



ENERGY EDUCATION

Elementary Education

Global Sustainability, Fall 2011

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INTRODUCTION

The Problem

There is a lack of education about alternative energy sources among the younger generation. Many students at the elementary, middle, and high school level don't know what wind turbines and solar panels are or how they work.

Background

Only 1 in 10 have said that they are "very well informed" about climate change, and 75% say they would like to know more. Large majorities of Americans say that schools should teach out children about the causes, consequences, and potential solutions to global warming (75%) and that the government should establish programs to teach Americans about the issue (68%) (Yale). It will be increasingly important to stay educated about our environment, the increase of fossil fuel prices, the oil insecurity, and the change in climate as we begin to search for alternative energy sources. Among the most promising energy sources are the use of natural wind and sunlight to produce energy, specifically through wind turbines and solar photovoltaic panels (Brown).

Goals and Objectives

Our aim is to continue a project that was started last year by another group of University of Virginia students that began to raise awareness about these alternative energy sources in the schools of Albemarle County. We will expand the scope of last year's project by educating the youth at Brownsville Elementary School. Our objectives are to increase knowledge of the wind turbine designs and solar panels through the use of interactive and educational activities. We hope to present information that excites the children's interests so that they are enthusiastic and curious about alternative energy sources, especially wind and solar power. We will also work with teachers to integrate alternative energy education into their syllabi in order to ensure continuity in their curriculum.

PROJECT DESCRIPTION

Last year, Albemarle County's local middle school was the recipient of a federal grant of a wind turbine and roof solar panels. While these energy sources will be installed at Henley Middle School in Crozet, the wind turbine and solar panels are meant to benefit the greater community, including the students and parents at Brownsville Elementary School and Western Albemarle High School. Below is a visual representation of both Henley Middle School and Brownsville Elementary School, showing their close proximity. These alternative energy sources are a tangible way for the community to act more sustainable. Another major part of this initiative, and the main issue that our group was trying to target, is to use it as an educational tool for the youth.

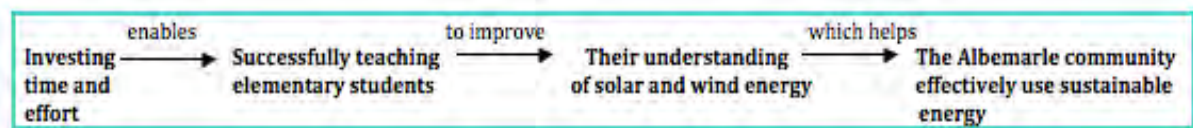


This project was started last year by another group of University of Virginia students who began to raise awareness about these alternative energy sources. The group worked with the sixth graders at Henley Middle School and taught them how turbines work, why they are important, and the future of wind and solar energy. Our job was to expand the education program to Brownsville Elementary School.

Our hope was to teach the students through hands-on learning about wind and solar energy, their benefits, and how sustainable energy sources can help the community. Our goal was to present information in an understandable, cost and time effective manner. We hoped to excite the students' interests so that they would become more enthusiastic and curious about alternative energy sources, and would be more knowledgeable for when the wind turbine and solar panel are installed.

Mission Statement

To excite, to engage, and to educate the youth about sustainable energy sources in hopes of promoting more awareness throughout the Albemarle community



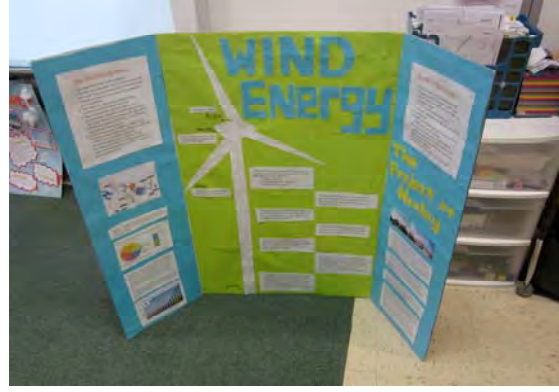
APPROACH

Initial Approach

There is a lack of education about alternative energy sources at the elementary school level. Our approach addresses this problem through expanding education to a younger audience.

When we began this project we knew finding an age appropriate, cost/time effective, fun, purposeful, and engaging set of activities was key to the success of our classroom visit. We realized that when attempting to teach a group of students' material that may be new or difficult for them to understand, doing so in an age appropriate and engaging manner is crucial to success. To help think of interesting and fun ways to introduce materials, it was important to use all of the resources that were at our disposal. We began by researching what previous groups had done, since they had already completed a similar project in the past. Next, we engaged with our supervisors who specialize in this field. We turned to our group coordinators who gave us ideas and had interesting props and models that would help us. Lastly, we looked on the Internet for ideas about activities that would relate.

