a science story. Kids can write about their investigation and include plenty of interesting data. Or they can create a neat and eye-catching display that showcases their work. Finally, they can talk it out. Be sure to leave time in your field trip or summer class setting for this important phase of the science process.