To Wind-Finity & Beyond!

Sarah Barker & Danielle Swartz
STEMAZing Teacher Leader Program

Good morning beautiful people!

Head to the back table and choose a toy that makes you feel something!

Introductions:

- Name
- School and title
- Why you chose your toy

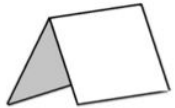
Bernoulli Probe:

1. Activate prior knowledge
2. Check for misconceptions

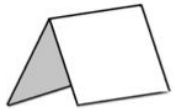
Name: _____ Date: _____

Bernoulli Paper Tents: Prior Knowledge Probe

1. Do you think the the air will move faster on the inside or outside of the tent when you blow through it?



2. Do you think the tent walls will blow in, up, or out when you blow through the tent?

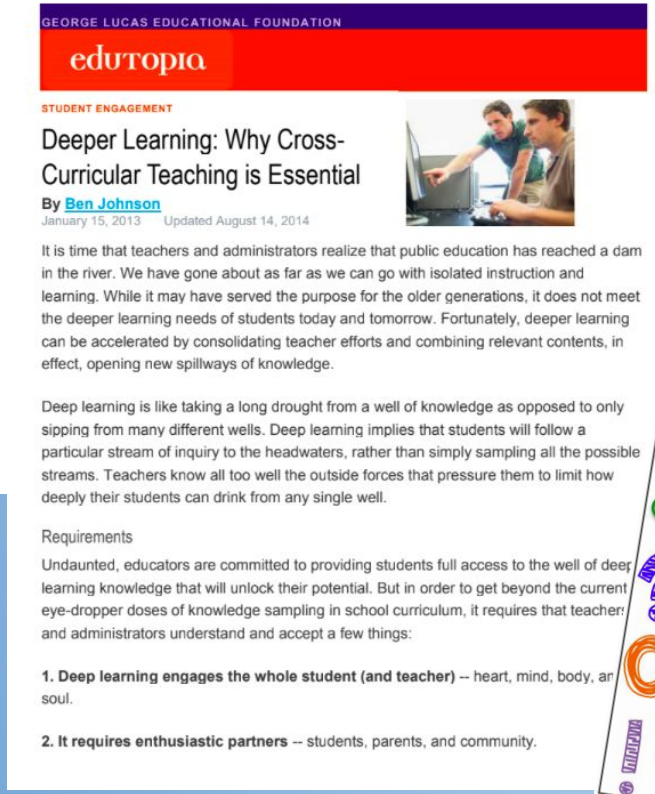


3. When air moves fast over an object, will it push the object up or down?

Daniel Bernoulli
1700-1782

2018 K-12 Arizona Science Standards

Deeper Learning: Why Cross Curricular Teaching is Essential


GEORGE LUCAS EDUCATIONAL FOUNDATION

edutopia

STUDENT ENGAGEMENT

Deeper Learning: Why Cross-Curricular Teaching is Essential

By Ben Johnson

January 15, 2013 Updated August 14, 2014

It is time that teachers and administrators realize that public education has reached a dam in the river. We have gone about as far as we can go with isolated instruction and learning. While it may have served the purpose for the older generations, it does not meet the deeper learning needs of students today and tomorrow. Fortunately, deeper learning can be accelerated by consolidating teacher efforts and combining relevant contents, in effect, opening new spillways of knowledge.

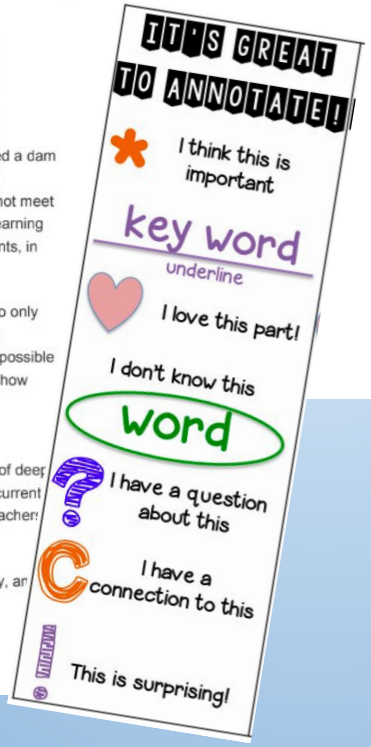
Deep learning is like taking a long drought from a well of knowledge as opposed to only sipping from many different wells. Deep learning implies that students will follow a particular stream of inquiry to the headwaters, rather than simply sampling all the possible streams. Teachers know all too well the outside forces that pressure them to limit how deeply their students can drink from any single well.

Requirements

Undaunted, educators are committed to providing students full access to the well of deep learning knowledge that will unlock their potential. But in order to get beyond the current eye-dropper doses of knowledge sampling in school curriculum, it requires that teachers and administrators understand and accept a few things:

1. Deep learning engages the whole student (and teacher) -- heart, mind, body, and soul.

2. It requires enthusiastic partners -- students, parents, and community.



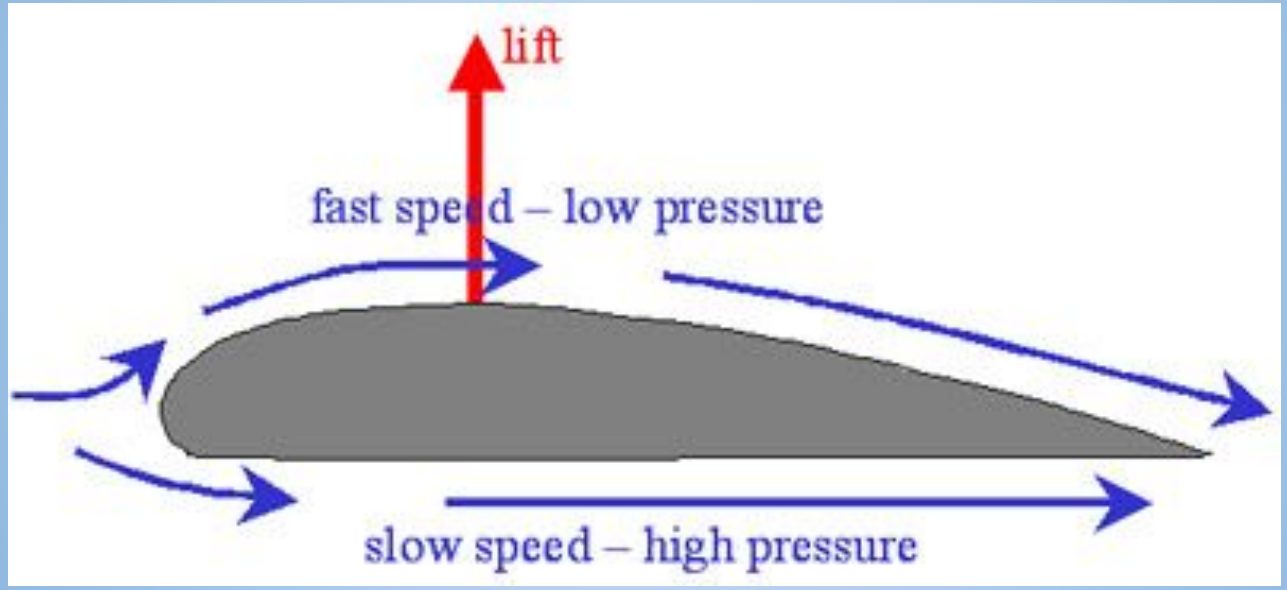
twitter

Use a sentence strip to "tweet out" something that you found to be important using 20 words or less.

Bernoulli Bags

3 closest birthdays

Bernoulli's Principle



primary:https://www.youtube.com/watch?v=KFE98nje_L0

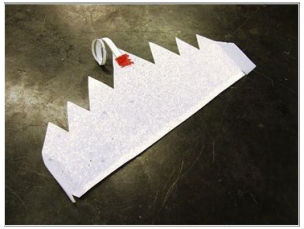
Intermediate: https://www.youtube.com/watch?v=sIrJOrTAJjg

