

*Going Green:  
Saving the Environment  
While Saving Money*

Lauren  
Amanda  
Dominique  
Lea  
Rachel  
Chelsea  
Caitlin  
Kyle

4<sup>th</sup> Period College Math  
Mr. Smoyer

## *Summary*

As students of Northwestern Lehigh we have been exploring and researching a variety of ideas in order to make our school more environmentally friendly. Topics that were of interest among our group included wind energy, plastic bottle recycling bins, TV and lighting schedules, and hand dryers instead of paper towels in our lavatories.

“Going Green” is becoming a worldwide trend and should be taken into all aspects of our school. Electricity was a big component within our research and what we could do to reduce our giant electric bill. An idea that would be very successful among our school would be to simply set up a schedule of times when the 100 televisions would be turned on and off. We have also applied this idea to our lights throughout the school. A strict rule would be set to enforce the turning off of lights when class is not in session and nobody is present in the room.

One school goes through mass amounts of paper each school year. Students attending Northwestern receive an ID number that is used for cafeteria accounts and H drives on the computers. These ID numbers have the potential to also be email accounts linked to our schools webpage. Special announcements could be sent through these emails versus 800 pieces of paper that usually wind up in the garbage.

Wind turbines are popping up around the area and schools all over the country are beginning to consider the idea of powering their school with wind energy. An investment such as a turbine would easily pay itself off in a matter of a few years. Using wind energy produced on the school campus would become virtually free electricity after a decade or so in use.

Saving money is essential during today's society and with upcoming renovations to our school the money saved would greatly benefit our school system. Eco friendly ideas that are being introduced will help to improve the environment while saving our school thousands of dollars a year.

### *Assumptions*

- There is a consistent wind in the high school area.
- Electricity output will be about the same.
- The price of electricity will not change in the near future.
- We will not gain any more computers in the next couple years.
- All classroom resource calculations are based on a 180-day school year.

## *Wind Power*

Wind power is one of few renewable resources available to use in order to produce electricity. Wind energy is extremely clean energy that does not produce any pollutants, which reduces smog, the development of acid rain, and polluted water sources. Using information given to us by the administration office we found that the high school uses approximately 1,708,800-kilowatt hours of electricity per school year that costs about \$166,990.55 per a year. Upon research our group discovered a company that provided different types of wind turbines for a school community. We found that either a 250 kW or a 50 kW turbine would be most efficient for our district. A 250 kW turbine would produce approximately 1,080,000 kW hours annually at a cost of \$640,000. This would save this district \$108,000 per year and allow us to pay off the windmill in about 6 years.

The 50 kW windmill will only produce approximately 216,000 kWh annually at a cost of \$125,000. This would save the district \$21,6000 and again it would be able to be paid off in about 6 years.

With the statistics we obtained, we concluded that the 250 kW wind turbine would be the most efficient for our school. With the average wind speeds in the area we would be able to produce close to half of our yearly energy costs with this machine. In order to achieve this amount of energy production with the 50kW windmill the district would have to purchase 5 separate windmills. Being able to pay the turbines off in the same amount of time, the 250 kW turbine is the most efficient for our district.

Power	Cost (With Grant)	KWH annually*	\$ Saved	Paid Off
250KW	\$640,000	1,080,000	\$108,000	5.9 Years
50KW	\$125,000	216,000	\$21,600	5.8 Years

\*KWH based on a 180 day school year

### *Hand Dryers*

In the United States, we produce over 3,000 tons of paper towel wastes every day. One way our school could cut the amount of paper towels we go through every year would be to install electric hand dryers in all our bathrooms. We have twenty bathrooms in the high school, and we assume that every bathroom uses two rolls of paper towels per bathroom per month we would consume 40 rolls of paper towels per month. Students are in school for nine months out of the year, which means we would use approximately 360 cases per school year. Each case contains 6 rolls of paper towels and costs \$50.00. In one year we would spend \$3,000 on paper towels. After researching the price of electric hand dryers, I found an average price of each hand dryer to be \$200.00. If we were to install one hand dryer in each of the twenty bathrooms, the total cost would be \$4,000.00. Therefore, in one school year and three months, we would have the hand dryers paid off and in the years that follow, we would save \$3,000.00 per year. Not only would installing electric hand dryers save the school money every year, it has other benefits that help the school and environment. Having the hand dryers would cut back on the amount of labor for the custodians by eliminating the amount of trash they would have to take out and they also would not have to keep refilling the paper towel dispensers. Another benefit of the electric hand dryers is that they use only a small amount of electricity so they are

