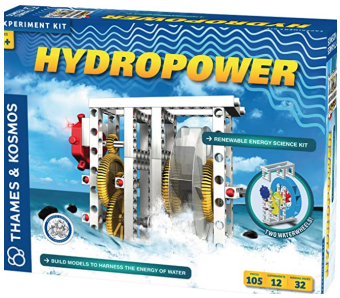
TEXAS 4-H
4-H STEM District-Wide Research Project

Title: Hydroelectric Power
Grade Level: 4th, 5th, and 6th grade
TEKS: Science
4.1(A), 4.2(A)(B)(C)(D)(E)(F)(G), 4.3(A)(B)(C), 4.4(A), 4.6(A), 4.7(C), 4.8(B)
5.1(A)(B), 4.8(B), 5.2(A)(B)(C)(D)(E)(F)(G), 5.3(D), 5.4(A)(B), 5.6(A)(B), 5.8(B), 5.9(C)
6.1(A), 6.2(A)(C)(D)(E),

Title of Lesson: Hydroelectric Power

Objectives (2 to 4):
The participants will:
Learn the Steps of the Scientific Method
Renewable vs. nonrenewable energy sources, hydroelectric power operations and their sustainability
Practice the 15 STEM Abilities (build, categorize, collaborate, demonstrate, describe, contrast, solve, design, evaluate, hypothesize, invent, infer, interpret, measure and learn the basics of graphical representation)

Supplies:
Hydropower kit
Voltmeter
Safety lab equipment (goggles)
Computer
Programs used (google docs, google sheets, google slides)



Explore the Content:
Vocabulary:
Hydropower: or hydroelectric power uses the natural flow of moving water to generate electricity.
Potential energy: Stored energy in an object or energy.

Kinetic energy: a form of energy that an object or particle has by reason of its motion.
Renewable energy: or clean energy comes from natural sources or processes that are contently replenished.
Nonrenewable energy: A nonrenewable source is a natural substance that is not replenished with the speed at which it is consumed.
Metric system: System of measurement that uses the meter, liter and grams
Volts: Voltage is the pressure from an electrical circuit's power source that pushes charged electrons (current) through a conducting loop.
Watts: Describes the rate or power flow.
Graph: A diagram showing the relation between variable quantities.
Angle: Space between tow intersecting lines or surfaces at or close to the point where they meet.
Pressure: Continuous physical force exerted against an object by something in contact with it.
Dams: A barrier built across a river to create a body or water.

Main Question: Does the (angle, pressure, distance of water dispensed) affect the volts generated through a hydropower system?
Independent Variable**:** Angle of the blade (catch or flow) or water pressure
Dependent Variable: Volts generated)
Possible Hypothesis:
Formulas:

- If____(IV)___ is related to ___ (DV)____, then (predict the effects).
- If the ____ (IV) is (describe the changes) then the ___ (DV) will (predict the effect).
- __ the (DV) will (predict the effect) when ___ (IV) ___ describe the changes.

Examples:

The water blade angle is related to the number of volts generated by the generator, and the blades which allow water to flow will generate more volts than when they catch water.

The higher the water pressure, the more volts the turbine will generate.

Steps to conduct research:

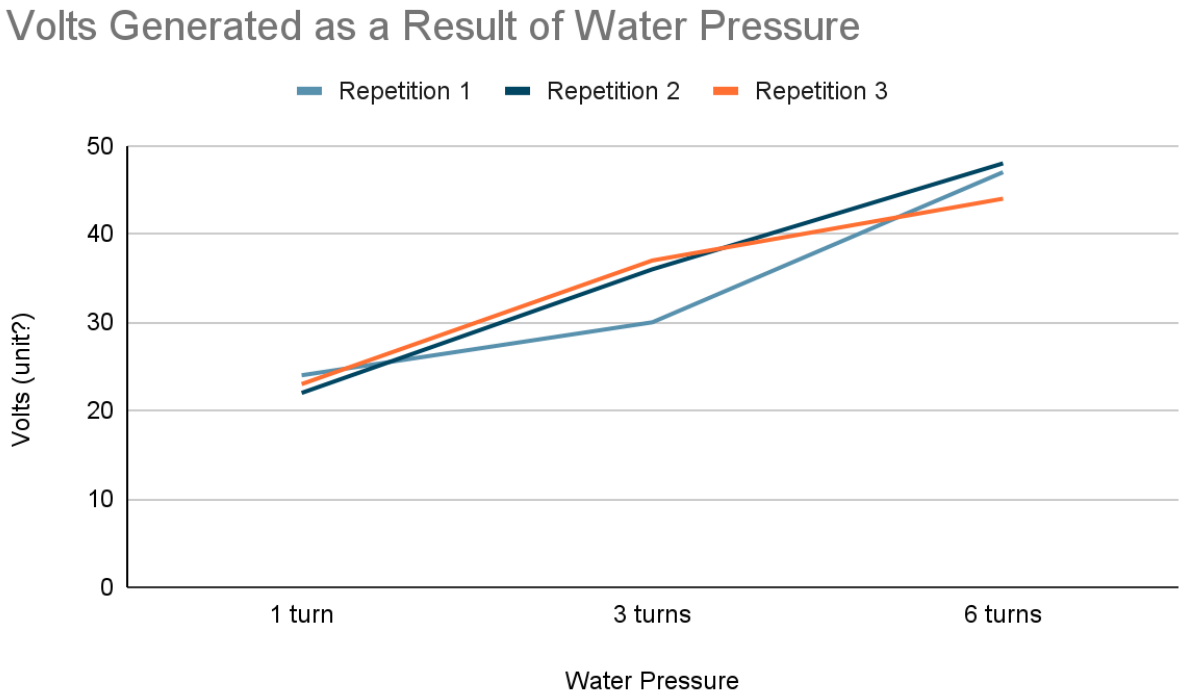
1. Students will assemble the Thames and Kosmos Hydropower kit following the manual instructions pages 27 to 31. (Students will learn the basics of gear function and generator)
2. To ensure proper assembly, students will use the LED light to test for power generation (students will learn the basic concept about closed circuits)
3. [Students groups choose variable to test]
4. Students will test variable, measuring the volts produced 3X
5. Students will record data on a table.
6. Some students will construct a line graph in order to predict trends (6.2 E). Others may choose a bar graph to show comparisons between angles of buckets.

