

Teacher Notes-“Cost Of My Classroom Lights”

Ready for a practical lesson that will show your students how expensive lights are? In this activity students will begin with a series of calculations (with your help...all they really have to do is copy off the screen) to see the hourly cost of one fluorescent light tube.

Once you have the hourly cost of one tube, they will multiply that by the number of tubes, then times the number of hours per day they're on, and again by the number of school days. That final number is the cost of the electricity to power the lights in your classroom per year.

Materials per group (2 students):

- Calculator- Yes, every student needs one. Make every student pick up and do every calculation. The quickest students will always call out the correct answer first. Have everyone else do the math “just to check and make sure they're right”.
- PowerPoint- There are 2 versions you can choose from- 1 that has 60 fluorescent lights, and the other with 68. If neither fit your room, click on and change the numbers. Feel free to also change any other number- the wattage of the light tubes, the rate of electricity, the number of hours the lights are on per day, and the number of school days in a year.

Procedure:

1. Give students a copy of the handout (see last page). They can also do this work on a clean sheet of paper.
2. If using clean paper, at the top have them copy the title- “Cost Per Hour Of 1 Fluorescent Light Tube”.
3. Ask how much electricity each fluorescent light tube uses per hour. If know one knows, tell them it's about 18 watts and have them write that down.
4. Since we're setting this up as a proportion, our denominator (the hourly cost of that tube) will be “x” since it represents the cost per hour- this is what we're trying to figure

Cost Per Hour Of 1 Fluorescent Light Tube

18 watts/hr

Cost per hour → ×

out.

5. As these PowerPoint animations pop up on your screen, have students copy it onto their paper.

6. On the right side of the equation we'll set it equal to the rate of electricity. These numbers came from a recent electric bill I got at home (Indiana). If you want, change this rate to reflect what you pay.

Cost Per Hour Of 1 Fluorescent Light Tube

$$\frac{18 \text{ watts/hr}}{x} = \frac{1000 \text{ watts/hr}}{\$.085}$$

Cost per hour → x } Rate of electricity

7. The standard unit of electricity is the kilowatt-hour. Give an example based on this: “If you had a small 1000 Watt space heater and ran it for exactly 1 hour, it would cost how much money?” (8 ½ cents.)

8. To solve a proportion, cross multiply. As shown, 1000 times x = 18 times .085. Going the other way you get 18 times .085, which is 1.53.

Cost Per Hour Of 1 Fluorescent Light Tube

$$\frac{18 \text{ watts/hr}}{x} = \frac{1000 \text{ watts/hr}}{\$.085}$$

Cost per hour → x } Rate of electricity

$$1000x = 18 * .085$$
$$1000x = 1.53$$

9. We're still not done, because we have 1000 stuck on the x. Ask if anyone knows how to get rid of it. (Divide both sides by 1000.)

10. Doing that isolates the x on the left side. On the right, divide 1.53 by 1000. Have students do this in their heads- it's quicker and easier than with a calculator. Ask how many zeros there are in 1000. (3). That means we'll move the decimal guess-how-many places to the left? (3)

Cost Per Hour Of 1 Fluorescent Light Tube

$$\frac{18 \text{ watts/hr}}{x} = \frac{1000 \text{ watts/hr}}{\$.085}$$

Cost per hour \rightarrow x } Rate of electricity

$$1000x = 18 * .085$$

$$\frac{1000x}{1000} = \frac{1.53}{1000}$$

$$x = \$.00153 = \boxed{\$.002}$$

Each tube costs 1/5 of a penny per hour

11. Let's round that number to the nearest thousandths place, making it \$.002

12. All of that probably went by a little too quick for everyone, so pause and take a moment to understand what \$.002 means: *it costs one-fifth of a cent to light one of your fluorescent tubes for one hour.*

“That’s incredibly cheap! So why is everyone telling us to turn off lights and conserve electricity?”

13. Now that we know what it costs per hour for 1 light tube, ask students what's next. If they're stuck, point up at a light fixture and repeat- “Ok, we just figured the cost of *just one* of these lights for *just one* hour. So what's next?” (The cost of all the bulbs per hour.)

14. On the PowerPoint, it will show the prompt “Number of light tubes in this room” before the number is given so that you can wait there while everyone counts.

Cost per year of lights in this room:

$$\boxed{.002} \times 60 = \boxed{\$ 0.12}$$

Cost per hour of lights \times Number of light tubes in this room $=$ It costs twelve cents to light this room for one HOUR

15. Once you've counted, reveal the number, and HAVE THEM do the

calculation. Don't reveal the answer until everyone is in agreement what the number is.

