

A Community Outreach Through Social Media:
Green2Growth “Viral Video Challenge”
An Interactive Qualifying Project
submitted to the Faculty
of the
WORCESTER POLYTECHNIC INSTITUTE
in partial fulfillment of the requirements for the
Degree of Bachelor of Science
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ABSTRACT

Environmental pollution is a global problem that is destroying the Earth's natural resources and accelerating climate change. The goal of Green2Growth is to transform Worcester, Massachusetts into a sustainable community by actively promoting sustainable living to the residents of the city. To help achieve their goal, they sponsored an interactive qualifying project (IQP) at Worcester Polytechnic Institute (WPI). The IQP was completed by a team of three WPI students, and it involved preparing a plan for a Viral Video Challenge. The challenge will use local middle school students in the production of short videos that convey a message about sustainability. The IQP consisted of the following steps: background research, hosting interviews, developing a lesson plan and promotional plan, and assembling a list of recommendations and contacts. By completing this IQP, the team has organized and prepared a Viral Video Challenge for implementation in Worcester's middle schools for the near future.

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EXECUTIVE SUMMARY

Green2Growth is a community-initiated organization sponsored by National Grid. Their goal is to make Worcester, Massachusetts a green powerhouse by promoting sustainable living. In order to help accomplish this goal they intend on hosting a Viral Video Challenge. The challenge will use local middle school students in the production of short videos that convey a message about sustainability. The completed videos will be posted on multiple social media websites in order to maximize the number of viewers and have the greatest impact on Worcester's community. In order to prepare and organize this challenge, Green2Growth sponsored an Interactive Qualifying Project (IQP) at Worcester Polytechnic Institute (WPI). The IQP consisted of four steps: background research, hosting a series of interviews, developing a lesson plan and promotional plan, and assembling a list of recommendations and contacts.

In order for the IQP group to develop a fundamental understanding of all aspects of the project, background research was conducted on the following subjects: sustainable energy solutions, adolescent learning styles, and social media. The group's research regarding these subjects enabled them to host meaningful interviews, and to develop an effective lesson plan and promotional plan.

The group hosted three separate interviews in order to prepare a lesson plan and promotional plan. First, employees from National Grid were interviewed in order to provide the lesson plan with data specific to Worcester and a list of suggestions for sustainable living. Second, an adolescent teaching expert from Worcester State College was interviewed in order to help the group produce an organized and engaging lesson plan for middle school students. Lastly, an interview with a marketing consultant was conducted in order to aid in the production of a promotional plan for the Viral Video Challenge.

The resulting lesson plan lasts approximately 45-60 minutes and consists of an introduction, body, and conclusion. The introduction involves the educators asking questions to gauge the student's existing knowledge on sustainable energy topics. The body of the lesson contains a brief PowerPoint presentation, an educational board game, and a kilowatt-hour demonstration. The lesson concludes by assessing what the students learned, and by introducing

the Viral Video Challenge. The purpose of the lesson plan is to provide content for the student's videos, and to encourage them and their parents to practice sustainable lifestyles.

The resulting promotional plan consists of three phases: media generation, posting, and advertising. The first phase involves generating products that can be posted on social media websites from local middle school students. Such products include essays, artwork, and videos that convey a message regarding sustainability. The second phase consists of posting the products on social media websites, such as YouTube, Facebook, and Green2Growth's blog. The final phase involves advertising Green2Growth and the Viral Video Challenge by utilizing text based advertisements on local middle school websites and in newspapers. The purpose of this plan is to maximize the exposure of the generated media and to encourage the students, parents, and teachers to live sustainably.

In order to facilitate the completion of the Viral Video Challenge, the IQP group assembled a list of recommendations and contacts. The recommendations include two major components: a proposal for middle schools, and a parental consent form. The purpose of the proposal is to provide middle schools with a detailed explanation of the challenge and to ask whether or not they intend on participating. The purpose of the parental consent form is to inform the parents of the nature of the project and to gain their approval. The list of contacts includes local middle school administrators and teachers, founders of Green2Growth, and other people involved with the project. Additionally, an extensive list of Worcester's middle schools and their phone numbers is provided.

All of the information the IQP group received from their interviews fueled the lesson plan, promotional plan, and the list of recommendations and contacts. The lesson plan provides the information necessary to effectively teach students about sustainable living in Worcester, and produce footage for the challenge. The promotional plan allows the media to spread through websites like Facebook, YouTube, and Green2Growth's blog. Finally, the group's recommendations and list of contacts will be useful for executing the Viral Video Challenge. With the completion of this IQP, the group provided the information needed to facilitate a successful Viral Video Challenge in the near future.