Data collection Table

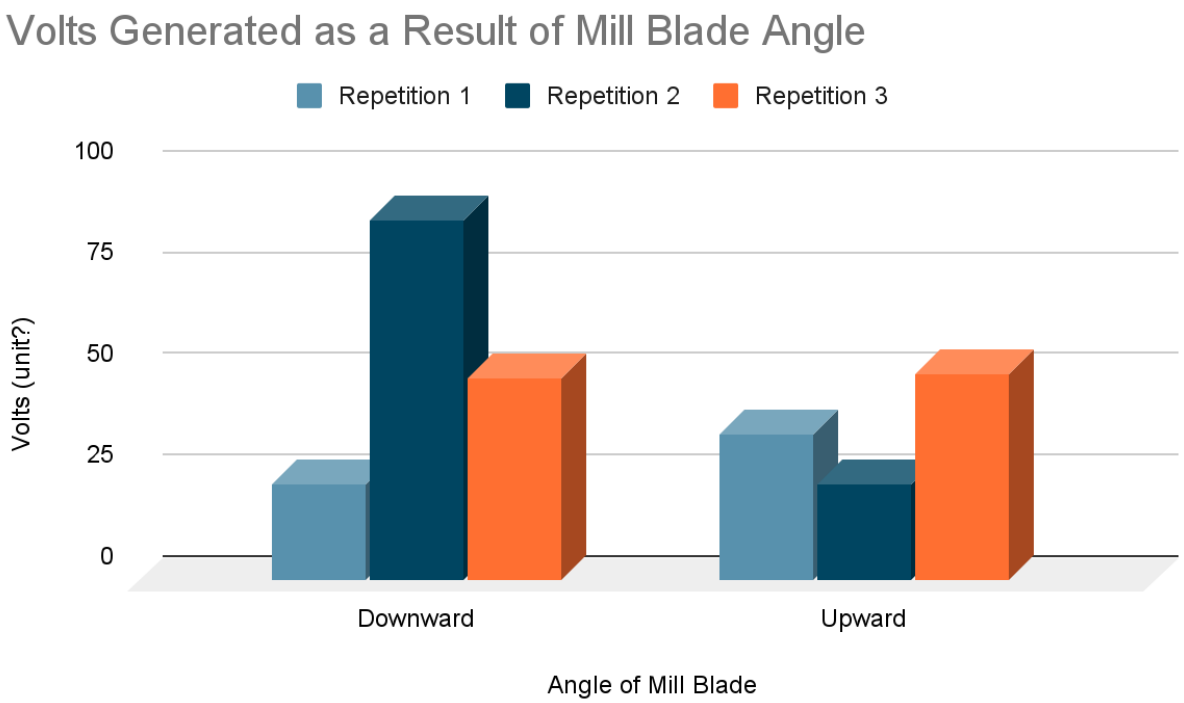
	Independent (Treatment) Variable	Dependent Variable	**Observations**
	Pressure OR Angle (downward to catch vs. upward to let flow)	**Volts (unit__?_) of electricity**	
1st repetition			
2nd repetition			

3rd repetition			

Example of chart if students used pressure as IV:



Example of chart if students used angle as IV:

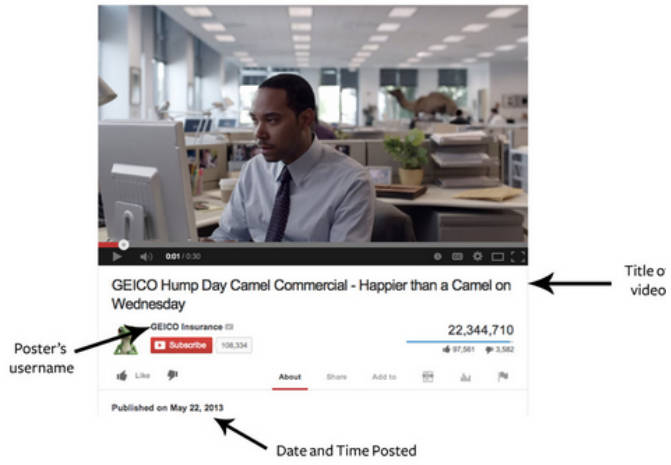


Useful Websites

APA Citation
http://writing.wisc.edu/Handbook/American_Psychological_Association_%28APA%29_Documentation_M.pdf

APA Video Citation

Last Name, F.M. [Username]. (Year, Month Date). *Title of video*. [Video File]. Retrieved from URL.



Example:

[GEICO Insurance]. (2013, May 22). *GEICO Hump Day Camel Commercial – Happier than a Camel on Wednesday*. [Video File]. Retrieved from http://youtu.be/kWBhP0EQ1lA.

Poster Creation Using Microsoft Power Point
https://www.youtube.com/watch?v=1c9Kd_mUFDM