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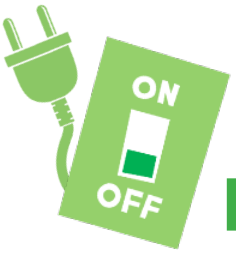

Gaia's Teacher Guide: Plugged-in Loads Audit

Grade level: 6-12

Objective: Discover how much energy consuming items that are plugged-in around your school are using. Translate this into financial and environmental findings.

Length: 3-5 days (group, or independent project-based)

Pre-activity: Get students to estimate how many things they have plugged-in at home and invite them to a discussion with you to figure out an average number.

Energy overview: Energy is the amount of kilowatt-hours (kWh) used by an electrical device (i.e. a lightbulb, plugged-in item, or heating device).

Equipment:
- Energy monitor (see picture on the right - can be borrowed from any New Brunswick public library or by contacting The Gaia Project to borrow some based on availability of resources)
- Table 1 (Estimating yearly energy use, cost and CO_2)
- Calculator

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Method:

STEP 1: Choose items around the school which are plugged-in that you want to monitor (i.e. interactive whiteboards, lamps, vending machines, etc.) Write down items in column 1 of Table 1.

STEP 2: Do an inventory of how many of these items may be in the school (i.e. if you choose interactive whiteboards, count or estimate how many are in the school). A survey could be useful here to help figure out the number of items. Write down the results in column 5 of Table 1.

Plugging in and setting up the energy monitor:

STEP 1:

Plug the energy monitor directly into the outlet.

STEP 2:

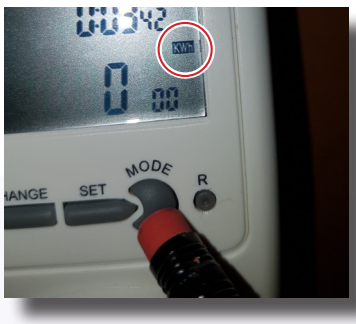
Plug in item you want to measure directly into the energy monitor.

STEP 3:

Using the tip of a pencil, press the "R" button to reset the energy monitor memory. (screen will go blank)

STEP 4:

Press the "MODE" button multiple times until the kWh unit appears in the center of the right side of the screen.



STEP 5:

Leave it plugged in for 24 hours and the energy monitor will indicate how much energy the item you are measuring uses in 1 day.

NOTE: Inform teachers/admin staff of the importance to use devices in the school as they normally would to avoid affecting the results of the experiment.

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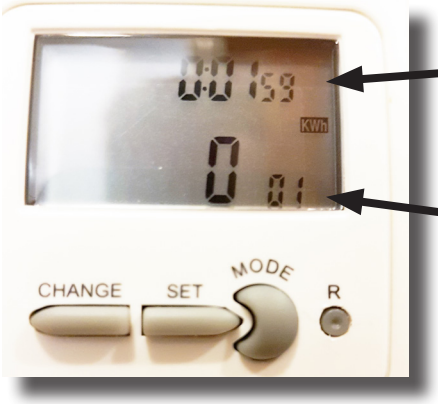
The next day:

STEP 1: Before unplugging the device and energy monitor, write down the number appearing on screen (not the time but it should be around 24hrs if it's the same time as the day before). Make sure the monitor is still on the kWh mode. If not, press the "MODE" button repetitively until you have the right unit. The large number represents units and the small ones, decimals.

STEP 2: Write down that energy consumption value in kWh under column 2 in Table 1. Example:



Shows time elapsed since the energy monitor was reset

The number you would record here is <u>0.01 kWh</u>

STEP 3: Using a calculator, follow the steps outlined in Table 1 (all simple multiplications).

Important information:
Each kWh used in New Brunswick schools costs around 10¢ ($0.10). Every time fossil fuels are burned to make energy in New Brunswick, CO_2 is released into the atmosphere contributing to global warming and, in turns, to climate change. For every 1 kWh of electricity consumed in the province, it is estimated that 290 grams of CO_2 is emitted into the atmosphere (or 0.29 kilograms).

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Possible improvements:

1. Create team of students to unplug devices at the end of the school day and re-plug everything the next morning.

2. Evaluate if all vending machines are necessary. Follow up with a survey of use. Check if same items may be sold in the cafeteria instead.

3. Ensure all lamps have LED light bulbs.

4. Turn on timer setting on interactive whiteboards so they automatically turn off and check to make sure they operate under the econo mode (if applicable).

Share your findings with us and any sustainable improvements you make at your school!

Use hashtags:
#GaiaPluggedAudit #GaiaSchools

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Table 1: Estimating energy consumption, cost and CO_2 emissions in a year

1	2	3	4	5	6	7	8
Device	Energy/day (kWh) ** taken from energy monitor after 24 hours*	Energy/year (kWh/yr) *= Energy/day (kWh) x School days/year*	Cost/year ($/yr) *= Energy/yr (kWh) x $0.10/kWh*	Number of devices in the school	Cost/year of all devices ($/yr) *= Cost/year of one ($/yr) x Number of devices*	CO_2/year of each device (CO_2/yr) *= Energy/yr (kWh) x 290 gCO_2/kWh*	CO_2/year of all devices (CO_2/yr) *= CO_2/yr one device x Number of devices*
Example: Mr. B's Computer	**0.75 kWh**	0.75 kWh x 185 days **= 139 kWh/yr**	139 kWh/yr x $0.10/kWh **= $14/yr**	**30**	$14/yr x 30 devices **= $420/yr**	139 kWh/yr x 290 g CO_2/kWh = 40,310 g CO_2/yr **= 40 kg CO_2/yr**	40 kg CO_2/yr x 30 devices **= 1,200 kg CO_2/yr**

Important Information : - There are on average 185 school days in a year in New Brunswick.
- Every kilowatt-hour consumed in NB cost around 10¢ ($0.10).
- Every kilowatt-hour consumed in NB contributes to the emission of 290 g of CO_2 (0.29 kg).

Extra activity: Enter your CO_2 data into the following calculator to find out how many trees you would have to plant to remove that amount of CO_2 from the atmosphere:
https://tinyurl.com/calculepa