Early College and Career Center (EC3)

Project: EcoCharger

Advisor: Joe Stuecker

The EC3 Energy Team is made up of 12 students from our 3 feeder high schools. We have different backgrounds, interests, and cultures but we all share a common goal. Our goal is to learn about energy and become better environmental stewards. We are enrolled in a dual credit Energy Management program that is a partnership between our school and Madisonville Community College (MCC). We are also studying and working towards our industry certification with the Center for Energy Workforce Development (CEWD).

To learn more about energy we set 6 goals for the year. Our goals range from building our team, educating the district teams, solving an energy problem, community education, and partnerships. We elected officers and everyone on the team worked together to achieve our goals. Mr. Stuecker was there for guidance and encouragement but our officers and team members had to coordinate and implement our efforts towards our goals.

We used many resources during this school year. We followed NEED curriculum, CEWD curriculum, MCC Energy curriculum, and we also used Mr. Stuecker's experience in the electrical industry as a resource.

HARDIN COUNTY SCHOOLS EC3 EARLY COLLEGE & CAREER CENTER

Goal #1 Strengthening the EC3 Team

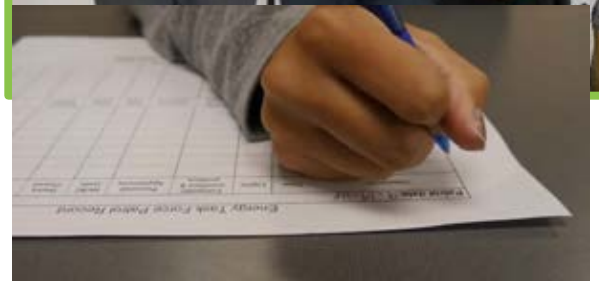
We had to develop the energy team we already had. We developed our team by electing officers to establish a sense of leadership in our team. We were able to develop a very diverse team. We gathered students from three different schools and each coming from a different background. To strengthen our team and develop our community we participated in community service work at Feeding America. Currently our team has over 1000 hours volunteered at Feeding America.

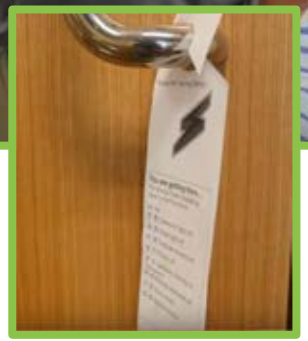
Goal #1 Strengthening the EC3 Team

Goal #2 Strengthening & Educating the HCS Teams

Our team worked with our school board and district office during the 2015-16 school year to get an energy team in every school in our district. Some of the schools already had great teams but others had none. We went to different schools and recruited teacher sponsors and students. We worked with students to show them how to perform audits and walkthroughs. We knew we needed to do more and wanted to help the other students. Our generation learns a lot from videos so we collaborated with our Media Arts students and created videos explaining audits, walkthroughs, recycling, shut down for breaks, and instructional videos for test equipment. We divided our team in to groups and each group had a specific topic. The groups wrote their own scripts, picked their shots, and worked with Media Arts to schedule filming. The district energy teams were very successful this year and we surveyed teachers and students and they reported that our videos were informative and helped them to be successful. The videos were posted to youtube and have been viewed over 1,000 times.

