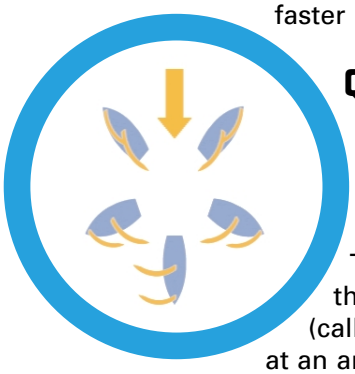
dragonflytv

Air – Sail Away!
Episode 110

Investigations To Explore

Sailing

Emmanuel and GiGi love to sail their toy boats in Central Park, and noticed that their boats seem to travel faster in some directions than in others.



Question

What is the fastest sailing direction, and why?

Investigation

They sailed their model boat in three directions: with the wind (called "running"), with the wind, but at an angle (called "broad reach"), and into the wind at an angle (called "close hauled"). Once they found the fastest direction, they tried the same experiment on a real boat.

Results

	Model Boat Speed	Real Boat Speed
Running	0.22 m/sec	5 Knots
Broad Reach	0.33 m/sec	7 Knots
Close Hauled	0.24 m/sec	6 Knots

Conclusion

Emmanuel and GiGi found that broad reach was the fastest sailing direction for the model boat and the real boat. On the real boat they also used an anemometer and discovered that the wind speed was different on the two sides of the sail.

Scientist: Lonnie Johnson

Lonnie has been winning awards for his creative inventions. His most popular invention is the Supersoaker™, everyone's favorite squirt gun, which uses air under pressure to make the best spray anywhere.

Balloons

Masha and Patsy were fascinated by the grace and speed of colorful, gigantic hot air balloons, and wondered how something bigger than a house can float through the air.

Question

How does hot air lift things?

Investigation

The girls booked a ride in a hot air balloon and recorded the temperature and the variometer (changing altitude) reading.

Conclusion

They learned that the hotter the temperature, the faster the balloon rose, and that even hovering required a high temperature.

Find out more: pbskids.org/dragonflytv.

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Classroom Inquiry

1) Getting Started

- Have you ever been sailing? Have you been to a lake, river, or ocean where boats were sailing? Try to describe the shapes of the sails you remember.
- What makes a sailboat go fast? Think of all possible answers.
- Think about the direction the sailboats were going. If the wind blows your boat along in one direction, how do you get back?

2) Going Deeper

- Can you make your own anemometer? Use it on a real or model sailboat, and see what it tells you.
- Investigate other kinds of wind-powered vehicles, like wind cars or ice sailboats. What direction of travel gives you the fastest speed?
- Look at pictures of different models of sail boat (catamaran, ketch, sloop, schooner). What are the features of each design (number of sails, sail shape, sail position)?

3) Investigate With DragonflyTV

- Watch the video and see how Emmanuel and GiGi investigated sailing – OR – give you students data from the video (see opposite page) and have them draw their own conclusions.
- How did GiGi and Emmanuel figure out the boat speed at the sailing pond?
- Emmanuel tells GiGi about the Bernoulli Principle. How does the Bernoulli Principle work when GiGi blows over the sheet of paper?
- They found that the wind speed was different on the two sides of the sail when they were on the big boat, which means the Bernoulli Principle was working. So does the air push harder against the inside of the sail, or against the outside of the sail when this happens? Make a picture showing your answer.

4) Investigate On Your Own

- Using Sailing or Balloons as an example, ask your students to design their own investigations. Here are some challenge cards to hand to student teams to get things rolling.

Challenge Cards

1) To Fly or Flop

Why do some kites fly better than others? Try drawing and building four kites using only triangular pieces of material; two you think will soar like an eagle; and two you think will drop like a rock. Make sure all your kites weigh about the same.

2) Seed Ships

The seeds of some plants, like milkweed or sugar maple "helicopters," float through the air. Catch some seeds with a net, or collect them directly from a plant. Design a test to see if differences in seeds on the same plant (size, weight, shape) makes some seeds fly better than others. Try changing some seeds in a way that makes them better fliers than before.

3) How's the Air Up There?

The air quality index, tracked by meteorologists, measures the levels of impurities and pollution in the air. For five days, follow the air quality index in your local newspaper or newscast. Does weather influence air quality? How? Communicate with a friend in another city, and compare air quality indexes. What are the differences between these two locations? What creates these differences?

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