1. Previous Groups who had done this before: When determining how we should tackle the task of educating elementary students and how to help them learn about alternative energy sources, we turned to the group who had previously worked on this assignment. By looking at the presentation of their work and the successes, as well as the obstacles they faced, we were able to turn our project in a new direction. We learned helpful hints from them and were actually able to use some of their material to improve our own project. Because we all had the same mission, to best educate the children and help our world become more sustainable, everyone was eager and willing to help one another. We found that we needed to work together with other groups and individuals who have experience in this field in order to create the best education program possible. Another valuable resource we were able to use was other groups in our class. The kick-off event group had made a number of great posters for their event and allowed us to bring them to Brownsville as aids to our presentation. Having the posters for the students to look at and read proved to be very beneficial. These various posters on solar energy and wind turbines highlighted the facts in our PowerPoint presentation and reinforced the important information regarding the actual installation at Henley Middle School.



2. Supervisors who specialize in this field: Because the Global Sustainability class at UVA initiated our project, we were provided with some reliable initial contacts from James Madison University and Henley Middle School who helped us get started. For example, Remy Luerssen works for the Virginia Center of Wind and Energy and not only gave us a few of the ideas that we considered for our project but also had resources that saved us money and energy. We received handout activities from Remy that we passed along to the teacher so she could send them home with her students or do them at a different time. Remy also had a Lego set of a wind turbine and Solar Panel that she let us use. Lastly, we were able to take the science club, composed of 4th and 5th grade girls, to Henley Middle School where Remy had set up a scale model of a wind turbine and solar panel.

3. The Internet: As a second grade audience learning a somewhat difficult concept, we turned to the Internet to give us good ideas on how to most appropriately teach them the information. We initially turned to credible websites that were either given to us by Remy or Lindsey or ones we had previously worked with on our own.

- windpowerva.org
- need.org
- awea.org
- kindwind.org
- aer.cisat.jmu.edu

In order to organize all of our research, we used the Internet to create a googledoc because we have so many team members. This enabled us to each do research on our own individual schedules and still compile all the information we found in one, easily accessible place. We split our various categories up on the page; Solar Energy and Wind Energy and then listed various projects, books, or information we found applicable. Once we had all these ideas and an extensive amount of research, we were able to tackle the next component of the project, deciding which activities to use.

Selection Criteria/Design Matrix

We chose seven selection criteria with which to judge the different activities. These were relevance, appropriate length (time), age appropriate, feasibility, affordability, teacher convenience, and engagement. Relevance was a very important measure for us because we wanted to make sure the lessons that were being taught were on topic with wind turbines and solar energy. We understood that the actual technical aspect of these devices is complicated, and so we had to make activities that were engaging and age appropriate. If we were too technical, we could have missed the opportunity to engage the students. Therefore we looked for a great median between relevance, engagement, and age appropriateness.

We also understood that we would be working with the teacher of the classroom and therefore we chose activities that would be as convenient to her as possible. Also, since we had less than an hour, our activities

needed to not be overly time consuming. As far as we were concerned, as organizers, we needed to consider the feasibility of implementing the activities as well as their affordability. Overly expensive activities would not have been practical because they would have required resources we did not have, and therefore would have infringed more on the teachers than needed. Thus we compiled all of the various activities we found suitable into a design matrix using these criteria, as displayed below. We scored each activity on a scale from 1-5 (with 5 being the best) and then totaled the score for each of the activities to see which ones fulfilled most of the criteria.

Wind Energy Matrix

	Wind Socks	Windmill Generator	Paper Wind Turbine	Make a Pinwheel	See the Wind	Interactive Website	Spin the Saltine	Tale of Wendy Wizard
Relevance	2	5	5	2	5	3	3	5
Appropriate length	5	4	4	4	5	3	3	4
Age Appropriate	5	3	4	4	3	3	5	5
Feasibility	3	3	4	4	4	2	5	5
Affordability	4	1	4	4	3	5	4	5
Teacher Convenience	3	5	4	4	4	4	1	5
Engaging	4	5	4	3	5	4	4	3
Total	26	26	29	25	29	24	25	32

