

Into the Wind

Facilitator Guide Sheet

Part One: The Kite

Key Concept:

Wind is the movement of air from high to low pressure systems.

Video Length:

2 minutes 13 seconds

Age:

10 – 14 years old

Key Words:

- **Newton's 3rd Law** is every action has an equal but opposite reaction

How to use the video with youth:

After viewing the video, ask youth to individually think about and write down thoughts they have about the following questions.

- How and where do you see wind playing a role in their lives?
- When have you experienced interaction with wind?
- In what ways might you be interested in learning more about wind?

When participants have individually reflected on these questions, put them in groups of three and ask them to share their responses to one of the questions in their group. When small groups have had a chance to discuss, ask for each group to respond in the larger group.

Use With *The Power of the Wind* Youth Guide:

This video can be viewed prior to lesson one in *The Power of the Wind* Youth Guide. It sets a backdrop for wind energy and allows youth to see themselves as having an interaction with wind. (Many of them have flown a kite before).

Extensions that can be done as a result of seeing the video:

- Have youth make different shaped kites and see how they work in the wind. If doing this outside is not an option, they can make “mini” kites and use a controlled wind source such as a fan or hair dryer.
- Have youth seek out other things found in their life that are affected by wind. For example—can they connect what they see in this video to determine wind effects on opposite sides of buildings?
- Have youth explore the function of the tail on a kite. Do different tails affect how the kite flies?

Supporting Information:

- Wind motion is a source of energy.
- The sun heats parts of Earth’s surface unevenly.
- Warm air expands and rises.
- Cooler air fills in the gaps below.
- The downward force creates an equal upward force that lifts a kite.



This **Facilitator Guide Sheet** is designed to be used with the *Into the Wind* videos. To view *Into the Wind*, visit www.4-H.org/curriculum/filmmaking and click on “Featured SET Films”.



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Part Two: The Hang Glider

Key Concept:

Air moving across the hang glider wing creates force that lifts the hang glider.

Video Length:

2 minutes 22 seconds

Age:

10 – 14 years old

Key Words:

- **Airfoil** is the aerodynamic shape of a wing or blade as seen in cross-section.
- **Low air pressure** is a region where the atmospheric pressure is lower than the area surrounding it.

How to use the video with youth:

- After youth watch the video, they may be interested in learning more about hang gliding and the role wind plays in their flight. Have youth research different types of hang gliders. Although hang gliders may take on different forms and look different, the same key principles apply related to wind. How does the wind work in each of them?
- The hang glider changes direction by turning the control bar and shifting body weight. Have participants explore how this phenomena works. Are their similar concepts or principles that are apparent in your everyday life?
- Have youth research the “design” elements that are needed for hang gliding. Can you identify how you might change any of the design elements to make a better hang glider?
- Scientists have explained flight with Bernouli’s principle in the past but now the science community has shifted and now argues that Newton’s laws explain flight. What does this tell you about science as process?

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Use With *The Power of the Wind Youth Guide*:

Use with activities on pages 8 – 9, 10 – 11, 30 – 31, 38 – 39.

- * This lesson can be done as an extension to “How do we Observe and Measure the Wind?” (pg. 10 – 11). After learning about the Beaufort scale, they can use the scale while they view the video and see if they can identify wind speed. This lesson also provides content about wind direction.

Extensions that can be done as a result of seeing the video:

- Have participants identify the essential parts of a hang glider? Have them develop a model. If there is a large fan, can they get it to fly downward?
- Have participants apply these concepts to other wind powered objects such as windmills and kites?
- Explore how updrafts work in desert and mountainous regions.

Supporting Information:

- Wind blowing off the ocean creates an updraft when it hits a cliff.
- Hang gliders ride the updraft.
- The hang gliders wing is an airfoil.



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Part Three: The Sailboat

Key Concept:

Wind carries energy that is in the flow or kinetic energy of the air.

Video Length:

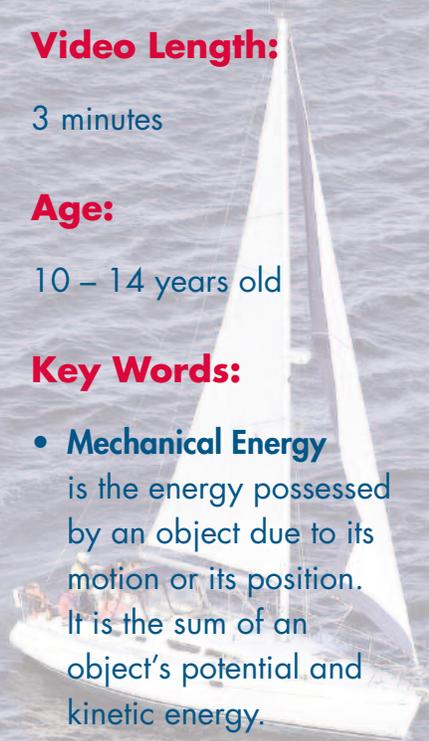
3 minutes

Age:

10 – 14 years old

Key Words:

- **Mechanical Energy**
is the energy possessed by an object due to its motion or its position. It is the sum of an object's potential and kinetic energy.
- **Kinetic Energy**
is the energy of motion.
- **Heeling Force**
is the force that the wind presses into the sail.