Goal #2 Strengthening & Educating the HCS Teams



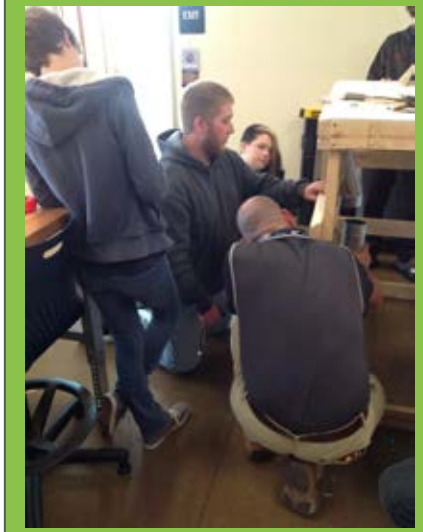


Goal #3 Project EcoCharger

Mr. Stuecker wanted to have a project for the school year that would engage and challenge us. He wanted us to look around our schools and communities and find problems.We identified 2 main issues. We hated the amount of trash we saw all around us and the lack of recycling was staggering. We needed to change student habits and the way they viewed recycling. We needed a way to encourage students to recycle. We looked for other things that are important to students. We are all so connected to our phones and the thought of a dead phone is devastating. We also noticed that you can never find a place to plug in your phone.We decided that we needed to pair the two issues. We built a recycling bin that rewards the deposit of a recycled bottle with 15 minutes of USB charge time. The EcoCharger has a photoeye that sees the bottle being deposited and triggers a timing relay that closes a contact that allows for 120 volts to pass to the USB chargers. After the 15 minute interval the contact opens and the charge time stops.

We started this project with the ultimate goal of encouraging recycling. We did not anticipate that it would let us reach students on 2 fronts. One is recycling and the other is energy conservation and efficiency. Students on our team and the community at large were able to see the negative effects of trash and the lack of recycling. They were also able to see how much a standard wall phone charger uses. We were able to teach power calculations and conversions.

Goal #3 Project EcoCharger Pictures



Goal #3 Project EcoCharger Data

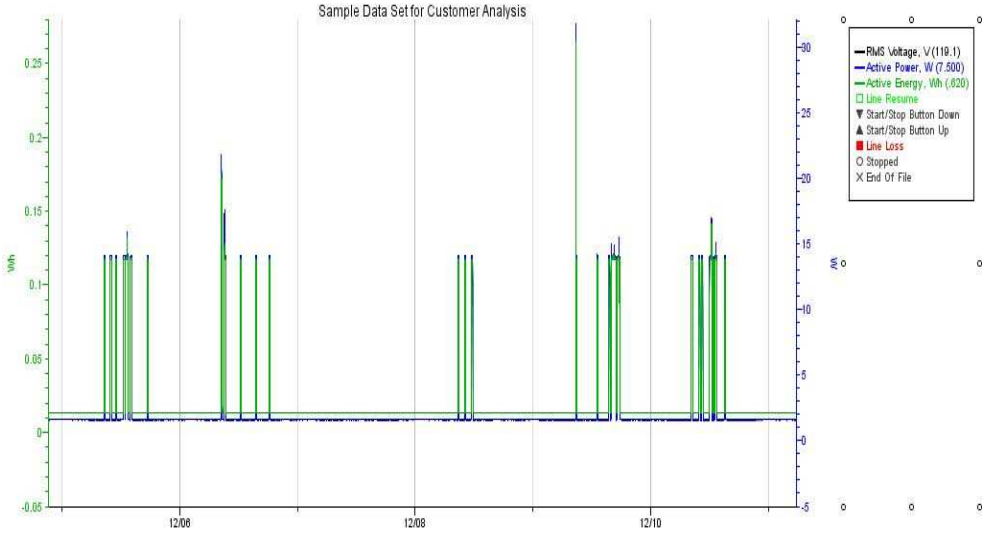
We set up HoboWare data logging equipment on the EcoCharger to monitor the energy usage of the charger. We were looking for the power consumption in standby and during usage. The EcoCharger prototype has green LED lights in the front and white LED lights in the side. The lights were installed to encourage the public to use it and to let them see inside the unit. We wanted to make sure we were wasting to much energy by having the led lights.We expected to see a savings of using one transformer per 4 USB plugs but we were not sure how that savings would affect our district. We had no idea how many phones were in our district. We contacted our district technology department and they were able to tell us how many phones were registered for the wifi in our district. There are roughly 10,000 phones in our district. Those phones are student phones and faculty and staff phones. Our standard wall trasnformer USB plugs use around 20 watts. If we have 10,000 phones that is 200,000 watts or 200 kW. The USB chargers used in our EcoCharger with the lighting option uses around 43 watts per 4 phones. With the LED lighting unhooked it uses around 29 watts. For 10,000 phones we would use around 72,500 watts or 72.5 kW. **That would be a savings of 127.5 kW.**