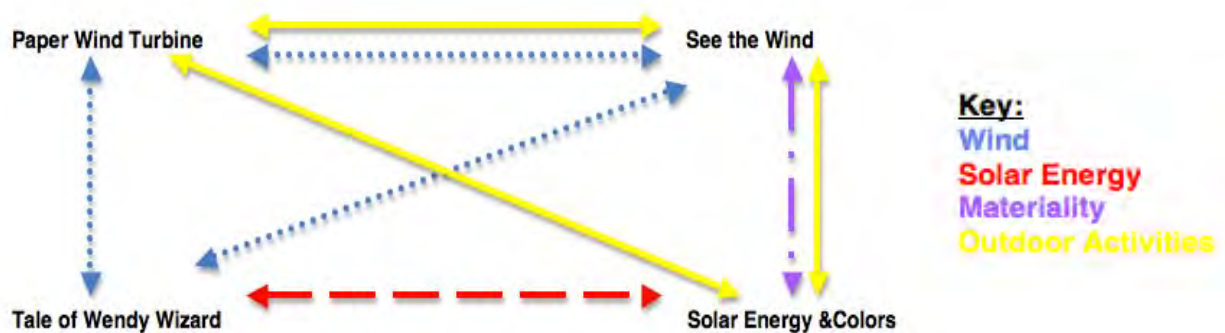
Solar Energy Matrix

	Tale of Wendy Wizard	Solar Energy & Colors	Coloring Book	Solar Cell Simulation
Relevance	5	4	2	5
Appropriate length	4	2	5	4
Age Appropriate	5	4	4	1
Feasibility	5	4	4	1
Affordability	5	4	3	4
Teacher Convenience	5	3	4	4
Engaging	3	3	3	3
Total	32	24	25	22

After reviewing our potential activities, we noticed that we chose a diverse range of options. It seemed appropriate to use more than one of the activities in order to maximize engagement and education with the Elementary school students, time permitting. Here we learned another important lesson: just because something quantitatively gets the best score or seems the most appealing does not necessarily mean that it is something that fits your needs. For example, for our specific project, although in the design matrix above the “Solar Energy and Colors” activity was not the highest ranked, it was something that we believed would teach the children the most, at the appropriate age level. The coloring book was ranked the second highest overall, but was ranked the lowest in the ‘relevance’ criteria, which should be given more value compared to the length of time.

Our ideal project would have included two days of interactive teaching in the classroom. On the first day, we hoped to provide the students with an overview of why we were there and an introductory presentation on our topic of sustainable energy. We would have then broken the students up into workshop groups to administer the activity of “Making Wind Turbines”. Next, we would have gone outside to do the “See the Wind” activity. On the second day, we would have begun with reviewing wind energy and presenting solar energy by reading the “Wendy Wizard Story”. We would have moved outside and carried out the activity “Solar Energy & Colors”. Finally, we planned to conclude with discussion and give the teacher a list of resources and additional activities that she could work into her curriculum or pass along to the students’ parents to work on at home in order to continue education. However, we also constructed a plan to link these two ideas together in case we were only permitted one day to teach.

Once we chose the activities that we wanted to do, we decided to figure out connections between them that would help the children understand how the different activities related. The main links that we found were the type of energy used, i.e. wind or solar, the materials that the activity requires to complete it, and the location in which we are doing it. The three activities that relate to wind energy are the Paper Wind Turbine; See the Wind, and the Tale of Wendy Wizard. These three activities all use wind in a different way, and therefore show how it has many different properties. Both the ‘Tale of Wendy Wizard’ and ‘Solar Energy and Colors’ show how solar energy works, and ways in which to make it more effective.



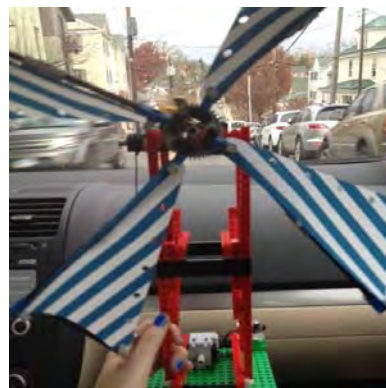
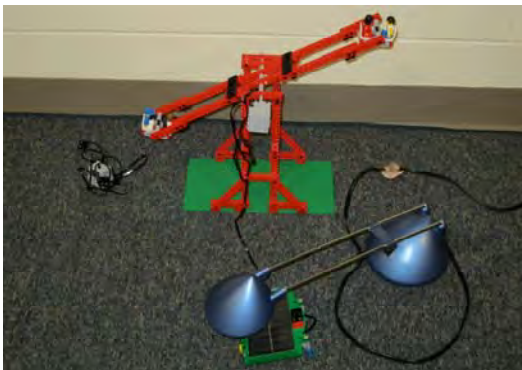
We thought about how to keep making sure the kids saw that everything related to each other, and we did this by using similar materials and doing each of the activities in a similar setting so that the varying aspects of the energy is the only thing changing. We therefore planned to do most of the activities outdoors, and balloons, paper and water bottles are the only materials we planned to use. We hoped this would help them to see how each of the activities relates to one another.

Day of Teaching at Brownsville: November 21, 2011

All of this preparation proved beneficial once we eventually conducted our day of teaching, even though it was quite different than originally anticipated. Due to many scheduling conflicts we were excited that we got

in touch with Mrs. Vicki Snead, a second grade teacher at Brownsville, who wanted us to come speak to her class. While we only got an hour to speak with the students we decided we would make the best of the situation and try to most effectively make use of our time. A final phone call with our community partner Remy also encouraged our group to take a new direction, rather than have it be solely educational and involve fun activities like we had previously been told. They wanted us to be more focused on introducing these topics and really spreading the word about the kick-off event and incorporating an activity where they could make fliers and posters about this event. That being said, we had to rearrange some of the planned activities and focus on not just teaching the students about renewable energy alternatives but also try to have them help us spread the word about the upcoming plans at Henley Middle School. In order for them to continue to learn about these sustainable practices, however, we did print off some of the activities we had previously planned to do, as well as our conceptual design, and gave the teacher copies so that they had ideas for future lesson plans.

