

GREEN MATH PROJECT



MR. SMOYER PERIOD TWO

TEAM B

GREEN IS GOLD

With the current state of the United States economy, everyone is watching where they spend their money and everyone is looking for places to save. Why should the schools be any different from the rest of the country? Going green (eco-friendly) is also a major concern because of the ozone breaking down and all of the other side affects of polluting and giving off unintended side effects.

Our group of students, from Mr. Smoyer's second period College Math class, through research and mathematical analysis has concluded that there are places where the school district could save money and still be eco-friendly, which helps our taxpayers and our entire district. Some of those places are the electricity throughout the high school and the district and revamping our transportation department by purchasing natural gas buses, which would be better for the environment, and the costs are small in comparison to diesel. Also we have found that the paper consumption in the district is way more than necessary with all of the attention that we are paying to technology. We also believe that implementing new ways of getting energy throughout the school is an option that can save our district a lot of money while leading us closer to our green goal.

Our group is estimating that we can save the school district around **\$80,000** with **no cost** to implement and only **minor changes** to our daily operations. These savings are just the electrical savings and do not include any of our other statistics. We believe that some changes in our daily routine of business could possibly save the district a lot of money throughout the years. We know that these changes may not be easy to achieve but they are worth it both in the short run and in the long run.

OUR ASSUMPTIONS

1. That our district's energy consumption stays at relatively the same level with no major decreases.
2. Our district does not significantly increase in size over the next 5 years.
3. Our district does not decrease our paper consumption significantly.
4. No major bus incidents or decrease in bus size.
5. We are assuming that the cost of fuels stays relatively similar.

Over the last couple years, Northwestern Lehigh School District has been spending money on not necessarily unneeded things but we have definitely been spending more money than necessary. This has become an increasing problem with the current meltdown of the United States economy. Everyone's checkbooks have gotten smaller and saving money has become an increasing concern for the entire country. Another major problem that concerns not only the United States of America but also the entire world is the global environment. Namely using our resources at an increasing alarming rate. Another problem with the ecosystem is the pollution that occurs when we use said materials. These are some of, if not the most important, problems that concern our country today. So why not save money while cleaning up the environment? This solves both of our problems. Our team of Mr. Smoyer's second period College Math class has found some ways that we can do just that. Some of our main points are decreasing our paper consumption, decreasing our electrical consumption, finding alternative ways to run our buses, and alternative ways to power our district.

PAPER CONSUMPTION

With all of the emphasis put on technology in schools, we are still using the same old ways of teaching the class. Northwestern Lehigh School District uses an inordinate amount of paper. We use 1040 cases of white copy paper a year throughout our district. Each of these cases holds 5000 sheets of paper. This comes out to over **5 million** sheets

of paper a year. These cases cost us \$30,000 a year. This is just the cost of white copy paper only. This does not include all of the colored printouts that the teachers print out.

Our group is suggesting a 25% decrease in our paper consumption per year. This would cut our paper consumption by 1.3 million sheets of white copy paper. This may seem like this would be a difficult goal to achieve but we believe that not only is it manageable but it will be relatively easy to do. Some ways to reduce our paper consumption is by sending emails to teachers instead of sending paper memos for meetings or other activities.

Another way we could save paper is if we purchased textbooks for classes that do not have textbooks. There are many classes that the teacher does not have textbooks to work out of. This may not be a problem for the teaching portion of it but this definitely is a problem in our paper consumption. Say for example that this teacher has two classes of 25 students each that do not have textbooks. To get the bare minimum of paper he must print out only one sheet for each student. This is 50 copies a day. Over the course of a semester if he were purchased a textbook than we would save 4500 sheets of paper for just one teacher. This may not seem very high but also we have to take into account that this teacher would probably print out extra copies in case students lose them and in most classes you will use more than one sheet of paper a day. Chances are that this teacher will probably print at least two pages a day per student. So our paper savings will probably be more around 9000 sheets of paper per teacher per semester. Now say 10 teachers are all in this position than we would save 90,000 sheets of paper per semester and 180,000 sheets of paper per year.

We have found that reducing our district's paper consumption by 25% will save the district over \$7,000 a year. This may not seem like a lot in comparison to our district's budget but it is \$7,000 that we would save for nearly no cost to implement. We found that reducing our consumption by a higher percentage will save us more money, this is common sense. But to save a higher percentage we would have to implement more programs to save money but this may be worth it eventually.

