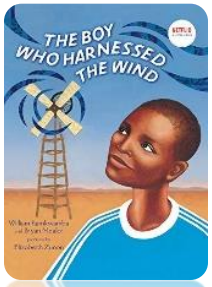
The Boy Who Harnessed The Wind Book Activity Guide

Grades K-5

Overview



Imagine the power of a young boy's knowledge, creativity and determination changing a community forever! Learners will be inspired to put their own learning and imagination into action after reading the true story of, "The Boy Who Harnessed the Wind". This guide provides pre and post reading activities, as well as a wind energy building challenge!

NB Curricular Connections

K-2 Learning Areas	3-5 Learning Areas
English Language Arts ○ *Strand:* Reading – *Big Idea:* Reading Comprehension	English Language Arts ○ *Strand:* Reading – *Big Idea:* Reading Comprehension
Explore Your World: ○ *Strand:* Literacies and Communication – *Big Idea:* Communicative Practices – *Skill Descriptor:* Explore multiple languages. ○ *Strand:* Play and Playfulness – *Big Idea:* Exploration and Problem Solving ○ *Strand:* Play and Playfulness – *Big Idea:* Play and Inquiry	Science ○ *Strand:* Learning and Living Sustainably – *Big Idea:* Responsible and Sustainable Application

What You'll Need

- Copy of "The Boy Who Harnessed the Wind" by: William Kamkwamba & Bryan Mealer (*available on Sora*)
- Chart Paper
- Fan (for testing windmills)
- Pencils
- SmartBoard (Google Earth) or World Map
- Maker Space Materials: recyclables, paper, cut up sponges, tape, scissors, newspaper, straws, fasteners, unsharpened pencils, etc. (see activity below for more suggestions)

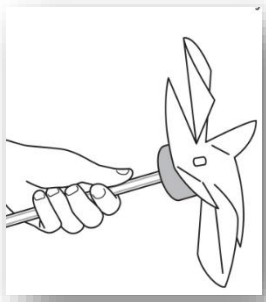
Instructions

PRE-READING:

a) **Discussion**: On a piece of chart paper, print the word – Wind. Ask students to describe what they first think about when they hear this word. Write down their responses.

b) **Context**: Using a world map or a website like Google Earth (https://earth.google.com/web/) show students the country of Malawi. Talk about the countries around it, how it is a land-locked nation, as well as how far away it is from the ocean. Known as the "warm heart of Africa", Malawi has been experiencing the affects of climate change for quite some time. The country is particularly prone to dry spells, seasonal droughts, intense rainfall, riverine floods, and flash floods.[1] This is particularly challenging because Malawi relies heavily on agriculture (crops, production and exports) for its economy.

AFTER READING:



a) **Build Your Own Windmill Challenge!**
Divide your students into small groups or partners. Have a variety of materials available. Then, see the activity guide below for all steps needed to complete the windmill challenge. The ultimate goal: to create a windmill that spins in the wind! The possibilities are endless and no two windmills need to look the same.

b) **Extending Our Learning:** Go back to the original chart paper of Wind and have students add to it. How does wind energy affect me? How does it affect our province of New Brunswick? What types of workers may be needed in the future of wind energy? Check out NB Power's Wind Energy site: www.nbpower.com/en/about-us/our-energy/wind-energy as well as Atlantica Centre for Energy's site, featuring an interactive map highlighting all of NB's Energy resources: New Brunswick's Energy Resources – Atlantica Centre For Energy (atlanticaenergy.org).

Acknowledgements

1. Climate Change Knowledge Portal - https://climateknowledgeportal.worldbank.org/country/malawi/vulnerability

2. **NB Power** - Wind Energy (nbpower.com)

A huge thanks to **Recharge Labs** (www.rechargelabs.org) for the use of their *Mini Windmills Class Pack Activity Guide*.

