# Oklahoma Alliance for Geographic Education

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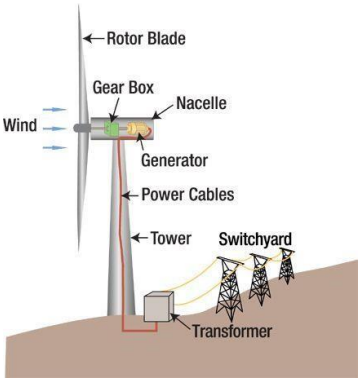
# *Blown Away!*
# *Oklahoma's Wind Energy*

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**Blown Away! Oklahoma's Wind Energy**

**Grade Level:** 6th, 7th or HS

**Purpose/Overview:**
The purpose of this lesson is for students to learn the fundamental parts of a windmill, to use the scientific method to isolate and adjust variables when constructing a functional windmill that lifts weights, and to understand energy conversions/transfers and how a windmill converts moving air into usable mechanical energy. Students will understand that wind power is a choice we can make that reduces pollution and climate impacts.

**National Geography Standards from *Geography for Life* Geographic Elements & Standards:**
Environment and Society

**Oklahoma Academic Standards for the Social Studies:**

| OAS 2012 | OAS 2019 |
|---|---|
| **Grade 6: World Geography Western Hemisphere** | |
| Content Standard 5: The students will examine the interactions of humans and their environment in the western hemisphere. | **6.4** The student will analyze the interactions of humans and their environment in the Western Hemisphere. |
| 5. Summarize the role of citizens as responsible stewards of natural resources and the environment including:<br>D. support of alternative and sustainable energy sources. | **6.4.6** Describe the role of citizens as responsible stewards of natural resources and the environment. |
| **Grade 7: World Geography Eastern Hemisphere** | |
| Content Standard 6: The students will examine the interactions of humans and their environment in the eastern hemisphere. | **7.4** The student will analyze the interactions of humans and their environment in the Eastern Hemisphere. |
| 1. Cite specific textual and visual evidence to describe the relationship between the distribution of major | **7.3.6** Describe the distribution of resources and evaluate how the three levels of economic activities (primary, |

| | |
|---|---|
| renewable and nonrenewable resources and evaluate how the three levels of economic activities contribute to the development of a country or region. | secondary, tertiary) contribute to the development of a country or region. |
| **HS: Oklahoma History and Government** | |
| Content Standard 5: The student will investigate how post-war social, political, and economic events continued to transform the state of Oklahoma during the 1950's through the present. | **OKH.6** The student will investigate how post-war social, political, and economic events continued to transform the state of Oklahoma from the 1950s through the present. |

**Geographic Themes:**
Human-Environmental Interaction and Region.

**Objectives:**

1. Students will

- recognize wind energy as an alternative and sustainable energy source.
- use a limited amount of materials to design and build functioning windmill models.
- use the models they create to convert wind into mechanical energy in order to lift weights.
- use the scientific method to conduct trials, change variables, and work to improve the performance of their windmills

**Materials:**

- MacGyver Windmill Class Packs
- 2 Box fans
- Rulers
- Tape
- Scissors
- Alternative materials such as skewers, dowel rods, soda bottles, oatmeal containers, paper plates, scrap cardboard, lawn signs, pie pans, etc. Anything that catches the wind will work!
- Graphic Organizer "Blown Away! Oklahoma's Wind Power"

**Time Frame:** Two 45-minute class periods

**Procedures:**

1. Teacher shows PowerPoint, "Blown Away! Oklahoma's Wind Energy" slides 112 (Slides can be deleted for use in the classroom.).
2. Discuss parts of the windmill and advancements in technology.
3. Students will use a limited amount of materials to design and build functioning windmill models. They will use these models to convert wind into mechanical energy to lift weights. Using the scientific method, they will conduct trials, change variables, and work to improve the performance of their windmills.
4. Discussion:
    - How many blades worked well for lifting weights?
    - Did more blades mean you could lift more weights?
    - What blade pitch was best for lifting weights?
    - Where did you attach the string? Why?
    - How did your design change after the attempt to lift weight?
    - How were you able to get more turning force from your blades?
    - What ideas seemed to work well?
    - What problems did you encounter?
    - If you had to do it all over again, how would your planned design change? Why?
    - How did the most efficient design differ from your own?
5. Teacher finishes Power Point. Hold a class discussion on slide 14, "Why Harness Wind Power" and the upcoming wind energy competitions.
6. Students complete the graphic organizer, "Blown Away! Oklahoma's Wind Power.

**Assessment Options:**

- Application/Performance assessment-student MacGyvers can be assessed for completion, performance and improvement.
- Application assessment grades will be taken on student graphic organizers
- Authentic assessment might include a visit to a wind farm or a visit from a wind farm operator.

**Resources:**

National Geographic. "Wind Energy." National Geographic Society: 1996-2017.
https://www.nationalgeographic.org/encyclopedia/wind-energy/

Recharge Labs. MacGyver Windmill Class Pack. Activity Guide. www.rechargelabs.org.

Try Engineering. "Working with Wind Energy." IEE: 2017. http://tryengineering.org/lesson-plans/working-wind-energy

**Extension and Enrichment/Simplification:**

- To adapt this lesson to a lower grade, students could create experiment with different blades on a firefly.
- A special needs student could be partnered with a high achieving student for help with creating the MacGyver or given one-on-one assistance.
- As an enrichment, students could visit a wind farm.
- Invite a wind farm operator or specialist from the State Energy Department or local college to visit the class.

**Connections (optional):** This lesson incorporates OAS standards for science and mathematics.

**Name** _____

**Date** _____

**What is a windmill?**

**What is the difference between a windmill and a wind turbine?**

**Draw and label the following parts on a wind turbine: rotors, gear box, nacelle, generator, power cables, tower, and wind.**

**Blown Away!**
**Oklahoma's Wind Energy**

**What makes Oklahoma a prime location for wind power?**

**Why harness wind power to generate electricity?**