How to use the video with youth:

The video may be used as a “starter” or introduction to wind energy. This can provide background information before attempting to build a sailboat.

Use With *The Power of the Wind* Youth Guide:

Use with activities on pages 6 – 7, 10 – 11, 12 – 13.

- * It can serve as reinforcement to content in the “Design a Wind Powered Boat” activity on page 6 – 7 in *The Power of the Wind* Curriculum Guide. This video can be used with the sailboat activity (p. 6 & 7) in *The Power of the Wind* Youth Guide. To use in the activity: After groups have built an initial sailboat and they have shared their design with other groups, have them watch this video. The wind concepts here may help them identify reasons for their boat's actions. After watching this video, groups can return and try to optimize their design.

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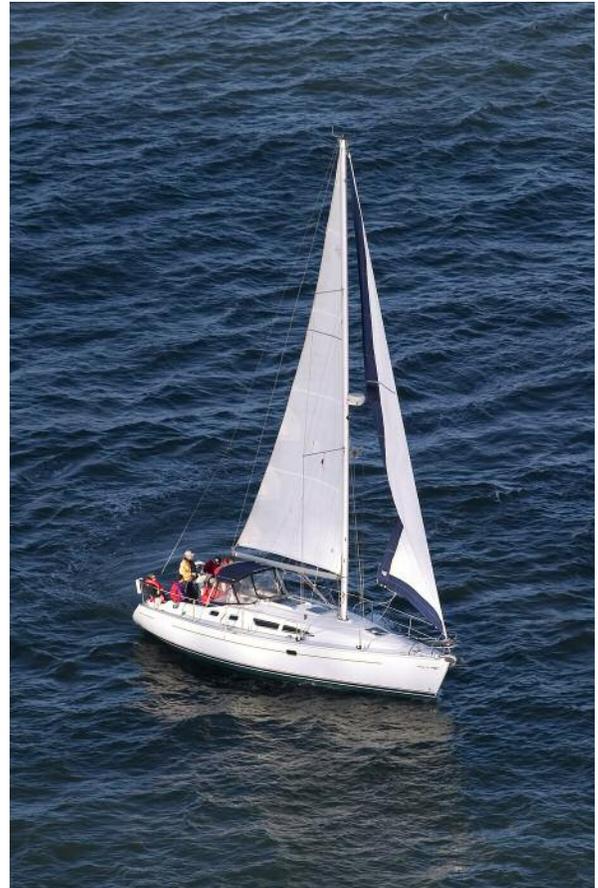
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Extensions that can be done as a result of seeing the video:

- Have youth think about what makes a “good” sailboat. They will need to define what they want to be “good.” Is it the furthest distance with given wind speed? Is it the optimal size sail? Have them design a model and build and test.
- Design a challenge based on availability of materials for participants to work on. Challenge examples may include: “design a sailboat that travels xx length given xx mph wind speed.
- Youth may choose to do additional research on the history of sailboats. They may compare and contrast characteristics through historical periods of time.

Supporting Information:

- The wind’s motion is a source of energy.
- Kinetic energy of the wind is transferred to the sailboat.
- The heeling force causes the sailboat to tilt to one side. When sailing at an angle, the wind force splits between forward thrust and heeling force. This causes the sailboat to roll to one side as it speeds forward.
- Fossil fuels create pollution which powers some boats, on the other hand, wind is a clean and renewable source of energy. Wind is a clean and renewable source of energy.



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Key Concept:

The wind's motion is a source of energy.

Video Length: 5 minutes

Age: 10 – 14 years old

Key Words:

- **Kinetic Energy** is energy of motion, the extra energy an object possesses due to its motion, or the work needed to accelerate a body of a given mass from rest to its current velocity.
- **Rotational Energy** is the kinetic energy due to the rotation of an object and is part of its total kinetic energy. Torque changes the rotational kinetic energy of an object.
- **Torque** is the tendency of a force to rotate an object around its axis, it can be equated to twisting. It can also be thought of as a measure of amount force is acting on an object causing it to rotate.
- **Mechanical Energy** is the energy possessed by an object due to its motion or its position. It is the sum of an objects potential and kinetic energy.

How to use the video with youth:

The pinwheel video may most appropriately be used after wind energy investigation has begun. It is most effective in describing similarities and differences between wind turbines, windmills, and pinwheels. After youth have had time to assemble a pinwheel and have begun thinking about how wind works on it, this video can help connect them to the next level of thinking and provide them with the basic content to continue investigating wind energy.

Use With *The Power of the Wind* Youth Guide:

Use with activities on page 14 – 15, 16 – 17, 18 – 19, 20 – 21.

* This video is used in the "Training Guide" Investigation exercise.

Extensions that can be done as a result of seeing the video:

- This video might be the first time participants are seeing wind farms. Connect with an area wind farm and take a tour. Ask the manager/owner/ operator if they can highlight the benefits of wind energy.
- Have participants explore the question, "Where else does wind supply energy to?" They might consider finding out how their local power is supplied. They might talk with local experts or do online research.

Supporting Information:

- The pinwheel is a simple windmill.
- The energy of the wind becomes rotational energy of the pinwheel.
- The pinwheel harvests kinetic energy of wind to make rotational energy.
- Wind turbine uses the same basic principles as windmill and pinwheel.

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