We decided that we would use the same initial approach of speaking to the students with an interactive PowerPoint and reading the "Tale of the Wendy Wizard," but we diverged from our activities matrix for the next section of the "lecture". After the introduction, we decided to have each student create fliers for the kickoff event, being held December 16th, that would not only keep them engaged as they were able to be creative and reiterate all the information they learned through art, but it would also help out our peers for publicity about the event and work to get the whole elementary school excited. While the students were working on their posters/fliers, each group (roughly 5 kids) rotated to the back of the room where demonstrations of a wind turbine and solar panel were taking place. The Lego demonstrations of the wind turbine and solar panel were a great way to not only involve the students but also show them first-hand what these alternative sources actually do. Providing the students a way to wrap their head around the information we had presented with actual visual representation was a major contribution to the success of our lesson. The students were able to shine light on the solar panel and see how it enabled the Ferris wheel to move. Likewise, we were able to turn on a fan and see the effects of the wind turbine. The students responded well to the activity and its something we would definitely recommend in the future.



Key People/Stakeholders

Our project involved many different individuals as stakeholders and/or beneficiaries. We worked with Remy Luerssen, Lindsay Snody, Vicki Snead, the previous group that did this assignment last year, and the second grade students that we taught.

- Remy Luerssen from the Virginia Center of Wind and Energy
- Lindsay Snody from Albemarle County Schools
- Vicki Snead; second grade teacher at Brownsville
- Elementary and Science Club Sponsor: We experienced a slight change in our assigned teacher contact.

Jennifer McCarthy, a Brownsville Kindergarten teacher, notified us saying that she did not feel she could commit the time to coordinate our visit. We then worked with Susan Guerssen, a contact at the Middle School, to get connected with an elementary school teacher who was interested in our education program, Vicki Snead.

- The previous group that did the project last year, the Envirovibes.
- Brownsville Elementary School's teachers and students

The key stakeholder in our project was Brownsville Elementary School. They were the ones acting as our medium to facilitate the interaction with the students. Also the school's location in close proximity to Henley Middle School makes them an easy student body to teach solar and wind energy considering they may very well end up going to school there in the future. These students are going to be experiencing of the installation of the wind turbine and the solar panels and, as such, they are an excellent group of young individuals to get excited about this project. Since this knowledge was presented to them in an effective, age appropriate manner, they will be able to grow and expand on these ideas as they venture into middle and later high school. When referring to stakeholders and key people within the project we found communication to be of utmost importance. It was extremely important to have multiple contacts who were all kept up to date and on the same page regarding the progress of the project. We worked with a student group of five members, two community partners, and several teachers at Brownsville. It was important to keep everyone updated on our progress in order to avoid confusion, disconnect, or frustration. Our communication process with the teachers and the community partners was mainly done with the medium of technology. While we eventually had to make several phone calls to get our project rolling, the initial contact was made through email.

Example of an E-mail:

Dear _____

Hope you are having a wonderful start to the school year. We would like to introduce ourselves as students from the University of Virginia who are taking part in the Global Sustainability course with Professor Phoebe Crisman. We have backgrounds in global development, biology, business, and architecture and share an interest in education concerning sustainable technologies. We are very excited to work alongside you with your students at Brownsville Elementary and with your support, hope to spread the awareness of alternative energy sources.

We have attached a project definition that outlines objectives and hopes for this project. At your convenience we would like to meet to discuss the overall project and reactions to the attached definition.

Please let us know when you are available.

Looking forward to hearing from you,

Best wishes,

Gabe Barrientos, Roshni Mahtani, Sarah Paul, Haley Plotner, Maddie Tolmie

In the course of this project we realized the importance of follow up with our community partners and teacher to make sure we were on the same page as them. An obstacle we faced when conducting our project occurred when we were given a teacher contact. Assuming that she was filled in and ready to help us out with our project, we sent an introductory e-mail to her on October 5th and did not get a response. We waited a few weeks to give her an appropriate amount of time to respond but when we did not hear back, we decided to follow-up with a phone call. This phone call was instrumental in our project as it proved to us there was a communication issue. She did not respond to our email because she had never heard of our project, or us. We had gone into the conversation assuming that she was on board with our project, yet she

