

Classroom Energy Consumption Activity

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Introduction

While there are benefits to having technological devices in schools, large amounts of energy are used to power these devices. This article introduces a brief activity that can be utilized in several different subject areas. In this activity, students will use Mathematical formulas to calculate the amount of energy that electronic technology devices use in the classroom and use research skills to identify the major offenders to energy conservation. Students will determine ways to conserve energy in the classroom. During lean economic times, this activity can serve to reduce energy consumption is something that many school administrators will appreciate. It promotes the notion of ‘green’ in the classroom. Students will gain an appreciation for the environment and the cost of energy that is used to power technology that students use. Michael Bluejay makes a strong point by saying that saving electricity doesn’t just save money; it also saves the environment (Bluejay, 2013). Students need to understand this to become better stewards of our environment. This article provides a basic outline for an activity that can raise awareness of environmental conservation in students, teachers, and administrators. It can also attract the attention of the community to the school’s efforts to be “green”, and open doors for joint activities in the community.

Energy Usage in Schools

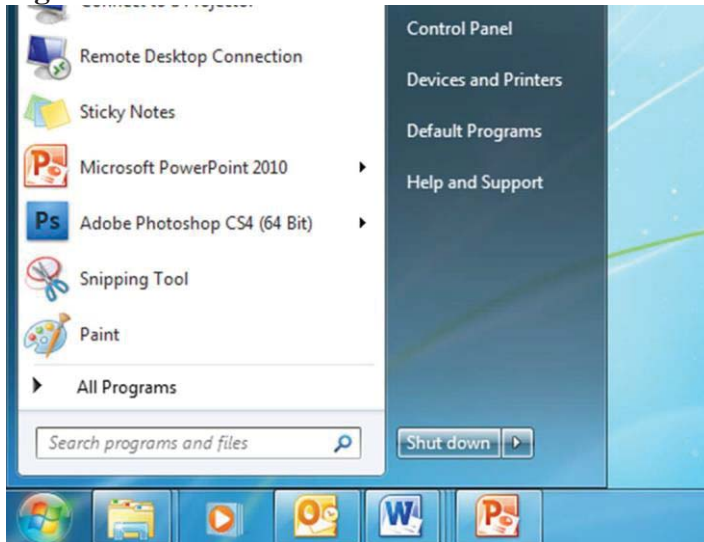
Schools may be wasting energy in classrooms, and administrators, teachers, and students may not even realize it. Conserving energy is something that everyone should participate in at school. Schools are faced with shrinking budgets, and expanding enrollment due to economic hardships. One way to help this situation is by saving money through reducing energy consumption.

Students need to engage in activities related to energy consumption in the classroom and develop ways to reduce it. This may help out in the long run when it comes to energy conservation. Throughout the school day, students can reflect on ways to reduce energy consumption and discuss these in classes. All disciplines can introduce the subject and consider ways to apply their subject material to conserving energy. Individual students can turn out lights (**See Figure 1**) when they are not in use, or perhaps even computer equipment being unused can be shut down (**See Figure 2**) to save energy.

Figure 1.



Figure 2.



There are many things that students, teachers, administrators, and janitorial staff can do throughout the day in their school building to help conserve energy (Sanders, 2009, p. 1):

- Turn out the lights – lighting is one of the largest users of energy in the classroom, and by turning out these lights when a classroom is unoccupied, the school saves money in the long run.
- Stop water waste – hot water requires a great amount of energy. By fixing dripping faucets, one can save water and energy, regardless of whether the water is heated by either gas or electricity. (See Figure 3)

Figure 3.



- Closing doors – leaving doors wide open to a room or building may make it more inviting to come in, but it wastes energy. (See **Figure 4**)

Figure 4.



- Change thermostat settings – change the thermostat settings in rooms to 78 during warmer months and 68 during cooler months. Doing so will lower the heating and air conditioning use. (See **Figure 5**)

Figure 5.



The aforementioned tips are just a few of the many steps that can be taken to conserve energy usage in the school. Students can also be assigned to research other less familiar energy conservation tips such as unplugging charging units when not in use or minimizing power to devices that are not regularly used. Additionally, all subject teachers can introduce energy conservation topics to their classwork and perhaps one class can study energy benchmarking as applied to the school system's buildings. Benchmarking involves comparing a building's energy use to accepted standards or best practices. In a school system, this could be utilized to compare buildings energy use in order to seek ways to reduce energy consumption. The U.S. Environmental Protection Agency's (EPA) Star* program offers guidance and has benchmarking tools that could help the school system succeed in saving energy (US EPA, 2014, p.1). It is important to ensure that the students have knowledge as to why they are performing these energy checks (Kruger, 2000, p.1).