Bernoulli Investigations

- Ping pong Possibilities

https://www.youtube.com/watch?v=159JUN6e9rA

- Big mouth gliders/Jagwing gliders



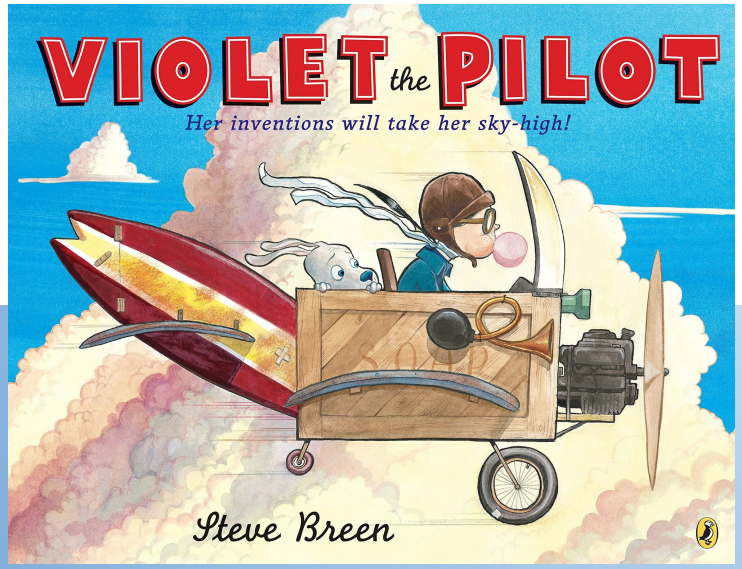
https://youtu.be/PPNTlilxGF0

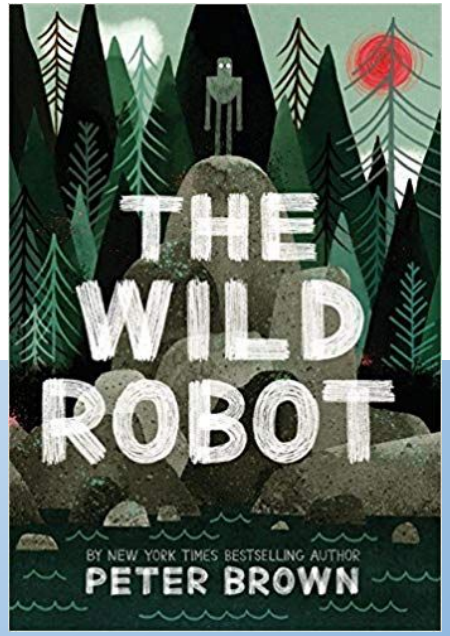
https://youtu.be/gEZ-riuX5qY

- Soda can Science

https://www.youtube.com/watch?v=UlN47zGNBDw

Literacy Connections