Mini Windmills
Activity Guide

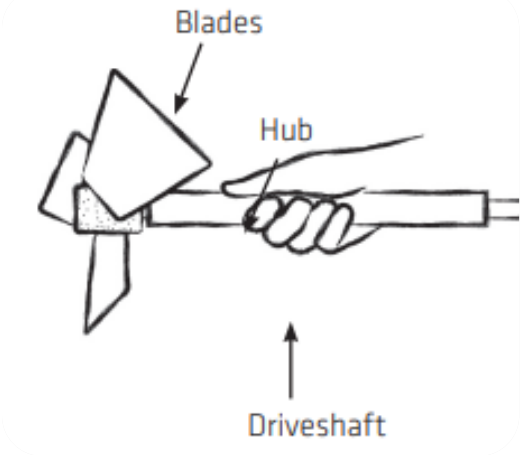
Concepts

- Energy and Transformations
- Forces and Motion
- Engineering, Art, and Design
- Collecting and Interpreting Data
- Using Basic Tools
- Math

Objectives

At the end of the lesson, students will:

- Know the fundamental parts of a windmill
- Be able to use the scientific method to isolate and adjust variables in a model windmill

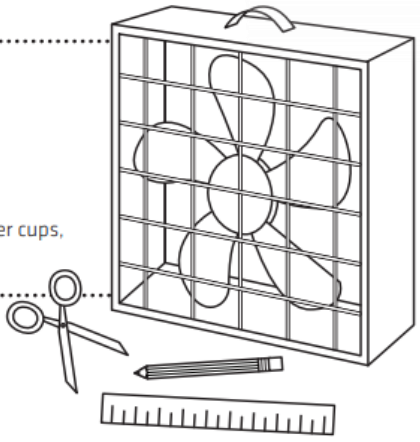


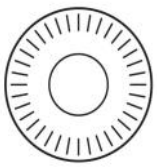
Materials

The illustration to the left is an example of the Mini Windmill the students will be building. The students will mainly be problem-solving and performing tests on the blade portion of the windmill. Paper plates are perfect for blade material, but anything that catches the wind can be used, like paper cups, card stock, and cardboard. If you have more than 45 minutes, we strongly encourage you to supplement additional blade making material to introduce even more variables for your students to work with.

You will need to supply the following materials:

- 20" x 20" standard box fans
- Ruler
- Pencil
- Scissors
- Alternative blade materials such as card stock, cardboard, paper cups, etc. Anything that catches the wind will work!

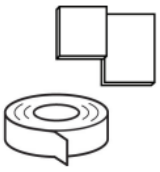




Blades
Paper plates

Hub
Foam cylinder

Drivetrain
Skewers
Straws



Attachments
Duct tape
Foam stickers

REcharge Labs®

Wind is a renewable energy resource. When we use wind to do work it can never be used up and it doesn't produce harmful waste. Windmills are structures engineered by people to capture the energy in the wind, converting it into usable mechanical power. Windmills have been used for more than 1,000 years to grind grain and pump water.

Step 1: Beginning questions for students

⏱ 2 minutes

Gather students to sit in a circle on the floor. Ask them these prompting questions to get them to think about the concept of wind doing work. Having a box fan on nearby may help the students think about windy conditions!

- What are windmills?
- Have you seen something spin in the wind before?
- Imagine it's windy outside. Is the wind doing anything to you or the things around you?
- Can you feel the wind? What does it feel like?

Step 2: Demonstration of tilt angle in the wind

⏱ 3 minutes

While students are still in a circle, ask them to model this scenario:

Have you ever played with the wind by sticking your hand outside a car window as the car is moving? Let's pretend we're doing that now. Stick your hand out to the side of you, being careful to give each other enough space to move. Imagine the wind is hitting your hand fingers first, toward your wrist, because the car is moving (box fans can be on to help with demonstration).