CHAPTER ONE: INTRODUCTION

In 2010, the average American household consumed about 95 million British Thermal Units of energy (Energy Information Administration, 2010; Stark, 2009). The United States generates nearly 83% of its energy by burning nonrenewable natural resources e.g. coal, natural gas, and petroleum (Energy Information Administration, 2010). Although these energy sources are convenient to use, they can have a grim impact on the health of the environment. In 2009, the United States emitted 5,379 megatons of carbon dioxide into the atmosphere, thus making them the largest contributor to climate change in the world (Hockstad, 2009). In order to prevent further deterioration of the atmosphere it is crucial to promote the use of “green” technology.

“Green” technology is about improving existing products to make them less harmful to the environment, therefore reducing the negative impact that humans have on the world (GPNM, 2010). The city of Worcester, Massachusetts is making the effort to change the behavior of its residents by promoting sustainable energy solutions with help from community initiated organizations like Green2Growth. Green2Growth’s goal is to make Worcester a more sustainable city by educating its residents on environmentally friendly living. Specifically, Green2Growth encourages residents to reduce energy consumption by utilizing smart grid technology and renewable energy resources.

In order to accomplish their goal, Green2Growth sponsored an Interactive Qualifying Project (IQP) at Worcester Polytechnic Institute (WPI). The project consisted of developing the plan needed to implement a successful Viral Video Challenge in Worcester’s middle schools. The Viral Video Challenge was broken down into three steps. First, Green2Growth will sponsor a team, who will go into local 8th grade classrooms and give an interactive presentation regarding sustainable living and smart grid technology in Worcester. This presentation will provide the students with a basic understanding of sustainable energy solutions as well as a list of energy saving tips and tricks. Second, the students will display what they learned from the presentation in the form of videos. These videos are intended to be entertaining as well as educational. Green2Growth will help facilitate the production of these videos by providing video equipment to the students and expert video editing. Lastly, the finished videos will be posted on social media websites like YouTube, Facebook, and Green2Growth's blog in order to further spread the message of sustainable living in Worcester. The middle school with the highest

number of views after the end of the challenge will receive a prize consisting of video equipment.

The objectives of the IQP were to develop a lesson plan based on the topics of sustainable energy solutions, to create a promotional plan to support the Viral Video Challenge, and to organize a list of recommendations and contacts for the completion of the project. In order to create an effective and engaging lesson plan, it was important for the IQP group to develop an in depth understanding of sustainable energy solutions and adolescent teaching techniques. The promotional plan was fueled by understanding the different types of social media and how they can be used to effectively achieve the goal of Green2Growth. Finally, the list of recommendations and contacts was consolidated by working with the IRB, networking with different local middle school personal, and analyzing the content that is needed to complete the video challenge.

With the increasing degradation of the environment, it is imperative that an effort is made to utilize more sustainable solutions. Green2Growth is taking a step in that direction by motivating the residents of Worcester to live more sustainably by sponsoring the Viral Video Challenge. This project consisted of five steps. First, background research was performed on sustainability, adolescent teaching approaches, and the social media. Second, interviews were conducted with National Grid employees, marketing consultants, and teaching experts. Third, by using information gathered from the first and second steps, a lesson plan for Worcester's middle school students was prepared. Fourth, a promotional plan was developed from the background research and marketing consultation. Finally, a list of recommendations and contacts was put together for use in the future. This IQP has prepared Green2Growth to conduct and promote the Viral Video Challenge in the upcoming years.

CHAPTER TWO: BACKGROUND

Green2Growth

Green2Growth (<http://www.green2growth.com>) is a community-initiated organization that is sponsored by National Grid and is working to make Worcester, Massachusetts a more sustainable city. This organization was founded in 2011 and is making the effort to organize programs that would increase environmental awareness in the community. In September of 2011, Green2Growth held a conference that focused on exploring different ways to increase the use of “green” energy in Worcester. The goal of Green2Growth is to transform Worcester into a “green powerhouse”. Green2Growth explained their motto, “green today, growth tomorrow,” in the following statement:

The phrase was developed by the steering committee to make the connection between investment in smart energy technologies and practices as a way of fostering an environment that is attractive to residents and business, particularly those in sustainable industries (Green2Growth, 2011).