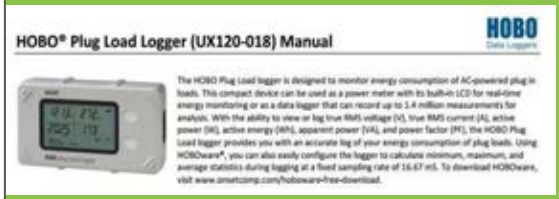
January 25 at approx noon
Recycling center charger

	Watts	Volts	Amps
Machine while not in use	1.604	121.0	0.24
Machine when only bottle dropped	14.0	121.0	.205
Machine with phone plugged in with person using phone	24.9	122.0	.331
Machine with bottle dropped and one phone	20.01	121.9	.307
Machine with two phones plugged in and being used	27.48	122.3	.418
Machine when bottle dropped and two phones	25.56	122.5	.406
Machine with three phones plugged in and being used	40.82	122.4	.639
Machine with bottle dropped and three phones	37.38	122.3	.565

Goal #3 Project EcoCharger Data

Below the graph illustrates energy usage on the EcoCharger. We were able to not only monitor the energy usage but we could see student habits. The product sheet below is of the plugs that we used. They were provided by our local CED and were Hubbell USB 4 Port outlets.





HUBBELL WIRING DEVICE-KELLEMS

ORDERING INFORMATION

USB 4 PORT OUTLET

Description	Color	Catalog Number
USB Charger 4 Port Outlet, Four USB Type 2.0 Ports, 5 Amp, 5 Volt DC, Style Line® Decorator	Black	USB4BK
	Brown	USB4
	Gray	USB4GY
	Ivory	USB4I
	Light Almond	USB4LA
	White	USB4W

Energy Information

120V AC Input Power	Energy consumed when USBs are not in use		Energy consumed when USBs are fully used	
	No Load Current	"0"	Full Load Current	0.46A
	No Load Watts	"0"	Full Load Watts	29.3W

This outlet is capable of delivering up to 5 Amps, 5V DC of USB power. If multiple portable devices are plugged in the individual ports will allocate power as determined by the portable devices.

Suitable for use on circuits with AFCI and GFCI protection.

Goal #3 Project EcoCharger Milestones

The EcoCharger has had many milestones. Production on the Alpha Prototype began in September 2016. It was complete and put in place late October 2016. We have been testing it extensively since that time. It has been tested not only at our school but all over our community and state. In November our local newspaper (The News Enterprise) did a story about the EcoCharger and the impact with recycling in schools. Our project slowly began to gain more and more recognition. A television news stations in Louisville, Wave 3, did a story on our project. They ran the story locally and it was picked up nationally by all 4 major networks. By the end of the week it was a global story. Our EcoCharger had become an overnight success. We have a huge following on Social Media with over 500k likes, comments, and shares on Facebook alone. We became a SnapChat Now This story and have reached over 24 million views. Hooked on Science, found out about our machine and did a segment on their show as well. We have had many offers to purchase the EcoCharger and have been asked to present our project all over the world.