was not even aware it was happening. After this conversation, we were able to go back to Lindsay and Remy to address the teacher contact issue. Remy directed us to Susan Guerrant who is very involved with the middle school project, and from there we found a teacher who was excited about having us in her classroom. Without the phone call to follow through, we would not have known that Jennifer McCartney did not know about the project. We respected her decision to not be the main coordinator with our project and are took the necessary steps to find another teacher. Again, while this at the time seemed like a huge obstacle that would take extreme efforts to recover from, we took a step back and recognized the lessons that came out of the situation. Because we had been well organized and established such detailed approaches, design methods, and planning, we were able to use that information to contact another teacher and present them with all the work we've done. Our group continued to work with the school system to try and find a class to work with and were very grateful and excited when Mrs. Snead a second grade teacher at Brownsville Elementary school responded to our e-mails, excited and eager to have us come speak with her students. With the help of our new contact, Mrs. Snead, we were able to not only speak to her second grade class, but also stayed after school and spoke with the Brownsville science club, a group of roughly 12 fourth and fifth grade girls interested in the subject of science and sustainability. By remaining positive and continually working, even though we had a rough patch, we were able to successfully teach these groups of students and hopefully ignite their passion for sustainable resources. Another teacher at Brownsville elementary, Ms. Eckerle, has also reached out to our group to see if we would be willing to come speak with her class. Thus, in the near future we're looking forward to going back to Brownsville and spreading the knowledge about sustainable practices.

For easy communication, we used a list-serve to keep track of all our emails, meetings and important dates. A list-serve enables an email to be sent to a selected group of individuals (who were entered into the list-serve) all at the same time. At the beginning of the project a list-serve was created that had each of our five e-mails added to it called energyedu_elementary@virginia.edu. This made sending emails to our various contacts easier because everyone was kept up to date with responses. For example, if one of us was sending an e-mail to a teacher the email would be sent to energyedu_elementary@virginia.edu, and to the address of the teacher. Then not only would everyone be up to date on what was sent out, but also each member would get the response from the teacher as well. This eliminated a large portion of miscommunication.

SCHEDULE

Timeline

Much of our timeline for accomplishing our overall task of teaching was contingent upon our teacher contact: how much time she could allocate for us, and when she could have us into her classroom. That being said, we created a timeline that indicates the steps we had already taken throughout this project. It also included the projected dates of our next few meetings and the eventual days of teaching in the classroom. Our team learned some important lessons over the course of this semester with regard to scheduling. It was necessary for us to leave time for correcting errors and set deadlines in advance so that we always had something to work towards. We initially set forth our schedule and all agreed upon dates that worked for us, but without the "okay" from the teacher it was all irrelevant. Setting up that initial meeting with the community partner/teacher we were working with, as well as planning when everything will take place, was imperative.

September

- 9/8: Skyped with our community partner Remy Luerseen and met our other community partner Lindsey Snood
- 9/8: Met with our group to outline project goals and work on Project Definition
- 9/9: Project definition due (outlined objectives and goals for the project)
- 9/20: Met to discuss how the project was coming along and work on Conceptual Design

October

- 10/3: Met to finish Conceptual Design
- 10/5: Email and made first contact with Jennifer McCartney- Kindergarten Teacher at Brownsville Elementary
- 10/5: Conceptual Design Due
- 10/24 Phone call with Jennifer McCartney
- 10/24: Met to work on Preliminary Report
- 10/27: Phone call with Remy about getting a new contact
- 10/27 : Emailed Susan Guerrant

November

- 11/2: Met to finish the Preliminary Report
- 11/2: Preliminary Report Due
- 11/4: Email Mrs. Snead and Ms. Eckerle (teachers at Brownsville)
- 11/15: Re-emailed Mrs. Snead
- 11/16: Got a response from Mrs. Snead, emailed back and forth final details
- 11/17: Met to go over presentation and make powerpoint
- 11/19: Ms. Eckerle emailed us about wanting us to come speak with her class
- 11/19: Met to create the lego models of the solar panel and wind turbine
- 11/21: Went into Brownsville to teach the second grade class and science club

December

- 12/3: Met to begin working on the Final Report
- 12/9: Met to finish the Final Report
- 12/10: Final Report due

Preparation

After discussing various new ideas with Remy, our group met once again and were back to drafting fun engaging ways to incorporate our new objectives. The most prominent of these was advertising for the kick-off event, and of course explaining what is going on at Henley. It was in this drafting session that we discussed the idea of the PowerPoint and then the Lego demonstrations and the fliers to be worked on simultaneously. After that was decided, our group then had to tackle one of our biggest feats, putting together the Lego's. After a hefty amount of time of trial and error and reading fine print, we constructed Lego replicas of a wind turbine and a solar powered Ferris wheel. The wind turbine structure had wheels and a generator that once wind was powering the turbine would reel up a Lego, in our case a young man we placed on the pulley system. The solar panel Lego demonstration was very realistic and cool. That structure had a Ferris wheel made out of Lego's with a generator and solar panel connected to it. When sunlight, in our case a desk lamp, shone on the solar panel the Ferris wheel spun. The degree of speed changed depending on the direct light that was hitting the solar panel. We were very pleased with the end product of these Lego demonstrations and not only were they an accomplishment for us but they also really helped the students understand the concepts.

