The Journey to a Sustainable Tomorrow

Final Summary

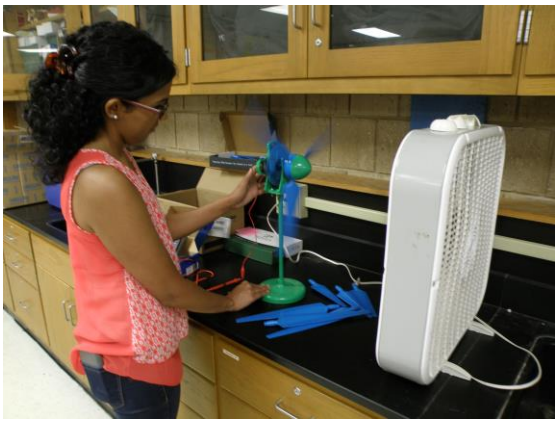
The Project

10th -12th grade Environmental and AP Environmental Students. (ages 14-18)
There will three classes with a total of 78 students taking place in the project

The journey was a success. The following is a general demonstration of the laboratory integration that your funding allowed to enhance our classroom notes and discussion on our journey to a more sustainable tomorrow.

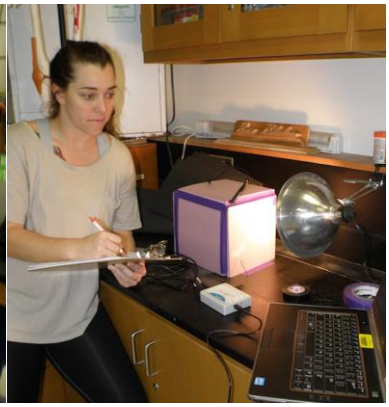
During the active and passive energy section the K'NEX solar kits were used to build and alter solar cars. The students built the cars based on the instructions that came with the kits. We took them out side, made a reading on the available light, and tested them on a ten meter course. We then borrowed more K'NEX from our Robotics Academy and the students were allowed to make any modifications that the available parts allowed and then we retested the vehicles for improved efficiency. The students learned a great deal on how simple modifications can go a long way, but when we did the experiment with the upper level students, they were inquiring into altering gear ratios so I have already contacted K'NEX about acquiring small sets of gears to put into each of the kits for next.

After we worked with solar cars, we built Solar Water Heaters. I supplied ¼ inch rubber hose and plexiglass and the students supplied the rest of the materials. Each lab group scoured the internet to come up with a design and then using mainly household junk(literally), they put together their water heaters. On test day, we started with a jug of water that was 70 * F and put it in each heater. The students then set them up outside on a 42*F day for 30 minutes. Our best design was measured at 178*. We then placed all of the designs in the front of the room and discussed what did and didn't work well.



We moved on to the Wind energy lab where the students build several different types of windmills. In the lab pictured, the students were using one type of turbine and testing blade size, number, and angle to see which combination produced the best result for a given wind speed.

Next we moved to hydropower and did an experiment similar to the wind power experiment.



Closer to the end of the year as we got closer to the final building project we worked on the Passive Solar Design Lab where the students had to use different materials to built similar structures and test the insulating properties of their materials. In the pictures above, the students are testing the inside vs outside temp under a 100 watt bulb. Their homes had windows built into them so that they were not only testing the materials, but also how the window placements affected the internal energy change.

We then moved on to the Geothermal lab to see how we could use geothermal energy to ease the burden of neutralizing the internal temperature of their home. By this time the students were starting to understand the concepts. They were saying that they could integrate a solar pumping system into a geothermal system so that during the day, here in Florida, when you need it the most, the energy from the sun that is heating the house could be used to cool it. That was nice to see.

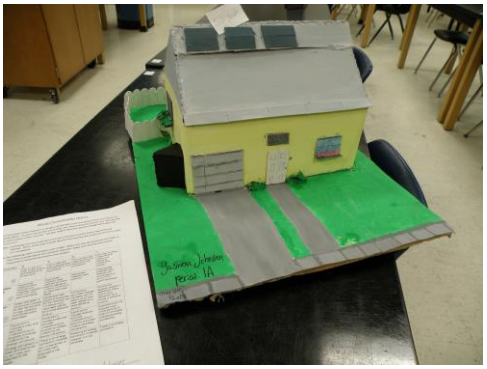
After we looked at all of the ways to get the energy, we moved to the Battery Lab so that the students could determine the best way to store the energy when the environment was not cooperating. This allowed them to complete the aspects of their home designs pertaining to the acquisition and storing of energy.

Prior to accepting the students' model plans, we covered a section Sprawl and one on Water Sustainability in which we discussed the negative effects of our life styles and how waste is managed. We used the wastewater demonstration to explain how we recover wastewater, but do to time constraints, we did not get to go on our planned field trip.

For the most part, I would say that the goals that we set forth were met:

To introduce students to the concept of sustainability and planning for sustainable development;
To develop the vocabulary of sustainability;
To teach students how energy is conserved and transferred;
To teach students how to use their local environment to enhance sustainability;
To design and create a working model of a sustainable home, including the interior, exterior, and vehicle.

The Final Project:



This is an example of the final product during the forth quarter that was used to bring all of the information together. The students used the following rubric to build their products and were allowed to do an oral presentation for extra credit.

Sustainable Energy Rubric

CATEGORY	4	3	2	1
Plan	Plan is neat with clear measurements and labeling for all components.	Plan is neat with clear measurements and labeling for most components.	Plan provides clear measurements and labeling for most components.	Plan does not show measurements clearly or is otherwise inadequately labeled.
Construction -Materials	Appropriate materials were selected and creatively modified in ways that made them even better.	Appropriate materials were selected and there was an attempt at creative modification to make them even better.	Appropriate materials were selected.	Inappropriate materials were selected and contributed to a product that performed poorly.
Construction - Care Taken	Great care taken in construction process so that the structure is neat, attractive and follows plans accurately.	Constuction was careful and accurate for the most part, but 1-2 details could have been refined for a more attractive product.	Construction accurately followed the plans, but 3-4 details could have been refined for a more attractive product.	Construction appears careless or haphazard. Many details need refinement for a strong or attractive product.
Scientific Knowledge	Explanations indicate a clear and accurate understanding of scientific principles underlying the energy conversion.	Explanations indicate a relatively accurate understanding of scientific principles underlying the energy conversion.	Explanations indicate relatively accurate understanding of scientific principles underlying energy conversions.	Explanations do not illustrate much understanding of scientific principles underlying energy conversions.
Energy conversion	Energy conversion is clear and explained on an index card attached to the model.	There is an energy conversion modeled but no explained on an index card attached to the model.	Modeling an energy conversion is started however it is not complete.	There is no energy conversion.

We would like to thank you for giving us the chance to take this journey. While seeing it on the screen is instructional and our Chromebooks played a roll in the journey, the ability to put the science in our hands and own it was invaluable.

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