



POWERWHEEL SNAPSHOT LESSONS

“5 minute lessons remembered for a lifetime”

Teaching the following:

- Defining “micro-hydro generator”
- Seeing and hearing how electricity is made using hydro power.
- Comparing types of light bulbs...(LED and Incandescent)
- Determining if we save energy when we turn off the lights in our homes when not in use

Summary:

- By encouraging observation, asking questions and promoting students to look, listen and think, we can help them become better prepared to make informed decisions about energy.
- Each of these lessons can be done separately or in a sequence depending upon teacher’s priorities and time allowed.

Suggested Grade Levels:

3rd-12th Grade

STEM:

Time Needed: 5-10 minutes for each snapshot lesson

Equipment Needed:

PowerWheel, LED lights, Incandescent Light

Pre-Lesson Set-up:

- Watch the video on the PowerWheel website to review the process of doing each “snapshot”. Start at the 1:57 mark and continue watching until the 4:50 mark.

Snapshot 1

1. PowerWheel as a micro-hydro generator.

- a. Have the observers help you define the words:
 - i. Micro=small
 - ii. Hydro=water
 - iii. Generator=going to make something
- b. The PowerWheel is a small thing, using water to make something...in this case, electricity.
- c. The PowerWheel is an example of how energy and electricity is created in our world using hydro power.
 - i. Use local examples around you that utilize dams, rivers, turbines or other methods of creating hydro electric power.



Snapshot 2

2. Show how the PowerWheel works.

- a. Have PowerWheel hooked up to LED lights...
- b. Explain that you are going to use the tap water to make electricity
- c. Turn on the water and watch lights glow.
- d. Turn water off and ask the observers to watch and tell you what happens when you turn on the water again:
 - i. What do they see? What do they hear? What do they think is happening?
 1. Encourage them to take it a step at a time and be specific...*water turned on, pelton wheel turns, which turns the pulleys, which turns the generator shaft, which creates the electricity which lights the string of LED.*
- e. Have observers answer this question: How do I make the lights get brighter?
 - i. More water=more water pressure=turbine goes faster=pulley wheels go faster=generator shaft turns faster=more electricity created=brighter lights...
 - ii. What do they see? What do they hear? What do they think is happening?

Summarize:

The PowerWheel is a micro-hydro generator that uses water to create electricity by: (go through the steps with the observers again)

Snapshot 3

3. Comparing LED to Incandescent lights...

- a. Get LED lights to moderate level of brightness where PowerWheel is not working very hard (can tell by sound)...
- b. Unhook LED lights but keep PowerWheel and water running....
- c. Show the observers the Incandescent Bike Lamp...ask them the question, "If I don't change the amount of water going through the PowerWheel, thus not changing the amount of electricity being produced...will I get the same amount of light, less light, or more light when I hook up the bicycle lamp?"
- d. Listen to the answers and then ask them why they said what they did...some examples:
 - i. More=bulb is bigger so there will be more light
 - ii. Less=takes more energy because it is bigger/older...will create heat etc.
 - iii. The same=amount of electricity is same
- e. Hook up Incandescent bulb to PowerWheel...
 - i. What do they see? What do they hear? What do they think is happening?
 - ii. Who was right? Was there more, less or the same amount of light?
- f. Have observers answer this question: How do I make the lights get brighter?
 - i. More water=more water pressure=turbine goes faster=pulley wheels go faster=generator shaft turns faster=more electricity created=brighter lights...
- g. Turn on more water:
 - i. What do they see? What do they hear? What do they think is happening?
 - ii. Were they correct in their suggestions?
- h. Ask question-Which light bulbs are most efficient? What type would they buy if they wanted to use the least amount of electricity?

Summarize:

There are choices that everyone can make to save electricity and energy...even to what type of light bulbs we choose to use.



Snapshot 4

4. Does turning off the lights save energy and electricity?

- a. Using the incandescent light, turn up the water to make the incandescent light brighter
- b. Tell your observers that you are going to unplug the light and to make sure that they listen to the PowerWheel.
- c. Unplug the incandescent light.
 - i. What do they see? What do they hear? What do they think is happening?
- d. Explain that the faster turbine turning and the higher level of noise is because the PowerWheel is not having to work as hard...in other words, the "load" of work is off...and the PowerWheel can now be turned down...saving electricity, saving energy and saving water.
 - i. You can illustrate this in another way...imagine if you draped yourself over the back of another individual and had them drag you to the other side of the room...if you suddenly released yourself from that person...would they be able to walk faster or would they go slower? Releasing the load on the PowerWheel turbine by turning off the light, allows the PowerWheel to go faster...which we don't need...so we can turn down the water source...saving energy and electricity.

Summarize:

There are everyday choices that we make when it comes to saving energy. What kind of choices are there? What choices do you make?

Extra Credit:

In any of the snapshots above, you can use the various gear ratios available on the PowerWheel to set up a whole different set of observations and questions. For example:

- What gear ratio will make the PowerWheel use the most energy to turn on the LED lights?
- What gear ratio will make the PowerWheel use the least energy to turn on the LED lights?
- If I want the PowerWheel to run even faster, what gear ratio would I use?
- Will changing the gear ratios help make the lights become brighter?
- If I want to turn the largest pulley by hand, which gear ratio would make it easiest for me to light up the LED's?

Teacher Notes: