

LESSON: Power of the Wind**GRADE:****3****OBJECTIVES:****Motion and Stability: Forces and Interactions**

- **3-PS2-1** Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

S.3-5.SI.3 Plan and conduct scientific investigations.

- Students should engage in systematic observation, making accurate measurements, and identifying and controlling variables.
- Follow appropriate safety procedures when conducting investigations.

MATERIALS & RESOURCES:

- Kites
- Big balls of kite string
- Caution tape or party streamers (precut lengths 1 ½ yards)
- Paper & pencils
- Photos of Iowa wind turbines
- Windy day
- Web sites:
 - Energy Quest-- <http://www.energyquest.ca.gov/movieroom/>
 - Wind Speed and Direction--
<http://graphical.weather.gov/sectors/conus.php?element=WindSpd>
 - Newton's First Law Applied to Kites--
<http://www.grc.nasa.gov/WWW/k-12/airplane/newton1k.html>
 - Dynamics of Flight (picture of various forces on airplane)--
<http://www.grc.nasa.gov/WWW/k-12/UEET/StudentSite/dynamicsofflight.html#lawofmotion>

PRESENTATION:

Let's learn about balanced and unbalanced forces. We will use of the kites made in *Flying Bags (3rd grade Math)*. One way we can help Keep Iowa Beautiful is to reduce fossil fuels use. Iowa is a leader in wind energy.

Understanding the effects of wind is important for engineers as they look for the best places to locate the wind turbines. Ask, "Where is on Earth is it windy? Is wind stronger on a mountain or in a valley? Have you seen the wind turbines as you drive through Iowa? How does the wind turn the blades of a turbine? Share website link referencing electricity and the growing need for wind power.

DIRECTIONS:

1. Show kids an open sheet of paper and another sheet crumpled into a ball. Point out that the two sheets of paper are identical, but that you made one into a ball. Before dropping each one, ask:
 - How will the ball of paper fall when I drop it? (It will fall straight to the ground.)
2. How about the flat sheet of paper? (It will drift to the ground.)
 - What is the name of the force that pulls the paper down? (Gravity)
 - Why did the pieces of paper act so differently when I dropped them? (Air is something! It is made of gas particles, such as oxygen, nitrogen, and carbon dioxide. The open sheet hits more of these particles, which slows it down.)
3. Make kites: Either use the kites made in the 3rd grade math lesson, *Flying Bags* or create kites using recycled paper sacks or other recycled materials. If more direction is needed check here: <http://www.my-best-kite.com/how-to-make-a-kite.html>
4. With students in groups or teams, have students tie a generous ball of kite string to the curtain ring on their kite. Tie a streamer, and add one every couple of yards along the kite string until the end is fairly close. To prevent tangling, have students wrap this around a box or bucket.
5. Before going out hold a class discussion about safety when flying kites.
6. Take students outside to an open area to fly kites. Make sure to note the length of the string that was pulled out to fly the kite. This can be done by marking the place on the string with a marker. Or perhaps your kite will use the entire length of the string.
7. When you are done flying the kites, sit down in a circle with the children on the playground, and talk about how their kites flew.
 - The action of air lifting a kite is similar to that of an airfoil or airplane wing. The air flowing over it has a longer way to go and has less force than the air against its near surface. As a result, the air pressure exerts a greater force on the front of the kite than on its back and the kite is pulled up and away. The string you pull towards you holds and steadies the kite balancing it in the air.
8. Once back in the classroom, have groups share their findings with the class and discuss what they learned.

9. Next: Look on the Internet for the wind speed and write that down. Measure the string that was spun out when our kites were in the air. Then each group will make a chart for the wind speed and the height of the kites. We'll chart this several times, and then see if there is a correlation between wind speed and height.
10. After this charting is done, see if the students can predict how high they'll be able to fly their kites by looking at the wind speed on the Internet.

TIME: Several class periods for flying kites and recording height and wind speed

PROCESSING THROUGH THE PILLARS:

WHAT HAPPENED?

- What did you think would happen?
- Were you right?
- What did you notice about the wind in different areas?
- What do you think made the difference?
- What surprised you about this experience?

SO WHAT?

- What did you learn about the wind?
- How does the wind affect us?
- How does the wind feel?
- What does the wind make you think about?

NOW WHAT?

- How will choices change after this experience?
- How do you think this experience will change you?
- What will you do differently after this wind experiment?