Recently, Green2Growth has tried to expand their audience by utilizing social media, such as a blog on their website and a YouTube channel. Social media is a tool that can be easily accessible by all demographics. As of February of 2012, their YouTube videos had received negligible views, with none exceeding 100 views. The IQP was designed to provide Green2Growth with the knowledge needed to carry out the Viral Video Challenge in the spring of 2013. By implementing the IQP group’s plan, Green2Growth will have the ability to reach a wider audience.

Sustainable Energy Solutions

Researching the topic of sustainable energy solutions completed the information needed for the content the lesson plan for the Viral Video Challenge. This was done by performing research on non-renewable resource energy production and then comparing it to alternative sustainable energy solutions. Countries all over the world need to eliminate the human dependence on natural gases and resources to reverse the rate of the degradation to the environment (Clark, 2010). According to Robert Kates, “Sustainability science focuses on the

dynamic interactions between nature and society” (Kates *et al*, 2000). In order to create a “greener” more sustainable future it is imperative to see the adverse effects that have been caused through today’s current technologies.

As of 2010, more than 80 percent of all the energy generated in the United States was through exhausting non-renewable resources (Energy Information Administration, 2010). Although these methods are widely known and an easy way to generate large amounts of energy, there are still many concerns with them. A large concern with the burning of coal is that the pollutants that are burned off contain CO₂ in addition to other pollutants that can cause acid rain. Both acid rain and excessive CO₂ are major causes of global warming (Ghosh, 2009). On a local level, Worcester, MA is home to approximately 182,596 residents, with each resident, on average, producing 14 Tons of CO₂ per year (Worcester MA, 2011; eRedux, 2011). Worcester, being the second most populous city in the state, in turn, contributes to the total CO₂ output of MA. According to the Energy Information Association (EIA), Massachusetts is the 25th highest Carbon Dioxide (CO₂) polluting state in the United States. There is a need to modernize the different ways of generating energy in order to ensure that the resources on Earth are saved, preventing further damage to the environment. There are many types of renewable energies e.g. smart grid technology, wind, and solar energy that can be implemented by Americans on a small and large scaled basis.

Smart Grid Technology

Smart grid is the concept of giving both the consumer and the energy provider a way of seeing exactly where and how much energy is being used. As stated by Tony Flick, “Smart grids utilize communication technology and information to optimally transmit and distribute electricity from suppliers to consumers”. In order to do this there are several inputs to be considered in order for the idea of smart grid to be utilized. There needs to be two way communication between the electric companies and the consumer, more control on energy, and more specific sensing and measuring devices (Flick, 2011).

The best way for a consumer to be conscious of the energy that they are using is through a smart meter. A smart meter monitors electricity usage and provides statistics in real time, allowing customers and energy providers to understand where the energy is being consumed.

Through these real time statistics there is the ability to provide consumers with pricing and suggestions of lowering costs and energy usage (Flick, 2011). A smart meter allows the consumer to be conscious of the energy they are using so they can save themselves money. This means that if consumers are trying to save money, less energy is being wasted making the current power plants more efficient.

A smart meter is most optimally used in a situation where a house has a Home Area Network (HAN). This HAN connects smart electronics (washing machines, refrigerators, televisions, thermostats, etc.) to the smart meter, allowing feedback on the energy usage of each device. With the information from the electronics to the smart meter it is possible to create a schedule of when certain electronics should be turned on to save money and energy (smartgrid.gov, 2011). For instance, running a washer or dryer in the middle of the night uses less energy because the power grid is not running at peak capacity. Simply by setting a smart washer to run at midnight, it will save the household money and electricity.

The major benefits of using smart grid technology come from the real time communication between the consumers and the utility companies. Power outages that occur can be detected instantly through smart meters, which allows for quick restoration of electricity. Also from the smart meter a consumer can see the current price of electricity, allowing them to choose whether or not they should use a high consuming electricity device. If a customer chooses, the utility company could control the air conditioning in the summer through the smart meter to again save the consumer money. Finally, there is the option to “set and forget” which allows the consumer to set up a schedule to run electronics in the house at the most opportune times to ensure a lower electricity bill (Faruqui, Mitarotonda, Wood, Cooper, Schwartz, 2011). Smart grid technology benefits the consumer on all levels, and at the same time it benefits the environment for generations to come.

On top of using smart meter technologies another alternative can be buying energy efficient equipment that can help take the load off of the power grid. Some examples of this could be buying energy saving light bulbs, appliances, and other equipment of similar caliber. By consumers being conscious of supplies and appliances they purchase, they can save themselves money through smart grid. In turn they also save energy that is wasted on inefficient products. There are many methods that the average household can do to save energy, and it's a matter

informing them with the right techniques to accomplish the goal. Green2Growth wants the average resident in Worcester to be aware of the procedures it takes to make the city more sustainable. Wind and solar energy are sustainable energy solutions that can be implemented by Americans, and can be integrated into the smart grid.