Students, teachers, administrators, and janitorial staff should do their part to conserve energy in schools. Simple steps throughout the day can help reduce energy consumption and improve the financial situation in schools. This can make a big difference in the energy cost at the end of each month. The money a school saves could possibly to be reallocated toward improving academics or funding extracurricular programs.

Introduction and Background

This activity gives school students the opportunity to research electricity consumption in the classroom and develop ways to reduce it. Students will use a classroom electricity usage checklist (see Classroom Electricity Usage Checklist) to record information about the types of electronic technologies in the classroom. Mathematical formulas will be used to determine the amount of energy consumed by the electronic technology devices in the classroom. Through collaboration with peers and the teacher, ways to conserve energy in the classroom will be discovered. Students will ascertain specific ways to reduce electricity consumption in the classroom through simple tasks that the students and teacher can commit to doing daily, such as unplugging devices, powering down

computers, turning out some of the lights, closing doors, and adjusting thermostat settings.

Learning Objectives

1. After a teacher presentation on electrical consumption, the students will identify electronic devices in the classroom and use the classroom electricity usage checklist to determine the power consumption of the devices.
2. Given mathematical formulas and the completed electronic technology usage checklist, the student will determine the estimated monthly electrical use and cost for each device in the classroom.
3. After determining the estimated monthly electrical use and cost for each device in the classroom, the students will identify ways to reduce energy consumption in the classroom through simple tasks that the students and teacher can commit to doing daily, such as unplugging devices, adjusting the power levels on devices, and powering down computers at the end of the school day.

Materials

- Computer
- Calculator
- Notepad

Procedure

1. The teacher should share information about ways to conserve electricity in the classroom. The teacher should also discuss basic electrical concepts with the students such as amperage, voltage, and wattage.
2. Identify and list all the electronic devices in the classroom on the classroom electricity usage checklist. Give an example of recording wattage for devices in the classroom and estimating monthly usage.
3. Students will write down the wattage for each electronic device in the classroom. If wattage is not available, it can be estimated by using amperes (draw) and multiplying that by the voltage use of the appliance.
Watts (Unit of Power) = Volts (Unit of Force) x Amps (Current or Flow)
4. Students will estimate approximately how many hours each month the electronic device is used in the classroom. This will be recorded on the classroom electricity usage checklist.
5. Using the classroom electricity usage checklist, the students will estimate the wattage per month for each device by multiplying the wattage by the estimated hours per month.
6. Students will convert the estimated wattage per month to the estimated Kilowatt hours per month by dividing by one thousand (1,000). The estimated Kilowatt hours will be recorded on the classroom electricity usage checksheet.
7. Students will visit this website (<http://www.eia.gov/electricity/data.cfm>) to find and access individual state tables (**See Figure 6**). Students will use the table to determine the average cost per kilowatt hour of electricity (indicated in cents) in the state where the school is located (**See Figure 7**).

Figure 6.

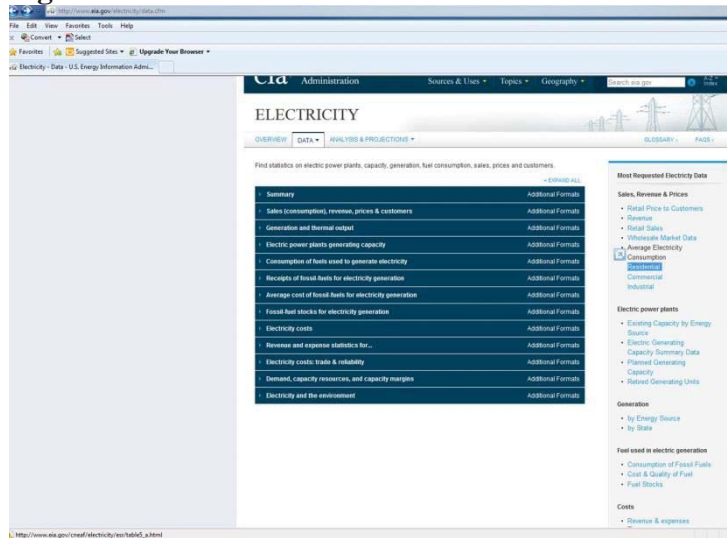


Figure 7.