environmentally friendly and our trash consumption of the school could be greatly reduced.

Getting Hand Dryers	
Average Cost of Hand Dryers	Number of Bathrooms
\$200.00	20
<b>Cost to Buy All Hand Dryers</b>	<b>\$4,000.00</b>

Cost of Paper Towels				
Cost of Paper Towels (per case)	Number of Bathrooms in School	Cases Used in High School/Year	Rolls (per case)	Months in School
\$50.00	20	60	6	9
Rolls for the Year	360	Rolls Per Bathroom Per Month		2
Rolls Used Per Month		40		
<b>Cost of Paper Towels</b>		<b>\$3,000.00</b>		

## Electricity

A very big portion of the district's budget goes towards electricity. We spend around \$200,000 in electricity every year just at the high school. We use around 2,000,000 kW of electricity each year in the high school and a lot of it is actually not needed. By turning off the TVs for 5 hours in the school day during classes, it not only stops using electricity, but it also ceases to be a distraction. Students really do not need to see the slide show all day, everyday. We also tend to waste electricity by leaving the PCs on in the computer labs. If students do not turn off the computers, they use an excess amount of electricity. The lights are also used excessively in the classrooms. In the end, by simply turning off a few things we can save around \$30,000. We would also cut around 300,000 kWh from our electricity bill. This saves us money and helps to keep the

environment safe and healthy. If we use less electricity, electric companies will not need to produce as much. The emissions into the environment from the electric companies would be less. After a while, this can really add up.

### *TVs*

Keeping the TVs on for just the morning show and during flex periods and unplugging them when they are done being used would end up saving our school \$1,485.00 a year. One TV uses 165 watts per hour. Leaving the TV on for 5 hours a day would use 825 watts (.825 kW per TV). Being in school for 180 days with 100 TV's in the school would use 14,850 kW. We pay about \$.10 a kW. This is a great start to cutting our electricity costs.

Turning TVs Off				
TV Watt Usage (W)	Time to Leave Off (Hours)	School Year (days)	TVs in School	Price per KWH
165	5	180	100	\$0.10
Watts Not Used (wh)	825	KWH Not Used/Year		148.5
KWH	0.825	KWH Not Used All TVs & Full Year		14850
<b>Amount Saved for Full Year</b>		<b>\$1,485.00</b>		

### *Computer Labs*

These calculations were found by assuming we use the computers in the computer labs for 3 hours every day. Each computer uses 400 watts of electricity. If we turn off the computers after we use them, they would be off for about 21 hours each day. Each computer would save 8400 watts of electricity by being turned off for 21 hours (8.4 kW

per computer). Being in school for 180 days for about 167 computers would equal 252,504 kW per year. Since we pay \$.10 per kWh, turning off the computers would save us \$25,250.40 a year.

Turning PCs Off				
PC Watt Usage (W)	Time to Leave Off (Hours)	School Year (Days)	PCs in School	Price per KWH
400	21	180	167	\$0.10
Watts Not Used (wh)	8400	KWH Not Used/Year		1512
KWH	8.4	KWH Not Used All PCs & Full Year		252504
<b>Amount Saved for Full Year</b>		<b>\$25,250.40</b>		

### Lights

Shutting the lights off for 2 hours a day would end up saving our school \$4,014.72 a year. Each light uses 34 watts. For 2 hours the lights use 68 watts (.068 kW per light). Being in school 180 days for 3,280 lights, we would save 40,147.2 kW per year. We pay about \$.10 per kW.