Wind and Solar Energy

Wind energy has been used since around 5000 B.C. when humans would use wind to propel ships. Since then it has been popularized by transforming it into electricity. Wind is created by a combination of the uneven heating of the atmosphere, the terrain of the Earth's



Figure 1 - Wind Turbines

surface, and the Earth's rotational movement. Between one and two percent of all the energy that the sun produces goes directly to wind, which is between 50 and 100 times the amount that plants produce through photosynthesis (Ghosh, 2011). This means that wind could be used as a primary source of energy. Along with the large quantity of it, wind is a completely renewable resource that will always be

available to humans for harvesting.

An example of wind energy being used in Massachusetts can be seen in the video Local Motion on the Green2Growth website. The Holy Name High School in Worcester was built on electric heat and saw their utility bills rising fast to the numbers of \$200,000 a year. In order to reduce their costs of energy, the school decided to install a wind turbine that would generate the schools energy. Although it was expensive to install, the school is running entirely off of the wind turbine (Green2Growth, 2011). Alongside wind, solar energy is another renewable energy that can be utilized on a local level.

In Worcester the most effective way of using solar energy is through photovoltaic (PV) panels. PV panels allow for the direct conversion of light into electricity on the atomic level. This happens because certain materials have a photoelectric property that allows the absorption of light to release electrons. These electrons can then be harnessed into a current (Knier, 2002). This type of solar energy is useful on a household basis because it generates energy directly from the sun. Other solar energies require the use turbines because the energy is created from the heat

of the sun, instead of the photons (Ghosh, 2011). Solar thermal energy is not useful in the northeast with the cooler climate. Already in Massachusetts there have been implementations of PV panels. Similarly to Holy Name High School, a car wash company in Worcester uses solar panels to generate 35% of their power (Green2Growth, 2011). Residents of Massachusetts are starting to use renewable resources on a small scale that will take burden off the power grid.

Currently it is unrealistic to implement massive solar fields or wind farms to power cities, because of inefficient technology or debate preventing the installation of these technologies. On small-scale levels, residents of Massachusetts can use these technologies on their own to save themselves money. Those residents that wish to implement solar or wind energy into their homes receive a tax break that adds another incentive for the application of these concepts (Environmental and Energy Affairs, 2011). However, even with the tax break that the government is providing to those that harness the sustainable energy technologies of solar and wind energy, it is still very expensive for the average citizen. Knowing this, moving toward Smart Grid technology is the most easily implemented sustainable energy solution and will have the largest impact. It also allows for renewable energy production to be implemented easily into the smart grid when wind, solar, and other renewable energy sources become more efficient. After the research on sustainable energy solutions was completed, the lesson plan was put together after the research of the best ways that adolescent students learn was finished.

Adolescent Learning Styles and Teaching Methods

Before the IQP group could produce a lesson plan for adolescents, it was necessary to first understand how to educate Worcester's middle school students. This section provides a background on Worcester's student body, middle school education system, and effective teaching strategies for adolescents.

Race	Percentage
White	72.6%
African American	13.6%
American Indian and Alaska Native	1.1%
Asian	6.8%
Pacific Islander	0.2%
Other	9.9%

**Table 1 – Worcester Ethnicity Breakdown
(U.S. Census Bureau, 2010)**

In Worcester there are twenty schools that teach the city's adolescent population (PrivateSchoolReview.com; GreatSchools.org). Fourteen of these schools are private and six are public, and each school includes some or all of the

following grade levels: five, six, seven, and eight. Refer to Appendix A for details. The students attending these schools are between the ages of 10 and 14 and are from various backgrounds. According to the 2010 census, the majority of Worcester's residents were white; however, African Americans, Asians, and others also made up a moderate portion of the demographic as seen in Table 3.

Although students in grade levels 5-8 are not required by the Massachusetts Department of Education to study sustainability, the Massachusetts Science and Technology/Engineering Curriculum Framework does insure that the students develop a fundamental understanding of Earth and life sciences (Massachusetts Department of Education, 2006). The IQP group intends to build upon what the students already know by educating them about sustainability. However, developing a teaching approach that can adequately prepare these students for participating in the Viral Video Challenge can be difficult. In order to overcome this difficulty, the IQP group provided a review of the inherent challenges involved with educating adolescents, as well as, effective teaching methods for them.