16. The answer shown is 12 cents, which is still not very much money. Things are about to change...

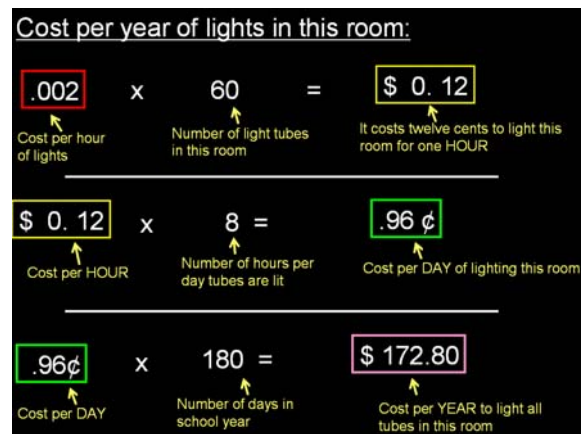
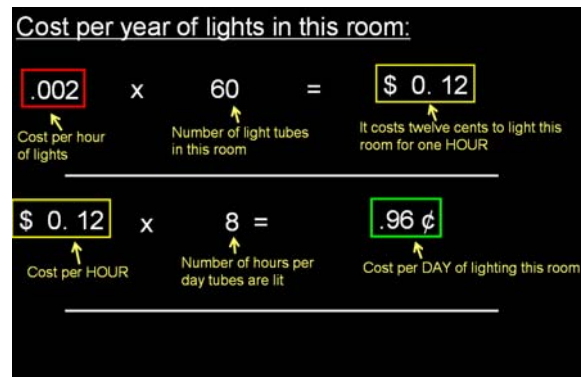
17. "Ok students, so now we know what it costs per HOUR to light ALL the lights in here. What's next?" (cost per day)

18. On the next line, take your previous number (the cost per hour of all the lights) times the number of hours per day they're on. Here we used the nice round number of 8.

19. In our example shown it costs 96 cents per day for just the lights. Now we're starting to get into some numbers that you can understand. "It costs about a dollar a day to power these lights. What's next?" (number of days they're on)

20. Have them multiply the 96 cents times 180, and there you've got the yearly cost of lighting this room, in this case \$172.80. That is a chunk of money!

21. Is this number dead on? Probably not, but it's in the ballpark. More importantly, students finally begin to understand what the big deal is with turning lights off you're not using. And don't forget all we've done in this exercise is figure the cost of just the LIGHTS. What else in your room uses electricity throughout the day?



By this time, 20 or so minutes will have passed. That leaves you the other half of class to continue the lesson:

- How much do the lights in your *entire school* building cost (send students on a scavenger hunt to count all the lights)?
- Your *entire school district* (your building's cost times the number of buildings in the district)?
- The cost of your lights at home?
- Dim one set of lights in your room (if you have that ability) and calculate how much you would save per year if you just used those. Make a bar graph to compare results.
- Ask your principal for a recent electricity statement for the school. Your principal should be delighted that you're interested- this is not only a great lesson, it's great PR that you want to save energy and expense!
- What if we weren't already using energy-saving fluorescent lights and instead used incandescent ones? (take the total of the exercise times 4)

Come back and visit InteractiveScienceTeacher.com to upgrade this lesson with:

PowerPoint- lead your students through the lesson click-by-click

Cost Per Hour Of 1 Fluorescent Light Tube

$$\begin{array}{r} 18 \text{ watts/hr} \\ \times \\ \hline 1000x = 18 * .085 \\ \frac{1800x}{1000} = \frac{1.53}{1000} \\ x = \$.00153 = \boxed{\$.002} \end{array}$$

Rate of electricity

Each tube costs 1/5 of a penny per hour

Cost per year of lights in this room:

$$\begin{array}{r} \boxed{.002} \times 60 = \boxed{\$ 0.12} \\ \text{Cost per hour of lights} \quad \text{Number of light tubes in this room} \quad \text{It costs twelve cents to light this room for one HOUR} \\ \hline \boxed{\$ 0.12} \times 8 = \\ \text{Cost per HOUR} \quad \text{Number of hours per day tubes are lit} \end{array}$$

Cost per year of lights in this room:

$$\begin{array}{r} \boxed{.002} \times 60 = \boxed{\$ 0.12} \\ \text{Cost per hour of lights} \quad \text{Number of light tubes in this room} \quad \text{It costs twelve cents to light this room for one HOUR} \\ \hline \boxed{\$ 0.12} \times 8 = \boxed{.96 \text{ ¢}} \\ \text{Cost per HOUR} \quad \text{Number of hours per day tubes are lit} \quad \text{Cost per DAY of lighting this room} \\ \hline \boxed{.96 \text{ ¢}} \times 180 = \boxed{\$ 172.80} \\ \text{Cost per DAY} \quad \text{Number of days in school year} \quad \text{Cost per YEAR to light all tubes in this room} \end{array}$$

Student Handout



Cost Of Our Classroom Lights

Cost Per Hour Of 1 Fluorescent Light Tube

Cost per hour for 1 light in this classroom: \$ _____

Cost per year of lights in this room

Cost per year for all lights in this classroom: \$ _____