Meeting Dates

Once we got connected with Mrs. Snead we were able to really finalize our timeline for the day of teaching. We went to Brownsville elementary on November 21, 2011 from 1-4pm. We were allocated an hour to speak to the second grade class and then an hour at the end of the day to speak to the Science Club. The schedule for these two time frames was the following.

Second grade class:

1:30 - 2:00: Introduce ourselves, PowerPoint presentation, and the tale of the Wendy Wizard
2:00 - 2:30: Activity and demonstrations

After School Science Club:

2:30-3:00: Presentation and demonstrations (more of a conversation because the students were more well versed with the topic)

3:30- Took a trip to Henley Middle School (with the approval of the librarian at Henley and with the club leader, Mrs. Snead) to see larger replicas of a wind turbine and a real solar panel

Individual Responsibilities

In order to divide the many responsibilities of the project, we first looked at each team member's background and what they had to offer. Each person in our group has an individual skill set, which helped our project run smoothly.



The matrix above outlines the unique perspective and skills each one of our five team members brings to the table. Their unique skill sets match up to the various aspects of the project they were each best suited for. Take for example, Maddie; as a fourth year student she has experience communicating with various community partners and adults. Due to the fact that she is well spoken and good at communicating she was our main point of contact with the elementary school. Thus, as indicated before, when phone calls were made to Ms. McCartney, Maddie was the team spokeswoman. Maddie was also delegated the task of reading the stories to the children in a fun and engaging way. Next year she is going to work for Teach for America, and as such, she was a huge part of our group's ability to connect with the students. She was truly responsible for engaging the students throughout the presentation and getting them excited about wind and solar energy.

Gabe had various responsibilities both behind the scenes, and for the actual day of teaching. When conducting research about the various activities Gabe was our team's "go-to-guy". He was able to sort through the various websites and be a key player in deciding which activities he felt were important. Gabe also is a fun and engaging speaker so he was delegated the task of explaining to the kids initially why we were there as well as exciting them about the new energy facilities. Gabe, along with the rest of our team, presented a large portion of the initial PowerPoint. Furthermore, the day of the actual event, one of Gabe's

duties was to run the wind turbine and solar panel demonstration with the Lego's; something as we have mentioned before, the kids learned a lot from and enjoyed thoroughly.

Having prior experience teaching in elementary schools, a large portion of Haley's responsibility was with the interaction with the kids. She, along with the rest of the team, taught the students with the PowerPoint and also introduced how to do each project. Haley also had the responsibility of walking around and making sure all the students fully understood the information and also kept an eye on everything to make sure the day of teaching ran smoothly. As far as her responsibilities prior to the actual day of teaching were concerned, she was responsible for understanding how the flow of the day should run and ensuring everything was handled appropriately. She did a great job of initiating and setting up group meetings and group assignments.

Being a student in the Architecture school here at the University of Virginia, Roshni was the "creative" all-star in our group. Roshni was in charge of understanding how to assemble the various projects (i.e. the Lego's) and was in charge of handling the logistical displays and making sure they went as planned. Roshni did a great deal of making sure the Lego's functioned properly and running tests on them prior to our day of presenting. She did a really great job of linking the practicality of the presentation with some aesthetic allure that only an architect could give us and edited the graphics for both the report and the presentation.

Lastly, Sarah held responsibilities in various components of this project. Being friends with the previous group who had done a similar project in the middle school Sarah acted as our point of contact with the group, enabling us to gain insight and advice. Also, along with Roshni, Sarah was responsible for fully understanding the logistics of how the materials of the various activities worked with one another, as well as making sure everything went as planned. Lastly, on the day of the actual event, Sarah, along with her portion of the PowerPoint, presented the wind turbine demonstration and dealt with showing the students how wind can generate energy.

BUDGET AND FUNDING

Cost has been a major factor in our project. We deliberately chose activities that have minimal cost yet provide educational value and follow our criteria as discussed in our design matrix. The only expected costs for this project were printing costs, gas for transportation, and small materials. It turned out that because our activities changed, our group (aside from gas) faced no substantial charges. We were very fortunate that another group in our section let us use their posters and we created the PowerPoint as a free way to relay information. As for the Lego models, Remy let us borrow them for the week and in addition, we used a light and bedside fan that we already had. The poster supplies and markers were supplied by Mrs. Snead.

