Should I Unplug?

**Background:** A wide variety of devices and appliances that we use frequently require electricity: cell phones, laptops, tablets, headphones, music players, computers, refrigerators, microwaves, washers, dryers, televisions, blow dryers, hair straighteners, etc. The energy used by a device while powered by means of an ordinary AC plug is known as its plug load, and the “amount” of electric power an electrical product uses is measured in units known as watts. If an electrical product is turned off, but remains plugged in to an outlet, the device still draws a small amount of power from the outlet. This unnecessary energy is often referred to as phantom load, standby power, or vampire power. In terms of needless electricity usage, there are several issues that can be considered; this project emphasizes monetary costs of phantom loads.

**In-Class Activity for Small Groups:**

1. Use a wattage meter to measure and record the plug load of a cell phone, a laptop, and a music player. Also measure and record the plug load of each charger alone.
2. Use a wattage meter to measure and record the plug load of a coffeemaker and a hair dryer.
3. Use your measurements to estimate the cost of electricity associated with using these electrical products for some duration of time. To get you started, the information below shows how to estimate the cost of electricity required to run a laptop for 24 hours. As a group, think of a similar example and perform the calculation for your specific example. In your example, are you computing the cost of a necessary load or an unnecessary (phantom) load?

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Example Calculation of Translating Wattage to a Dollar Figure:

The Cost of Running a Laptop for 24 Hours

Basic information:

* A watt is the unit of electric power; it measures the rate of energy conversion or transfer
* There are 1000 watts in one kilowatt
* A kilowatt hour (kWh) is a unit of energy equivalent to one kilowatt of power expended for one hour of time

Assumptions:

* The wattage of a laptop is 50 watts
* The price of electricity is 12 cents per kWh (kilowatt hour)

The cost of electricity necessary to run a laptop for 24 hours under the above assumptions is:

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**Group Project (Outside of Class):**

1. Investigate phantom loads associated with cell phones. Each cell phone takes a specific amount of time to charge. Leaving the phone plugged in to an outlet after it is fully charged is a plug load that could be eliminated. Additionally, leaving the charger plugged in by itself is an unnecessary plug load. Estimate how much money could you save over the course of a year by eliminating these plug loads. Also discuss alternative uses of the money you could potentially save.
2. Investigate student phantom loads. There are numerous electronic devices and small appliances that students use regularly. If these products remain plugged in while not in use, they draw standby power.
   1. Estimate the daily monetary cost associated with the total phantom load for appliances and devices that students regularly leave plugged in while not in use. If you include a product whose standby power we measured during the in-class activity, you can use the measurement from class; for devices whose standby power we didn’t measure in class, use a measurement you find on the internet.
   2. If living in an apartment, how much money could an individual student save each month by eliminating unnecessary plug loads? Each year?
   3. If living in a dorm room, how much money could an individual student save the university each month by eliminating unnecessary plug loads? Each year?
   4. Estimate the monthly and yearly savings to the university if all the students in an entire dormitory eliminated their phantom loads.
   5. What are some broader implications of eliminating phantom loads?
   6. Explore any other questions you may think of.
3. Present your investigations and results to the class in the form of an oral presentation accompanied by a visual display. Presentations will be graded using the following rubric:
   1. General overall quality (10 points)
   2. Clarity, thoroughness, and accuracy (70 points)
      1. Logical flow (10 pts.)
      2. Research beyond that presented in class and at least two cited sources (10 pts.)
      3. Investigation and results of all topics and questions presented (20 pts.)
      4. Calculations displayed; accuracy of calculations (30 pts.)
   3. Summary that includes a thoughtful and thorough response to the question “Should I unplug?” (20 points)