dragonflytv

Flight – Take Wing!

Episode 106

Investigations To Explore

Model Airplanes

Ryan and Alex fly model stunt planes. There are many models to choose from, but they wanted one that could do great stunts.

Question

How does wing shape affect the performance of the plane?

Investigation

Ryan and Alex tested two wing designs, a flat-bottomed wing, and a symmetrical wing (curved equally on the top and the bottom). Using a scale of 0 to 3, they rated both types of plane on their ability to perform three stunts: an aileron roll, a snap roll, and an inverted loop.

Results

	Aileron	Snap Roll	Inverted Loop	Total
Flat-bottomed	2	1	0	3
Symmetrical	3	3	3	9

Conclusion

The symmetrical wing beat the flat-bottomed wing on all three stunts. Ryan and Alex concluded that air flowed over the symmetrical wing more evenly and provided lift, even when it was flying upside down.

Scientist: David Urie

David is an aeronautical engineer, whose latest invention is the SkyTrac, a kind of body surfboard for skydivers.

Paragliding

David, Alex and Abby are learning to paraglide. They want to find the best thermal updrafts to lengthen their flight.

Question

Where are the strongest thermals?

Investigation

Using a thermal camera, they measured the temperature of four different kinds of terrain: grassy, wooded, rocky and watery. David paraglided over each type of terrain, and checked how his altitude changed using a variometer.

Conclusion

David flew higher over the warmer terrain, and realized that the best thermals are found where the sun heats up rocky and grassy terrain.

Find out more: pbskids.org/dragonflytv.

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Classroom Inquiry

1) Getting Started

- Ask if your students have ever flown in a plane or taken a helicopter ride. Invite a pilot to talk to the class, or to host a visit to the airport.
- How heavy is a plane? How does it get off the ground? Solicit ideas about how air lifts planes.
- Birds flap their wings, of course, but many glide for minutes on end without flapping. Why don't they fall to the ground?
- What is flight? Compare kites, planes, paragliders, parachutes, even "flying squirrels." How are they different? How are they similar?

2) Going Deeper

- Everyone has folded a paper airplane; what's your favorite wing design? Why does it work so well?
- Compare the flight of different paper plane designs, and decide what to measure and observe. What counts as a good flight?
- How could you keep a paper plane in the air longer?

3) Investigate with DragonflyTV

- Watch the video and see how Ryan and Alex investigate model airplane wings – OR – give your students data from the video (see opposite page), and have them draw their own conclusions.
- Ryan and Alex chose to study wing shapes. What other features of the airplanes might they have studied?
- Most planes actually have flat-bottomed wings. What's the advantage to those? Why did Ryan and Alex prefer the symmetrical wing?

4) Investigate On Your Own

- Using the Model Airplanes or Paragliding segments to start them thinking, ask your students what other questions they might explore. Here are some challenge cards to give to student teams to get things flying.

Challenge Cards

1) Flight Paths

Hawks soar. Chickadees flit. Why does each bird fly in its own way? Find a spot outside where birds gather and sketch the scene. Then, for 15 minutes, draw the paths of whatever birds fly through your scene. Can you relate the type of flight to the size of the bird, the shape of the wings, or even where it lives or what it eats? Make predictions and test your ideas.

Pretend the flight paths are drawings of music. Try to hum different flight paths, or use a musical instrument to play the sounds the flight patterns suggest.

2) Everything That Flies

Quick — think of 30 things you can find in the air. Don't forget things like dust, clouds, insects, and even germs! Now take a look at your list. How many different ways can you classify your flying objects? How do they become airborne? What keeps them going?

3) Flight Dreams

Almost everyone has dreams about flying. Are all the dreams similar? Do kids dream about flying more than adults? Who dreams about flying more: boys or girls? Are most flight dreams fun or frightening? Make predictions and then create surveys to gather data to answer your favorite flying dream question.

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Inquiry Tips

The Art and Science of Investigation: On Questioning

It is true that there is no such thing as a bad question, but experienced investigators develop a knack for sifting through many questions to find just the right ones to suit their purpose. This process, which is both an art and a science, is a fundamental part of an investigation. Discuss the questions below with your students to start them thinking about the nature of inquiry and to help track down questions that will most likely lead to great discoveries.

Why should I care about this question?

If your class worked together to generate the question, chances are you have already solved the problem of relevance. Students know what they find interesting, but they may still benefit by discussing reasons why a question is significant. Such a discussion becomes more important if the students did not generate the question themselves.

Is the question too easy or too hard?

Often questions that seem easy at first lead to other questions worth investigating. Ask your students to keep probing. When faced with a question that seems too hard, ask your students to break the question into interesting pieces.

What's my best approach?

Challenge students to devise alternative strategies for addressing a question. A question about lions may best be answered by library research. Other questions may require interviews, computer research, thought experiments, direct observation, or field experiments. The best questions often challenge students to adopt multiple approaches. You might try giving students a list of questions and then have them determine the best ways to address each one.

Will this question lead anywhere?

Point out the difference between a descriptive question and a comparative question. Imagine a student who asks the descriptive question, "How many animals are under that rock?" Let's imagine she picks up the rock and finds three pillbugs and a spider. So what? It seems a dead end. But, if she asks the alternative, comparative question, "Are there more animals under big rocks than small rocks?" she opens up other questions. Does she think more animals live under big rocks just because of their size? Or is there more moisture under big rocks? Is there more protection? Do spiders fall into the same pattern as pillbugs? How could she find out? Review the questions in the DragonflyTV investigations. Are they comparative questions?

A wonderful unit could be born with just one simple comparative question. To help your students with comparative questions, have them practice moving from description to comparison.

Do we have the resources?

Some excellent questions may require more resources than students have available. Yet, constraints in time and equipment can be used to inspire students to create ingenious solutions. Often, the best investigations are completed with rulers, string, paper plates, and other simple tools. While recognizing that not everything is possible, help your students realize that more is possible than they might first think.

It would be convenient, but not very interesting, if inquiry could be defined in a simple way. It cannot because the process of investigation relates to your life inside and outside the classroom.

If your students have great investigations, visit our Web site at pbskids.org/dragonflytv and tell us about them. Your students could be on DFTV!

For graduate-credit teacher workshops, visit www.DragonflyWorkshops.org

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