Roundup Teachers' Day
January 29, 2019

Harnessing Wind Energy Activity Teacher Information

Purpose:

This activity focuses on wind power as an example of renewable energy. It develops science inquiry skills through interactive and hands-on experiments exploring how the wind's energy can be captured and what design works best to capture the wind.

The windmills will be compared according to the number of rotations they make in 15 seconds (time can vary). The factors being compared are blade length, number of blades, and size of windmill.

Teacher notes:

Each group can be provided with different requirements to compare so that no two groups will be comparing the same components (students could choose one of the procedures 13 or 14 as well as create a different factor to try). When doing any experiment, changing only one factor is important to know the cause of the change.

Using a fan instead of a blow dryer allows for more control. Keep fan/blow dryer on low.

Materials:

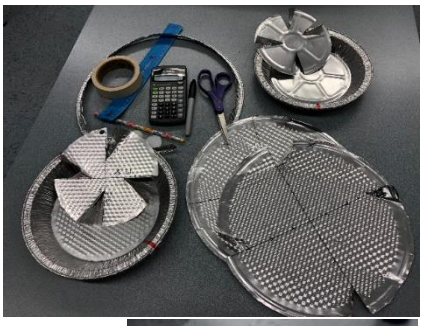
Cell phone/ipad (to record the windmill rotation)

Aluminum plates – two different diameters (ie. 31.5 cm and 22.2 cm)

Scissors, ruler, straight pin, tape, black felt marker, pencil with eraser on the end

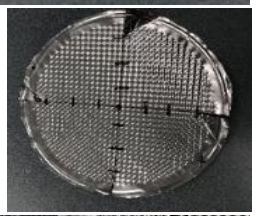
Styrofoam pieces (exacto knife to cut the pieces)

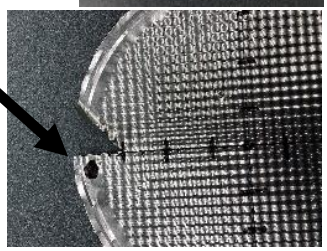
Blow dryer or fan



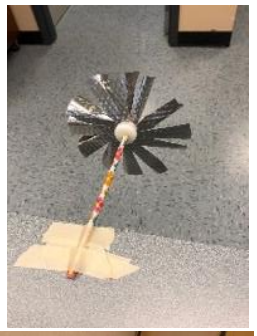
Procedure:

1. Cut the rim off a tinfoil plate to leave a flat plate.
2. Using the marker, divide the plate in quarters (4 blades).
3. Divide the radius by 4. This will determine the length of the three blades
4. Cut and fold the shortest blade.
5. Mark **<u>one</u>** spot on the left of a cut (this is a visual to make it easier to count rotations).
6. Put a pin through the centre of the aluminum plate, then into a piece of Styrofoam and then into the end of the eraser.
7. Tape the pencil to the desk.
8. Set the fan on low and in a location where it will cause the windmill plate to rotate
9. Video 15 seconds on "slo-mo". Record the number of rotations. Repeat two more times and calculate the average.
10. Stop the fan.





11. Cut blades to the medium length and repeat steps 9 and 10.
12. Cut blades to the longest length and repeat steps 9 and 10.
13. Repeat steps 1 to 12 having three blades instead of four.
14. Repeat steps 1 to 12 using a different sized plate (your choice on blade number).



Sample Data:

Factor being tested – blade length(17.5 cm plate)	**Rotations (measured in Seconds)**			**Average**
6 cm blade length	Trial 1	Trial 2	Trial 3	
4 blades	20	20	20	20
8 blades	26	26	26	26
12 blades	28	28	28	28

Roundup Teachers' Day
January 29, 2019

Harnessing Wind Energy Activity – Student Activity

Purpose:

This activity focuses on wind power as an example of renewable energy. It develops science inquiry skills through interactive and hands-on experiments exploring how the wind's energy can be captured and what design works best to capture the wind.

The windmills will be compared by the number of rotations in 15 seconds (time can vary). The factors being compared are blade length, number of blades, and size of windmill.

Hypothesis: Based upon the factors being tested, explain what you believe the single most important factor will be to capture the wind.