Shutting Off Lights				
Light Watt Usage (W)	Time to Leave Off (Hours)	School Year (Days)	Lights in School	Price per KWH
34	2	180	3280	\$0.10
Watts Not Used (wh)	68	KWH Not Used/Year		12.24
KWH	0.068	KWH Not Used All Lights & Full Year		40147.2
<b>Amount Saved for Full Year</b>		<b>\$4,014.72</b>		

## *Recycling Program*

Plastic bottles are an everyday part of life whether they are used during sporting events, in the classroom, or at lunchtime. Some students go through multiple bottles of water or other beverages throughout the school day wasting thousands of bottles in one school year.

If we assume that each student uses three bottles in one week, we waste over 86,000 plastic bottles every year. Instead of recycling these empty bottles, many students toss them into the trash. One major reason why we, as students, fail to recycle is because of the lack of available recycling bins in our high school. If we were to place recycling bins for plastic bottles in each classroom it would be very beneficial for the environment and also cost the school little to no money.

There are many online recycling organizations in the Allentown area that offer free recycling bins so getting the bins would be as easy as making a phone call. Once the recycling bins are conveniently placed around the building, instead of making the janitors empty them, we would organize an “environment group” that would maintain the bins. Along with the duty of emptying and managing the bins, they would devise a plan to enforce the importance of recycling and saving plastic. This extra-curricular group could also make it their responsibility to take care of our currently unused greenhouse. This could open up opportunities to grow fresh vegetables in order to make profits that would help fund the environment group. This groups’ goal would be to improve recycling within the school district and help reduce the amount of recyclable plastic in the trash.

## *Composting*

Creating a compost pile would be another great way to help the environment. It would not only be beneficial to the school, but also to the surrounding community. A compost pile could be started somewhere on school grounds. If we enact some type of environment club, they could take care of the compost pile. They would simply have to add to the compost pile, try to break the compost pile down as much as possible, and make sure the pile has enough carbon and nitrogen for the organisms to live on. After 6 months to 2 years, the compost pile can be available to anyone in the community as well as for the school. If the school ever wanted to, we could start some type of garden club. The compost can be used to grow a garden and we can use the produce in our cafeteria or sell it to the community. The compost pile can also be tied into the science curriculum. The organisms living in the compost can be studied and examined. Besides all the uses and benefits, it is really just a great way to dispose of the school trash. There is a variety of items that can be used for the compost pile: cardboard rolls, clean paper, coffee grounds and filters, cotton rags, eggshells, fruits and vegetables, grass clippings, hair and fur, hay and straw, leaves, nut shells, shredded newspaper, tea bags, yard trimmings, and much more. Rather than just throwing our trash out, we can use for something a lot more beneficial.

We do have to be careful of what we place in the compost pile. Some things do end up being harmful to the environment if composted depending on the chemicals it gives off while decaying. Dairy products create odor problems and attract pests such as rodents and flies. Fats, grease, lard, or oils also create odor problems and attract unwanted pests. Yard trimmings treated with chemical pesticides can kill beneficial

composting organisms. While not everything can be put in the compost pile, at least half of our school trash will be able to make it there. Rather than rotting away in a landfill, the school and the community can benefit from using our trash in a compost pile. It makes for a great project and can really help in making changes for our environment.

### *Plastic Cups in the Cafeteria*

Plastic Cups in the Cafeteria (Calculations)					
Students Eating Per Lunch	Number of Lunches Per Day	Plastic Cups Per Student	Number of Lunches Per Year	Cups Per Pack	Cost Per Pack
350	2	2	160	125	\$2.79
Plastic Cups Per Year		224,000	Packs of Cups Needed Per Year		1,792
<b>Cost of Plastic Cups Per Year</b>			<b>\$4,999.68</b>		

One way to cut costs in the cafeteria is to get rid of the plastic cups that we use for sauces and other condiments. We used to have the containers with the pumps, but this year we switched over to the plastic cups with the lids. Not only will switching back to the pump containers save the school money, it would also be environmentally friendly by reducing our use of plastic. These plastic cups do not get recycled and, therefore, sit in a landfill for years until they finally begin to decompose. This takes up room in the landfill, so we are constantly having to find new places to dump garbage. Less plastic in our landfills means a better environment for all of us.