Not only does reducing our paper consumption save our district money but also it is better for the environment. One tree produces around 8,333 sheets of paper. This means that our district uses about 650 trees a year. If we reduce our consumption by 25% then we would save approximately 162 trees per year. This is a huge impact for just one district and if other districts saw that we were saving money while helping the environment than they might be tempted to follow our lead. This is an opportunity to set a very important trend throughout the Lehigh Valley and save money at the same time. This is a win-win situation.

ELECTRICITY CONSUMPTION

Our district spends a lot of money on electricity a year. This is understandable because we use electricity to power nearly everything we use in our schools. But our group found that there are places that we could save money with nearly no cost and no effort to implement. We found that we could save the school district around **\$83,000** a year.

There are many easy ways that our district could save electricity and save money at the same time. One possible way is making sure that all of the laptops are off at the end of the day or when they are done being used. We could also make sure that all of the computers in the computer labs are shut off after the day is over. These are the two ways we found that require no effort or change in our everyday school day but we found two other possible ways that don't require much effort and would save us a lot of money. One of these ways is to have each teacher throughout the day have their lights shut off for four hours each day. Another way is to shut off all of the televisions in the school except for a half hour during the morning and over both flexes. These are easy ways to save electricity and money for our district and we feel are worth the effort to implement.

Shutting off the laptops when they aren't being used is a common sense way to save electricity. Yet in our classes we are told not to shut off the computers when we are done with them because that way the next class to use them has to turn them on. This reasoning makes nearly no sense at all. It isn't that hard to press the power button and wait the two minutes it takes the laptops to turn on. We have found that if the laptops were shut off when we were done using them then we would save around \$466 a year in

the high school alone. This may not seem like a lot of money but it is still money that we did not save before doing this.

Another way of saving is to shut off the desktops in the computer labs at the end of the day. We are also told not to shut off these computers when we are done using them and while this might not be a big deal up until fourth period then during fourth period than most students don't even bother turning off the computers because they are in such a rush to get out of school. We have estimated savings if 20% of the computers are left on at the end of the day, if 50% of the computers are left on at the end of the day, and if 100% of the computers are left on at the end of the day. We would save around \$4500 in the high school alone if we shut off all of the computers at the end of the day. This is just as easy as shutting off the laptops at the end of the day.

One of the ways to save money and electricity that might take at least some effort to do is to have the teachers shut off their lights for four hours each day. This while it may seem like a difficult task is in effect not that hard to achieve. If a teacher has their students working with the laptops than he/she can shut off the lights or if they are in a class with a window then they can shut off the lights. Many teachers would have no trouble at all at shutting their lights off for four hours a day. On average if just one teacher shut off their lights for four hours a day than that one teacher would save \$120 a year. If 100 teachers decided to do this than they would save around \$12,000 a year. This is just for one hundred teachers, if more teachers decided to participate in this policy than our savings would rise exponentially.

Our last electricity savings that we researched was turning the televisions off except for a half hour first thing in the morning and the hour over flexes. The main things

that the students watch on the television is the morning show or the flex show if there is one. Slides with a lot of information also appear. The slides that appear on the television are very helpful but most students don't look at them more than once so having them on the whole day is a waste of energy. We estimated that if the entire high school shut off their televisions for most of the day than we would save around \$3,700 a year. These are easy savings that we could get even though they would alter our daily routine somewhat but it would not be a huge change.

These options not only save our school district electricity and money but it also would cut down on the amount of heat that these electronics let off. If all of these energy consumption policies were put into place then we are estimating that our high school's savings alone would be \$20,940. If you multiply this by four for the four school buildings that make up our school district than our estimated savings for the entire school district is around \$83,762. These are major savings that require nearly no cost implementing and only minor changes in the daily operation of our school.

ALTERNATIVE BUS FUELS

Our buses are the main source of transportation for the majority of the Northwestern Lehigh School District's student body. Therefore they are one of the most important assets that a school district can have. Since these buses are so important it would be a natural thought to see if it is possible to save any money that we can on our buses since we use them every day of the year.

We found that our transportation department of Northwestern School District spends a lot of money, which is expected. What was not expected was how much money we spend repairing each bus and how much fuel we use overall. For the amount of fuel we use we should be searching for any way possible to decrease those costs. One way is alternative ways of running the buses. We decided to research natural gas buses. We came to this decision because natural gas is very eco-friendly and it is very cheap to purchase.