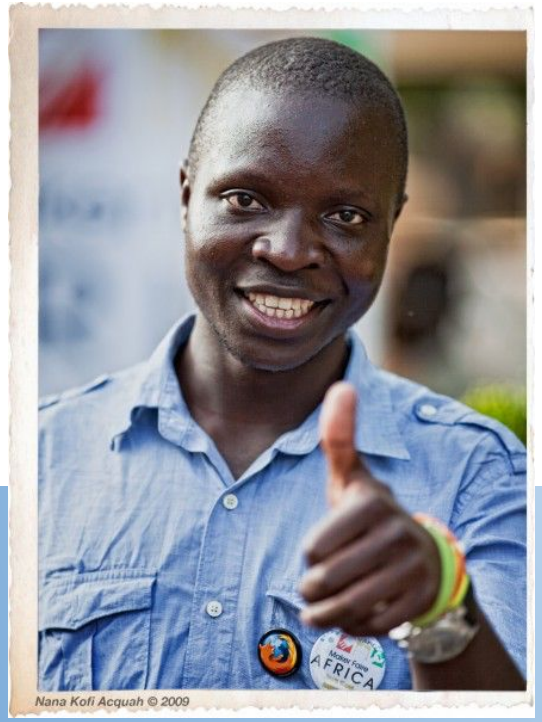




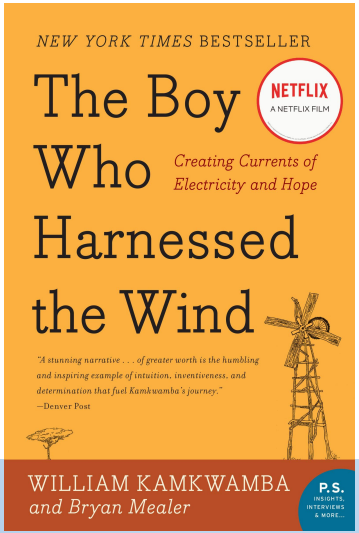
Break

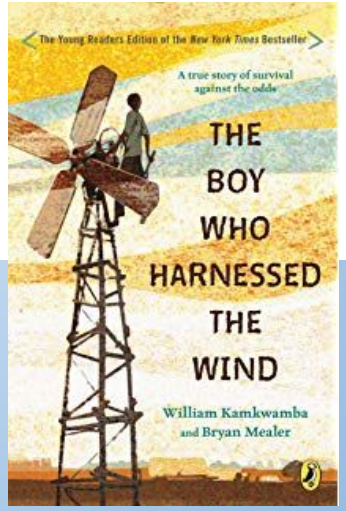
11:20-11:30

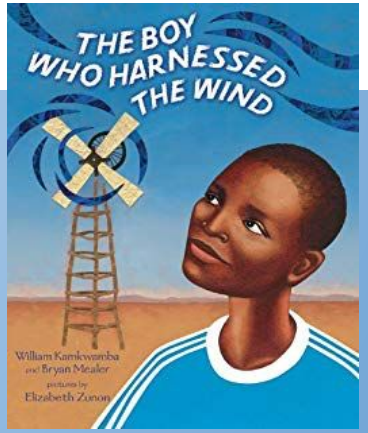
Real World Application



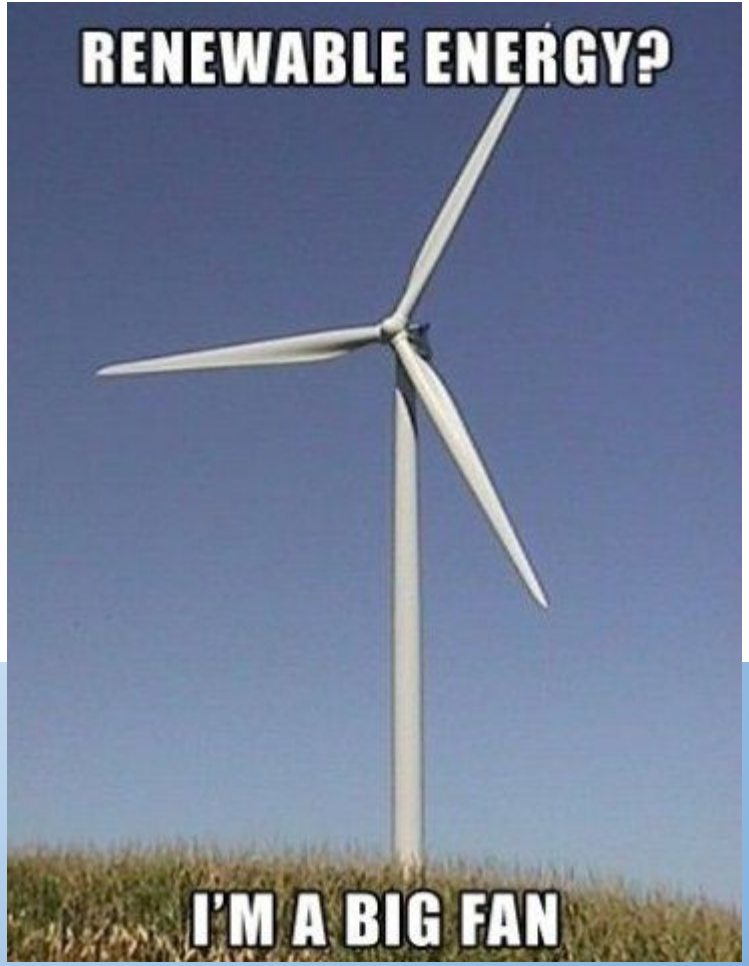
Meet William Kamkwamba



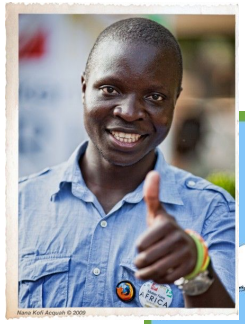




Lunch



Building global citizens



Why do we need renewable energy?