As far as cutting costs, we assumed there were around 350 students per lunch, with 2 lunches each day, and each one gets 2 plastic cups. We have around 160 lunches per school year. There are 125 plastic cups per pack and each pack costs \$2.79. The amount of plastic cups we use per school year is 224,000. Therefore, we need 1,792

packs of plastic cups per school year. The cost of 1,792 packs of plastic cups is around \$5,000. That is a significant amount of money to save for our school and it is also a great way to help keep our environment clean and healthy. This is a simple way to cut costs and only one of many.

### *Student Emails*

The high school uses at least 4 cases of paper for progress reports, report cards, and special announcements for each student every year. 4 cases of paper costs the school about \$120. While this is not a significant amount of money, it is a significant amount of paper. Although it will never be a paper-free environment at a school, we can certainly cut down on the amount of paper we use. With the enactment of the Sapphire Parent Portal, parents have constant access to their child's grades. When progress reports and report cards get sent home, the grades are no surprise to the parents who have parent portal. Chances are these grade reports are either thrown away or filed away and forgotten. The school can implement a plan to stop sending progress reports and report cards home now that all parents have access to the parent portal. For those who do not have accounts need to get them. As for special announcements and anything else the school may want to send out, it can either be added on to the parent portal if that would be possible, or students can get e-mails. By sending these items out in paper form, most students just throw them away before they even make it out of the classroom. Student e-mails can be based off of student ID numbers or can be tied in with our H-Drive accounts. A system such as this is only the beginning in cutting our paper usage at the high school. It saves the district some money, but more importantly it saves the environment.

## *Conclusion*

By implementing a few simple regulations, we can save the school around \$40,000. Our electricity usage is certainly an issue that needs to be addressed. The high school alone uses about 2 million kilowatts of electricity every year. This is an unusually high number and it really should be considered for review. The use of a windmill would cut the costs for our electricity in half and turning things off would account for a significant amount of electricity. With the new renovations coming up, installing hand dryers in the bathrooms would not be too difficult of a task. These hand dryers alone save us \$3,000 in paper towels and they also help the environment. There may be initial costs, but in the long run they would certainly save the district a lot of money. The plastic cups in the cafeteria cost us a few thousand dollars every year. Not only can we save money by not using these plastic cups, but we can help the environment as well.

It is also important to look at ways of being environmentally friendly. A recycling program needs to be put into effect for our plastic bottles outside of the cafeteria. Students are unable to recycle in classrooms and it would simply take a club or group of students to make this possible. By not allowing plastic to sit in landfills, the environment can be improved. In addition to recycling plastic, a compost pile can be created on the school property. This would be a beneficial way to dispose of the school's trash. It would only take a few students to take care of it and it can help the community out as well as the environment. We can also go eco-friendly by cutting our paper usage. Parents can be notified of things through parent portal or an e-mail system can be set up for student and parent use. All of these ideas are great ways to help the environment.

Not only can we help the environment, but we can also save the district a lot of money that can be spent elsewhere. Considering the small effort it would take to implement these ideas, we certainly gain a lot more than what it takes to make these things happen.

## *References*

- [www.oberlin.edu/recycle/facts.html](http://www.oberlin.edu/recycle/facts.html)
- <http://earth911.com/plastic/plastic-bottle-recycling-facts/>
- <http://www.cleanlink.com/sm/article/Will-Hand-Dryers-Blow-Away-Their-‘Green’-Competition—3364>
- [http://www.westchestergov.com/pdfs/ENVFACIL\\_Composting\\_leaves.pdf](http://www.westchestergov.com/pdfs/ENVFACIL_Composting_leaves.pdf)
- <http://www.epa.gov/wastes/conservation/rrr/composting/basic.htm>
- High School Records: Electricity Usage Spreadsheet