Natural gas buses are not cheap to purchase. They are around \$40,000 more expensive than regular diesel buses, which our district has now. So that brings the total cost of one bus to around \$130,000. This is not a cheap purchase that can be made lightly. But even with the high costs the fuel costs are much greater for diesel buses than for natural gas. On average diesel costs around twice as much as natural gas and since we purchase a lot of fuel for our buses it is safe to assume that we would generate a lot of savings by limiting the amount of diesel that we purchase.

Another reason that we are suggesting replacing some of our bus fleet is because some of the buses are very old and are costing as much as \$50,000 in repairs a year. If new buses were purchased than not only would we save the fuel costs but we would save

the repair costs. We could also sell some of the old bus parts if we wanted to recover some more cash but since the buses are not in the newest condition it would be impossible to predict how much we would receive by selling those parts.

Also our bus fleet travels a lot of miles throughout the space of a year. Over the life of all the buses they have traveled 4.5 billion miles. This averages out to 13,000 miles a year. These buses get on average around 7 miles to the gallon. This begins to paint a picture of how much fuel we have to purchase a year. The natural gas buses get a better mileage and it costs less to purchase the fuel.

Not only is new and alternative fuel options a great way to save money but also it is an easy way to help the environment. Our buses let off a lot of pollution and the natural gas buses would cut that by a lot. We believe that the up front costs are covered and are surpassed in the long run. Natural gas buses may cost a lot of money up front but they will save us money in the long run while helping our environment.

ALTERNATIVE ENERGY FOR SCHOOL

In our society today many people are looking at alternative means to power different things. This is because we are depleting our non-renewable energy sources. More concern and researching money is going towards researching alternative means of energy. One of the main sources that has become more popular is solar power. This has become a popular means of energy because while it is expensive to build/install, it pays for itself very fast because it is constantly storing energy. Plus the solar panels do not break down or need much reconstruction. They are good for around 40 years each. There are many reasons why solar energy would benefit the school and the community. This is the alternative energy source that our group has decided to research and is suggesting that our district take under serious consideration.

Our group has decided to research this form of energy because it is a very green form and they can store energy even when they are not using that energy. We found that other school districts have begun implementing this policy and they found that the solar panels paid for themselves within the next three years and then began saving money. The cost of one solar panel is 1.5 million dollars. This may seem like a huge price tag but they pay for themselves in 3 years. So it would cost our district \$500,000 each year for three years to install one solar panel. While this seems like an inordinate amount of money it really doesn't cost that much when you take into account how much money we would save each year if we installed just one solar panel. We would save around \$169,000 in kilowatt-hours. So the net cost that it would cost our district is around \$330,000.

This cost could and probably would become even lower because we would probably get a major grant for going green in the school environment. We estimated that

we would receive anywhere from a 50% grant to a 75% grant. If we received a 75% grant than we would save an additional \$248,000. This would bring our cost per year to around \$83,000 per year for three years. This is not a high price to pay for going green and eventually the solar panels would be completely paid off and would begin paying for other stuff. We estimate that for the whole district we would need around 9 solar panels. While it may seem like we are spending a lot of money on these panels, in reality if we purchased and installed a new one every 3 years than the cost would be minimal. Especially after the first one because the first one would keep saving us around \$169,000 a year. So the cost for the second panel and so on would be minimal because of all the money that we would be saving.

If our district decided to begin installing these panels than the upfront costs are far outweighed by the long-run savings and the green effect. Eventually if we decided to install 9 solar panels than the last of them will cost us virtually nothing because of all the savings the previous solar panels will have made us. Spending money in the present will save us more money in the future.

Our group has found that there are many ways that our school district could be saving money while going into the green initiative. Saving paper not only saves trees and our environment but it also saves us a fair amount of money each year. Our estimates include only white paper and have not taken into account all of the colored paper that our school district uses per year. Using less electricity not only will save us a lot of money but it lets off less heat and makes for a better learning environment. Also studies have shown that students learn better in natural light rather than artificial light.

Replacing our bus fleet with natural gas buses will not save us money in the short run but it will definitely save our district money in a couple of years. Not only will they save us money but they are more eco-friendly and let off less emissions than our diesel buses. Making solar energy one of the main energy sources for our district may seem like a huge cost right now but the savings far outweigh the costs in the long run.

Our team hopes that we have given enough information to warrant some consideration of changing our school day to some extent. We feel that the payoffs are huge and the costs are relatively small. We hope that our information leads to a change and we hope to see some sort of a change over the next couple of years.