DOCUMENTAION AND ASSESSMENT

Initially, we hoped to assess our project with a quantitative approach in terms of how comfortable the students felt with the material presented. We considered giving a "quiz" at the end of the class. While we never actually engaged in a quiz or pre-test because we wanted to use our time efficiently, we gauged the success on a qualitative basis. Our presentation was extremely interactive and we were really able to get a feel for how well the students knew the material. Then, while they made their fliers of information and got to see the demos, we were pleased with the new information the students were explaining to us, and one another. The class had a great grasp on the information when we left and were extremely excited to spread the word to their friends. We found a similar positive reaction when speaking with the Science Club. Due to the fact these were girls in the fourth and fifth grade with an interest in science, their initial understanding of the Henley project was at a higher level, but they were still eager and excited to learn more. The information they learned and the proof of our teaching was really evident when we took the mini field trip to Henley middle school. There, a librarian showed the girls the models of the wind turbine and solar panel and asked them various questions. It was exciting to see how well the girls were able to relay the information we had

taught them and how eager they are for the installation of these alternative energy sources.

For documentation, we made sure to get the necessary permission from Mrs. Snead and the parents of the students prior to our presentation. Signed permission slips were required for us to take pictures of the students in the classroom. We took photographs of the students engaged in the various activities and can hopefully even use them to publicized at the Kickoff event to engage the community and excite the kids. The pictures will also be a great resource for future groups to better understand our experience. We emailed all of our pictures to our community partners, Lindsay and Remy, who will use them to write future grants.

PROJECT DISSEMINATION

We had the opportunity to go into Brownsville Elementary School and teach about solar and wind energy to a second grade class, and a Science Club that was comprised of 4th and 5th graders. We look forward to continuing to speak with Mrs. Snead and maintaining our relationship at Brownsville so as to continue to spread the knowledge about alternative energy sources.

In order to disseminate our project results and expand the scope of this project in the future, we could research all of the sustainability clubs here at the University of Virginia and see which groups would be most relevant and interested in learning about this project. Once the wind turbine and solar panels are implemented at Henley Middle School, we might be able to propose a new club or work with an existing CIO to teach about sustainable lifestyles in elementary schools. Since our project is solely focusing on Brownsville Elementary, it would be great to expand this opportunity to other schools and grades. This might also be an interesting idea for a group project in the Global Sustainability class next year.

In order to implement this group, we would have interested students at the University of Virginia meet once a week to plan out activities and get organized and then throughout the semester they can have one or two sessions with each class in the elementary school. The first semester could just be an introduction, but then next semester when they went back to the same class they can quiz them on what they remember and have new activities that are getting harder as the children get older. Having multiple trips to the same group of students, even once a semester for their whole time in elementary school, will continue their education about sustainable energy. The information taught to them will also get increasingly more detailed so that they will have a very cohesive understanding by the time they leave.

To expand this project beyond the elementary level, we would love to take a trip with a bunch of University of Virginia students or with sustainability groups here to see the wind turbine. This will be the first turbine that most people will have seen and therefore it will be interesting, even for college-aged students to stay informed on the current happenings in the sustainable energy world. The hope is that these students are then inspired to either take part again the next year or perhaps lead others to join one of the sustainability groups on grounds.

The kick-off event will also be a great way to obtain publicity; each school is going to have their own table at the event and will use this booth to have children show what they have learned to the community. Teaching is a great way to learn, and so we hope that in helping to plan the information that the students will present at the event, this will also reinforce these new ideas and disseminate knowledge to their peers from other classes.

As with any development project, the "hand-off" is extremely important in maintaining sustainability. In the specific example of our project, the long-term aim is to provide continued education for youth. Repetition is important, especially as this information might be difficult to grasp and fully understand if it's just taught once. We made sure to stress to the teacher how important it is for her to review our lesson and to provided additional activities and resources that she can use in the classroom in the future. We have also created a

"how-to guide", which outlines our approach and presentation for future groups wanting to initiate similar education projects.

Lessons Learned

Throughout the project we experienced many barriers that we had to overcome. Our main issue was finding a teacher at the Elementary School to work with, but with many phone calls and following through with other contacts such as Remy and Lindsay, we were able to eventually find someone to work with at the school. Our main goal for this project was to excite, engage, and educate the youth about sustainable energy sources in hopes of promoting more awareness throughout the Albemarle community. While at Brownsville, we were able to tell the children all about the wind turbine and solar panel that will be installed at Henley Middle. We got them excited about the kick-off event that will take place on December 16th, and taught them all about the need for and uses of the sustainable energy methods.

Our most successful aspect of the teaching was the Lego models of the wind turbine and the solar panel because they were able to show in physical form the way that the two methods work and their similarities. It was also a very engaging method that enabled the students to work with the models.

If we were to do it again, we would try to get more time at the school or talk to more than one class so that the information could spread even further. Ideally, we would hold an assembly for the entire student body at elementary school because that would be a good way to get everybody excited about the new sustainable energy methods.

Overall, we feel we were successful in exciting the children about the wind turbine and solar panel, and taught them enough information so that they could appreciate the opportunity they have to the fullest degree.