Table 5A. Residential Average Monthly Bill by Census Division, and State, 2009

Census Division State	Number of Consumers	Average Monthly Consumption (kWh)	Average Retail Price (Cents per Kilowatt-hour)
New England	6,136,238	623	17.47
Connecticut	1,147,250	724	20.33
Maine	696,622	521	15.65
Massachusetts	2,661,985	610	16.87
New Hampshire	591,160	623	16.26
Rhode Island	432,102	566	15.60
Vermont	306,619	575	14.90
Middle Atlantic	15,582,581	660	14.64
New Jersey	3,430,837	676	16.31
New York	6,916,413	581	17.50
Pennsylvania	5,235,231	842	11.65
East North Central	19,621,947	779	10.92
Illinois	5,074,861	728	11.27
Indiana	2,733,611	992	13.00
Michigan	4,253,786	644	11.60
Ohio	4,680,393	878	10.67
Wisconsin	2,589,286	669	11.94
West North Central	9,061,636	942	9.14
Iowa	1,324,182	864	9.99
Kansas	1,209,522	906	9.53
Minnesota	2,290,861	862	10.04
Missouri	2,687,756	1,061	8.54
Nebraska	799,623	1,003	8.52
North Dakota	322,466	1,150	7.58
South Dakota	367,296	1,024	8.49
South Atlantic	25,469,340	1,123	11.22
Delaware	393,836	917	14.07
District of Columbia	217,635	712	13.76
Florida	8,493,591	1,133	12.39
Georgia	4,061,862	1,132	10.13
Maryland	2,168,359	1,026	14.98
North Carolina	4,175,829	1,124	9.90

8. For each classroom electronic device listed on the classroom electricity usage checklist, the average cost per kilowatt hour of electricity will be multiplied by the kilowatt hours per month (kWh/month X Price per kWh = Estimated cost/month) to determine the estimated cost per month to the school. This information should be recorded on the classroom electricity usage checklist (See Figure 8).

Figure 8.

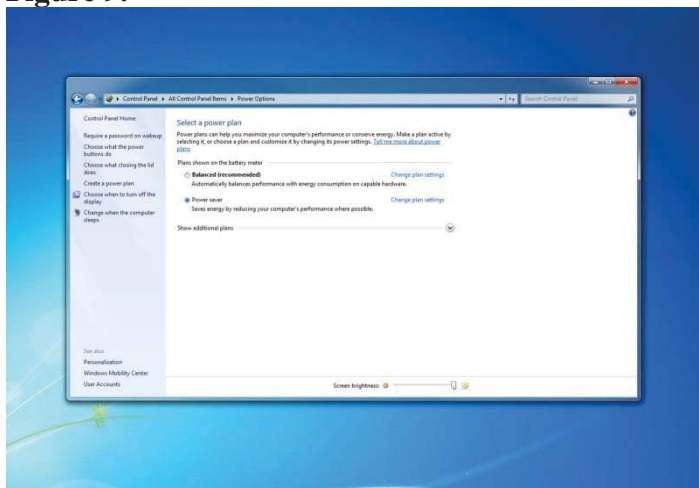
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Classroom Electricity Usage Checklist

Classroom Electronic Device	Computer
Classroom electronic device wattage	250 W
Estimated hours of use per month in the classroom	160 hrs
Estimated wattage per month in the classroom	40,000
Kilowatt hours per month in the classroom	40
Average retail cost per kilowatt hour in the state where the school is located	9.50¢
Estimated cost per month to the school	\$3.80

9. After determining the estimated cost per month of the classroom electronic devices, students will identify ways to reduce energy consumption in the classroom through simple tasks that the students and teacher can commit to doing daily, such as unplugging devices, adjusting the power levels on devices (See **Figure 9**), and powering down computers at the end of the school day.

Figure 9.



Discussion and Summary

This activity will benefit teachers, students, and potentially the school system. Teachers will benefit by having an additional conservation lesson included in their curriculum and a potential lead in to becoming involved and gaining recognition in a wider community of sustainability/energy conservation. Students will benefit by becoming more aware of energy consumption and gaining skills toward becoming assets to the community as aware citizens. The school system, if involved on a wider scale (benchmarking the buildings in the system for example), can potentially reduce energy and demonstrate a

cost savings, something attractive to any administrator and school system. This can prove to be a winning situation for all involved.

References

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Kruger, C., & Summers, M. (2000). Developing primary school children's understanding of energy waste. *Research In Science & Technological Education*, 18 (1), 2-4.

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Classroom Electricity Usage Checklist

Classroom Electronic Device				
Classroom electronic device wattage				
Estimated hours of use per month in the classroom				
Estimated wattage per month in the classroom				
Kilowatt hours per month in the classroom				
Average retail cost per Kilowatt hour in the state where the school is located				
Estimated cost per month to the school				