Facts and figures about our current energy supplies

Coal reserves

The USA has the largest coal reserve, with Russia coming in second and China third.

Sea levels rise

The rise in atmospheric temperature is causing the world's ice caps to melt, leading to a rise in sea levels.

Gas reserves

The country with the largest natural gas reserves is Iran, followed by Russia and Qatar.

Extreme weather

Global warming also affects weather patterns, leading to more extreme weather, such as droughts, flooding and hurricanes.

Global warming

Gases such as carbon dioxide, which are given off by burning fossil fuels, trap heat inside the Earth's atmosphere.

Coal supply

In circa 250 years, the world's supply of coal is expected to run out.

Oil reserves

Venezuela has most of the world's proven oil reserves, followed by Saudi Arabia, Canada, Iran and Iraq.

Oil supply

The world's oil supply is expected to run out in about 50 years.

Gas supply

Our supply of natural gas is likely to run out in about 70 years.

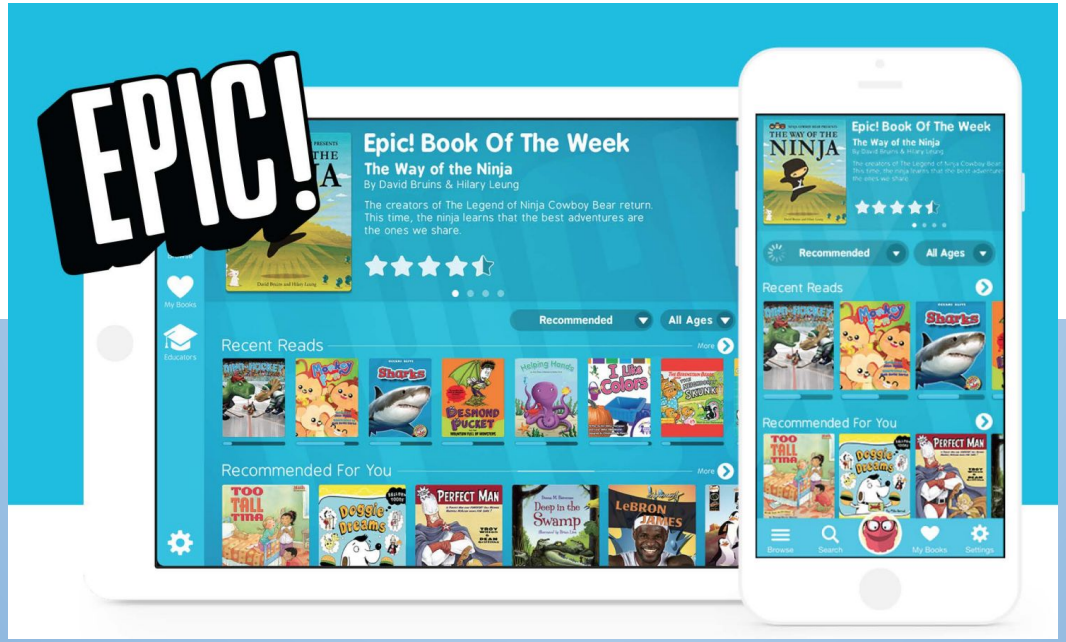
National Energy Development Project

NEED Energy info books

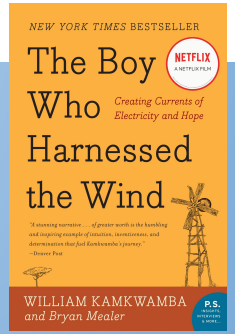
https://www.need.org

Free Teacher resource:

https://www.getepic.com

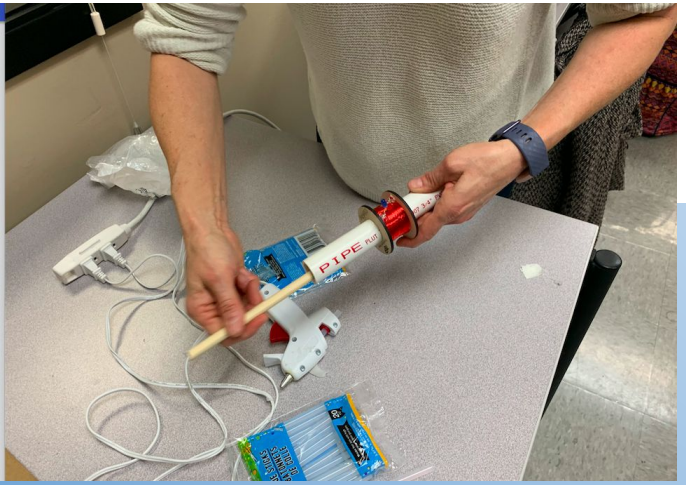


What did Electricity mean to William?
What does electricity mean to your students?



Taking the magic out of electricity:

Homemade generators

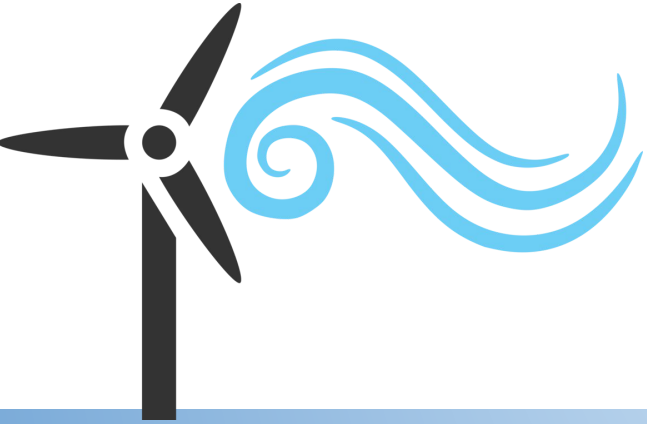


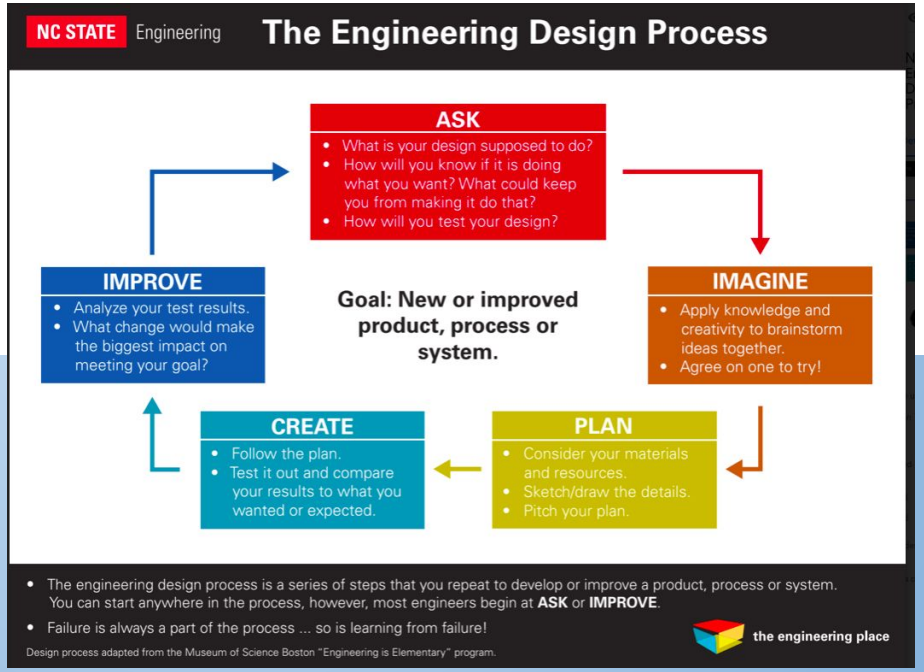
Taking the magic out of electricity:

Homemade generators

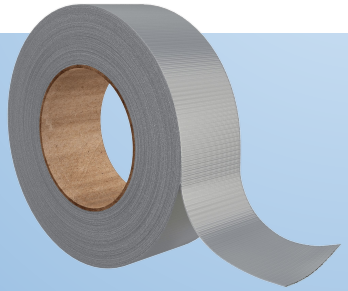
Applying the Engineering Design Process (EDP)

Generating electricity with Windmills



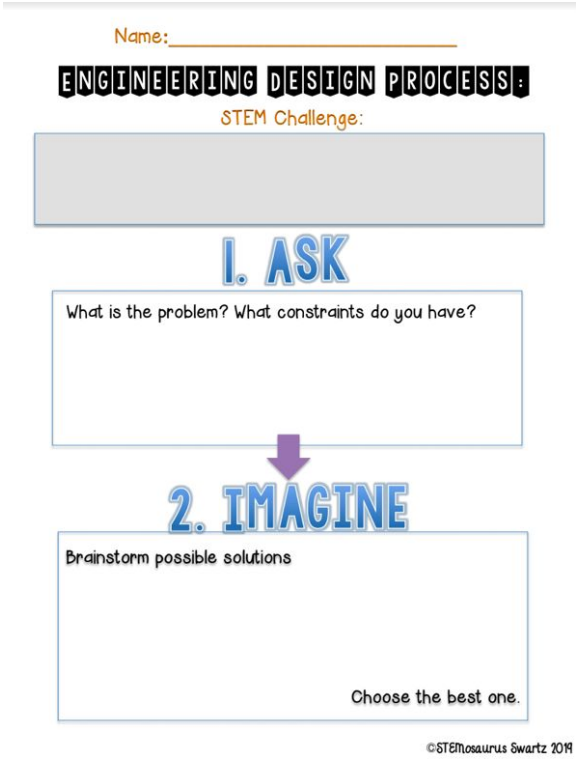


Building The Base



Ask: What are the problems and Constraints?

1. Design blade that will effectively catch the wind from a fan
2. Generate enough power to light the LED
3. Improve the design to better harness the wind



Constraints:

- no more than 9 blades
- only one blade material should be used at a time
- only one blade shape should be tested at a time
- only change one variable at a time

Imagine: Brainstorm Solutions

windmill

Name:_____

ENGINEERING DESIGN PROCESS:

STEM Challenge:

1. ASK

What is the problem? What constraints do you have?

2. IMAGINE

Brainstorm possible solutions

Choose the best one.

ENGINEERING DESIGN PROCESS:

3. MAKE A PLAN

Draw and Label your Design

What materials do you need?

- _____
- _____
- _____
- _____
- _____
- _____

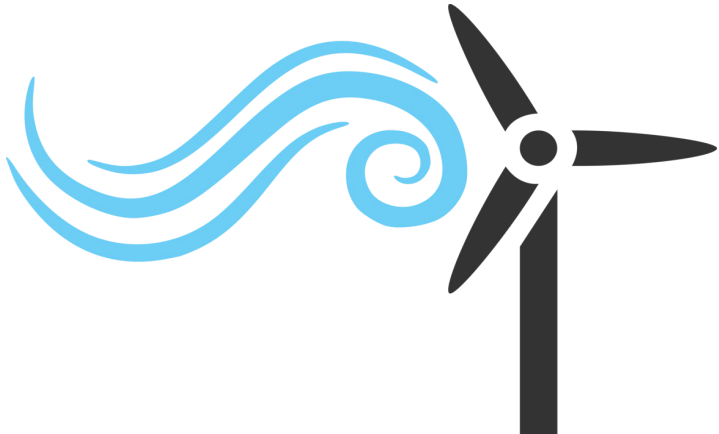
4. CREATE!

Follow your plan and test your design!