APPENDICES

Tale of the Wendy Wizard

PRIMARY ENERGY STORY: The Tale of Wendy Wizard



Wendy lived in a lighthouse with her father, who was a powerful wizard. Wendy was his only child and he gave her whatever she wished.

Wendy loved the lighthouse, which stood on a high cliff above the ocean. She loved to play outside in the sun. She loved the seagulls that soared through the sky. She loved to swim with the fish.

The only thing she didn't like was the wind. On the cliff, the wind blew all the time. If Wendy had a picnic, the wind blew away her napkin. It carried her potato chips up to the seagulls. It blew sand into her drink.

One day, Wendy's father gave her a new wizard hat. It was beautiful. Silver stars and moons glittered on it. Wendy shouted for joy and ran outside to show the seagulls.

Suddenly, a gust of wind grabbed the hat and blew it over the ocean. "Stop!" Wendy cried, "Bring back my hat!" But the wind blew the hat away from her.

Wendy ran inside. She was furious. "Father, Father, the wind took my new hat. I want you to make the wind stop forever!"

"Wendy, I don't think you understand what you are asking," said her father.

"Yes, I do, Father! Make the wind go away! Do this if you love me!" And her father, the great wizard, could not deny his daughter.

The next morning when Wendy woke up, it was cold and dark. The air was still. There was no wind. She smiled, then shivered. Why was it so cold and dark? She ran to find her father.

"Thank you for stopping the wind, Father. But why is it so dark and cold? The sun should be up by now."

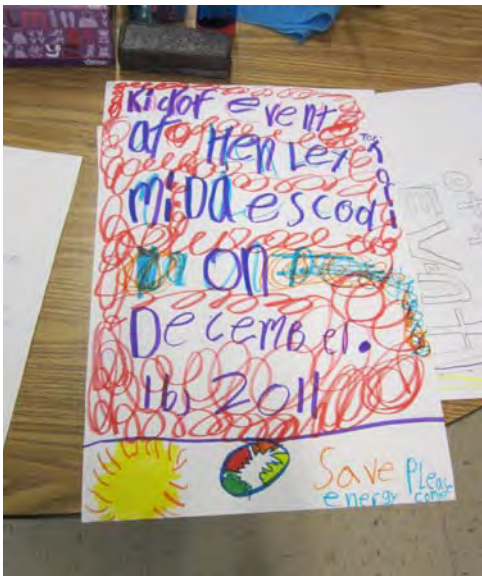
"I had to send the sun away to grant your wish, child. A dark, cold world is the price you must pay to stop the wind," explained the wizard.

"I love the sun, Father, I just wanted the wind to stop," cried Wendy. "Please bring back the sun!"

"But it is the sun that makes the wind. The sun warms the land and the air over the land rises. The cool air over the ocean rushes in to take its place. To stop the wind, I had to send away the sun. That was your wish."

Wendy looked at her father and grinned. "You did this to teach me a lesson, didn't you? I needed to know about the sun and the wind. I needed to learn to respect all of nature's energy. Now bring back the sun and the wind, and stop spoiling me!"

Pictures from the day of teaching





GLOBAL SUSTAINABILITY

Haley Plotner 🌐 Gabe Barrientos 🌐 Roshni Mahtani
Sarah Paul 🌐 Maddie Tolmie

What is energy?



Energy is in EVERYTHING

- ➔ to turn on lights
- ➔ to make a basketball shot
- ➔ to watch tv

We need Energy in our every day life
but we're running into a problem...

WE'RE RUNNING OUT!!

- Because we use so much of it, we are running out of it! We must look for other sources as well as limit our consumption of energy
- Renewable Energy:
 - Solar energy from the sun can be turned into electricity and heat
 - Wind

WIND ENERGY SOLAR ENERGY

- Wind energy means using the energy of wind to provide electricity
- Wind is renewable and clean source of energy
 - Using it doesn't hurt the environment and it doesn't run out!



- "Solar energy means using the energy of sunlight to provide electricity, to heat water, and to heat or cool homes, businesses or industry"
- Sunlight is a clean renewable source of energy



WIND TURBINES



- A wind turbine is a machine of propellers attached to the top of a tower
- When the wind blows it spins the rotor and gives power to a generator ➔ ELECTRICITY!
- One wind turbine can generate electricity for your house or even a building!
- Often they are found in wind farms- clustered together
- BENEFITS:
 - Pollution free
 - Renewable energy



SOLAR PANELS



- Solar cells direct sunlight into electricity
- The sun sends down energetic photons- these photons arrive from the sun and hit our solar panel that cause electrons to move down a wire
- The electrons then get power and move along the wire to power an appliance
- It can also be that the solar panels absorb the heat and can heat up your building- dark colors attract heat!



LET'S TAKE A LOOK AT SOME MODELS!

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