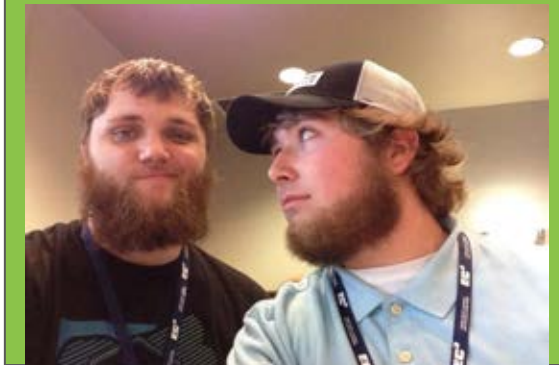
Goal #4 Social Impact

We started the project as fun way to encourage students to recycle. After we started working on it we realized that we had the opportunity to help the Earth and change students behavior. We also wanted to educate students on just how much energy is used by phone chargers. The amount of energy wasted by leaving chargers plugged in and the amount of energy saved by using USB wall outlets.For the 6 months that the EcoCharger was in place we have seen some incredible changes in student behavior. We evaluated our data logging graphs and spreadsheets and could see some interesting behavioral changes. When the EcoCharger was first put in place we saw a direct correlation between each time a bottle was deposited and a phone was being charged. After a few weeks students started recycling only and not charging their phones every time a bottle was dropped. They still charged their phones but it was typically towards the end of the day. Not all day long like initially observed. We knew that we had made a true difference when we started to get requests for EcoChargers at other schools. The students were wanting to recycle and charge at their home schools.

Goal #5 Community Energy Carnival

Our district has 23 schools with 17,000 students. Our energy teams are small but growing. We wanted to educate and offer a chance to have fun for the entire family. We partnered with other schools in our district, our district Chief Operating Officer, our district Energy Manager, Mr. Stuecker, NEED, and many local businesses to offer our first Energy Carnival. With our ultimate goal of reaching as many people as possible we had the event at our Historic State Theater. We offered a free showing of the Lorax. The carnival itself started 2 hours before the movie and we estimate around 500 people were in attendance. The theater holds 600 people and was almost to capacity. Many good things came out of that night. We taught kids about energy, we strengthed our district energy program, we built partnerships with industry, we thanked our community for their support, but most importantly it was great to see kids and parents working together to solve energy problems and having real conversations about energy issues. Mr. Stuecker has spoken with many parents who have expressed their gratitude in getting their children excited about something that they can share with their parents. We started planning the 2018 Energy Carnival before we left the building. Next years will be bigger and better!

Energy Carnival at Hardin County Schools



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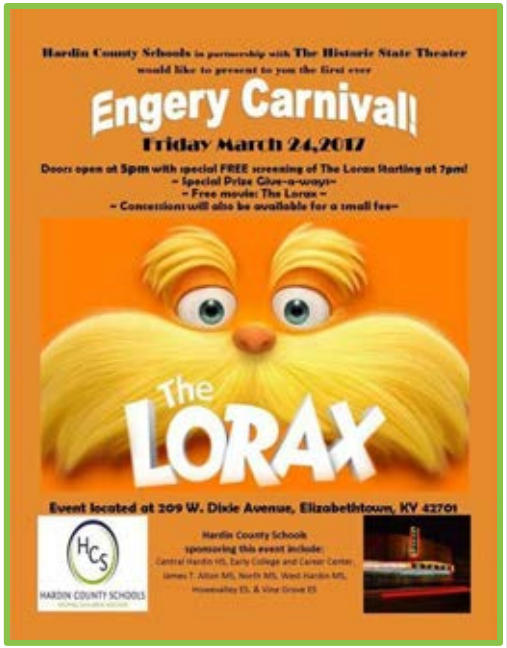
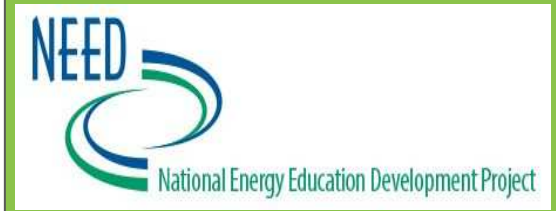


Goal #6 Strengthen Partnerships and our Advisory Board

Our program is in it's second year of existence. We know that we could not be as successful as we are without the support that we receive from partnerships that we have built in cooperation with Mr. Stuecker. These partners make up our Energy Management Pathway Advisory Board. We knew this year we needed to strengthen our past partnerships and build new ones. The partnerships that we build are mutually beneficial as we get support and opportunities from our partners and we also get to give back. We have volunteered, advertised, created videos, and product tested for our partners. The support we have received is far reaching. We have been on many field trips, had guest speakers, received materials for projects, had work opportunities, found career opportunities, and learned real world material from our partners. We will be offering a partner cook out before the end of the school year and again next fall. We want to say thank you while giving our partners a chance to see what the EC3 Energy Team is working on. We do many exciting things and like to showcase these projects.



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