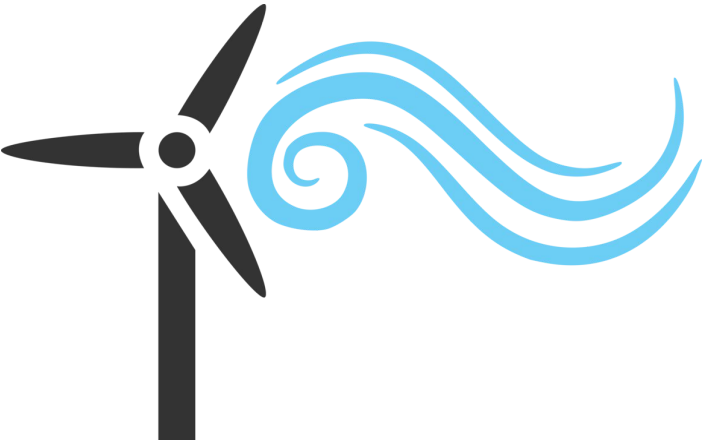
5. IMPROVE!

Did your plan work? (circle)
Yes No
How can you improve it?

PLAN: DRAW A DIAGRAM



Create: Build and test



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ENGINEERING DESIGN PROCESS:

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What materials do you need?

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- _____
- _____

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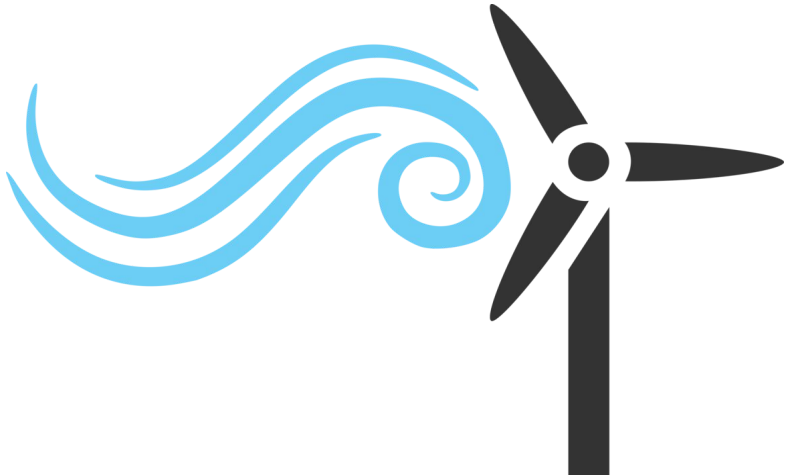
5. IMPROVE!

Did your plan work? (circle)
Yes No
How can you improve it?

Improve:
How can you make it better?



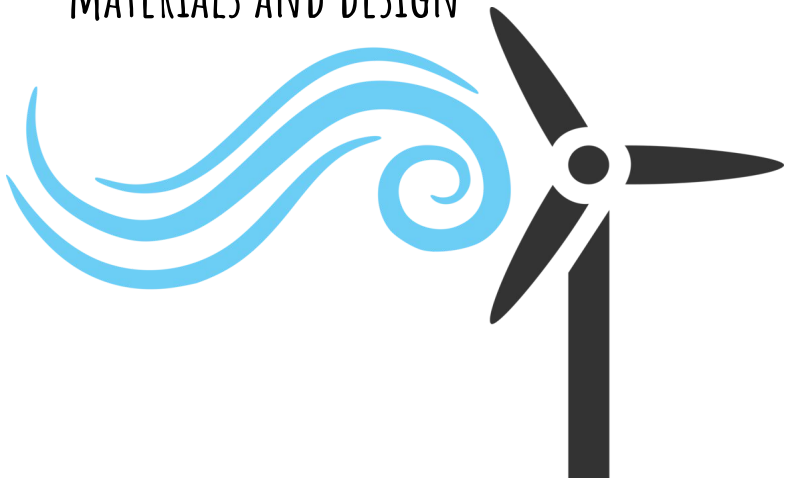

MAYBE I SHOULD'VE BEEN GIVING ALL THE NAUGHTY KIDS SOLAR PANELS INSTEAD OF COAL.
airbearentertainment.com
Stines

Break

Engineers share what they've learned!

Build a Billboard:

- Design a billboard to explain your design to our group
- Persuade others to choose your materials and design



2018 K-12 Arizona Science Standards

How do the activities from today fit into your standards?

Thank you for coming!

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sbarker@tanq.org

An extra special thank you to the following people and organizations who helped make today possible:

NEED National Energy Education Development Project — Mary Spruill

TEP — Jennifer Cox

Science Toymaker — Slater Harrison