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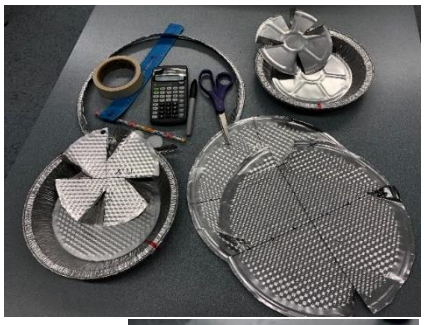
_____

_____

Materials:



Cell phone/ipad (to record the windmill rotation)

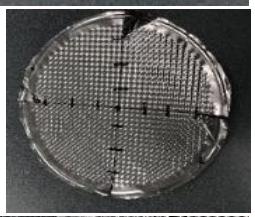
Aluminum plates – two different diameters (ie. 31.5 cm and 22.2 cm)Scissors, ruler, straight pin, tape, black felt marker, pencil with eraser on the end

Styrofoam pieces (exacto knife to cut the pieces)

Blow dryer or fan

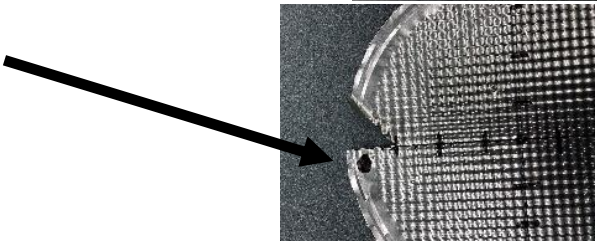
Hypothesis:

To test the number of rotations a wind mill will make based upon the following: length of blade, number of blades, and size of windmill.

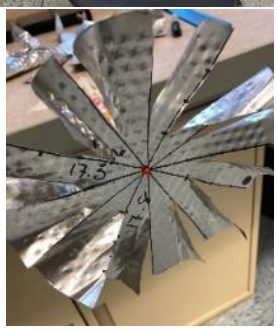


Procedure:

1. Cut the rim off a tinfoil plate to leave a flat plate.
2. Using the marker, divide the plate in quarters (4 blades).
3. Divide the radius by 4. This will determine the length of the three blades
4. Cut and fold the shortest blade.
5. Mark **<u>one</u>** spot on the left of a cut (this is a visual to make it easier to count rotations).
6. Put a pin through the centre of the aluminum plate, then into a piece of Styrofoam and then into the end of the eraser.
7. Tape the pencil to the desk.



8. Set the fan on low and in a location where it will cause the windmill plate to rotate
9. Video 15 seconds on "slo-mo". Record the number of rotations. Repeat two more times and calculate the average.
10. Stop the fan.
11. Cut blades to medium length and repeat steps 9 and 10.
12. Cut blades to long length and repeat steps 9 and 10.
13. Repeat steps 1 to 12 having three blades instead of 4.
14. Repeat steps 1 to 12 using a different sized plate (your choice on blade number).



Data:

1. Factor – Four Blades – changing blade length

Predict – which blade length will harness the greatest amount of wind? Explain.

_____

_____

Factor being tested – blade length (____cm diameter plate)	**Rotations (measured in Seconds)**			**Average**
4 blades	Trial 1	Trial 2	Trial 3	

Results: Explain your results.

_____

_____

2. Change **one** factor to test.

Examples:

- using the same size of aluminum plate - compare 4, 8, and 12 blades at a specific length,
- using the same size plate - compare 3, 6, and 9 blades with a specific length,
- using the same size plate – compare 3 or 6 or 9 blades at the same lengths as set 1
- using a different size plate - compare 4 blades changing three different lengths

Factor – _____

Predict and Explain.

_____

_____

Factor being tested – blade number (_____ cm plate)	**Rotations (measured in Seconds)**			**Average**
	Trial 1	Trial 2	Trial 3	

Results: Explain your results.

_____

_____

3. Change **one** factor to test.

Examples:

- using the same size of aluminum plate - compare 4, 8, and 12 blades at a specific length,
- using the same size plate - compare 3, 6, and 9 blades with a specific length,
- using the same size plate – compare 3 or 6 or 9 blades at the same lengths as set 1
- using a different size plate - compare 4 blades
- using a different size plate **-** compare 3, 6, and 9 blades with a specific length
- using the same size plate – compare 3 or 6 or 9 blades at the same lengths as set 1

Factor – _____

Predict and Explain.

_____

_____

Factor being tested – blade number (_____ cm plate)	**Rotations (measured in Seconds)**			**Average**
	Trial 1	Trial 2	Trial 3	

Results: Explain your results.

_____

_____

Question: Why do three trials for each rotation?

_____

_____

What other factor(s) could be tested?

_____

_____

Conclusion: Based upon your results, explain what created the best turbine?

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