ACT THIS OUT WITH ME:

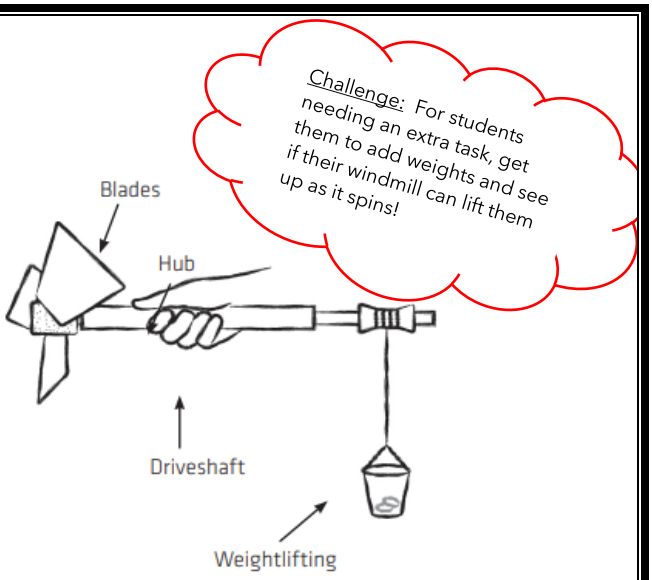
What happens if we tilt our hand, thumb pointing upward?

What if we move our hand flat, like it's cutting through the wind?

What happens if we tilt our hand, thumb pointing downward?

Now our hand is out, fingers together like we're making a wall. What happens to our hand?

Ask students to them act out with you how an airplane works. Demonstrate with arms out how very similar to an airplane, when we tilt our hands up, we go up. When we tilt down, we go down. This tilt angle makes a big difference if we want the wind to push something up or down.

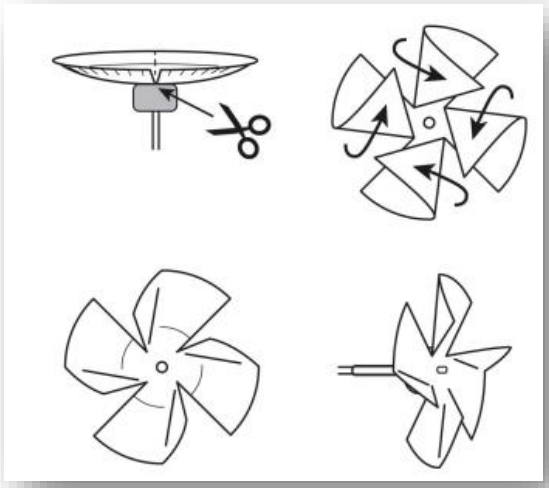


Step 3: Introduce the Mini Windmill and the main concepts

5 minutes

Emphasize the function of the blades and how they tilt into the wind.

The plate blades are making the windmill spin. This is the most important part, and the part they will be doing most of their investigation and discovery. The number of folded pieces and how much the folds are pointing up or down make a significant difference to how much the Mini Windmill spins. Show them with your hands the way the folded pieces are tilting. This tilt angle is called pitch.

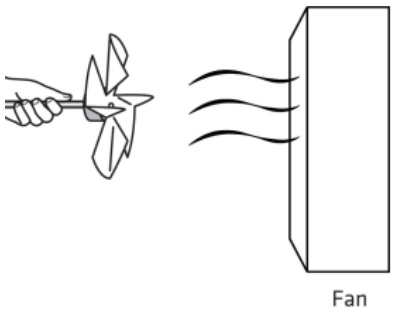


Step 4: The Mini Windmill Challenge

40 minutes

- The windmill must spin in the wind

The blades are what make the windmill spin. Pitch angle determines how much the blades spin in the wind. The pitch angle is up to the students to experiment with.



Test

Each windmill needs to be "arms length" from the fan for testing.

Reflect and redesign

Did the windmill accomplish the goals? If not, or if not very well, then students need to figure out a solution and make adjustments to the pitch angle.

REcharge Labs®