Teaching adolescents can be a difficult process because of their emotional changes, inherent traits, and various learning styles. Puberty can evoke the following reactions in adolescents: embarrassment, moodiness, depression, rebelliousness, and geocentricism. Furthermore, adolescents feel that peer approval is very important, so their behavior has been observed to reflect that (Rischin, 2002). Rischin recommends that teachers be aware of these emotional reactions and approach students with patience and sensitivity. Additionally, Williamson has identified four common traits among adolescents. The traits include the following: desire for peer acceptance, abundant energy, love of fun, and limited time-management skills. In a lecture-style teaching setting, students who display these traits are likely to become uninterested with the lecture, disrupt class, and perform poorly on assignments.

Similar to Rischin, Williamson encourages teachers to be patient and sensitive with the students; however, Williamson also encourages the utilization of unconventional teaching methods. Such methods include using educational games or dividing the students into groups to work collaboratively on an assignment. In Williamson's article, she describes a game that can be used by music teachers to educate students on proper posture and technique when playing an instrument. The game involves choosing two volunteers to act as "catchers", whose task will be

to identify their classmates who have an incorrect playing technique. Also, the teacher will secretly choose 3-4 students to intentionally use an incorrect playing technique, while the rest are playing normally. The goal of the game is to have the “catchers” correctly identify the students who were chosen to by the teacher to mess up from those playing correctly. The educational purpose of the game is to allow students to interact with each other and teach them the correct playing techniques by first teaching them the wrong ones (Williamson, 2000). Games like this can be useful tools for teachers to use in the classroom because they are educational and they accommodate for the adolescent’s inherent traits.

Most students can be divided into two groups, intuitive and non-intuitive learners (Rischin, 2002). By understanding the needs of these two types of learners, an effective teaching approach can be formed. According to Rischin, Intuitive learners are motivated by challenge, are able to persist despite setbacks and are emotionally self-supporting; whereas, non-intuitive learners feel defeated by high levels of challenge, are unable to persist in the face of failure and require a supportive environment and teacher.

Conventional teaching methods (classroom lectures) are not tailored toward educating non-intuitive learners, thus these students are often regarded as “bad” students. Although these types of students are generally more challenged by problems than intuitive learners, they still have a high capacity for knowledge. In order to facilitate the education of these types of students, direct and interactive teaching techniques must be implemented. Earl Oremus, the headmaster of the Marburn Academy in Columbus, Ohio, suggests to teach the non-intuitive student by first getting him/her to “experience the joy” of the lesson, and then approach the issues involving their methodology or technique (Rischin, 2002). An example of this teaching approach could involve a creative writing teacher exposing students to the famous short stories of classical writers. Ideally, the students would appreciate the quality of the writing and then be motivated to excel in their own creative writing assignments. This teaching approach may be utilized by the IQP group for educating Worcester’s middle school students about sustainably living. For example, the IQP group could begin a lesson by bringing the students to a rural and pollution free location, like a local park, where the students can develop an appreciation for nature. Ideally, the students would be able to understand the need for preserving natural resources, and, consequently, they would be motivated to learn about sustainability and develop meaningful viral videos.

Other researchers believe that students can be divided into four different types of learners: visual, auditory, tactile, and kinesthetic (Montemayor, 2009). Students in these groups prefer one style of learning. Visual learners are taught best by lessons that incorporate pictures or videos, while auditory learners prefer those that utilize the spoken word. Tactile learners are educated best by hand-on approaches and kinesthetic learners prefer learning by trial and error. Although students may prefer one specific learning style, they still are capable of learning through the others. According to Deeb, the optimal learning style for most students is a combination of some or all the styles. This suggests that a fully immersive teaching approach, which appeals to all learning styles, is optimal for educating most students (Deeb, 2011).

By considering the emotions, inherent traits, and learning styles of Worcester's adolescent middle school students, the IQP group was able to design an effective lesson plan, tailored toward preparing the students for participation in the Viral Video Challenge.

Social Media

In the past decade the growth of social media websites has rapidly expanded. An example of this expansion is the fact that millions of new accounts are created annually on sites such as YouTube and Facebook. To put social is a medium where content is user generated and user shared and be commented on by the masses. Never before has the planet so easily interconnected through the internet. With the click of a few buttons and typing in someone's name one could be instantly linked to that person's Facebook, Twitter, LinkedIn, YouTube channel, etc. The list goes well on as new social media sites have cropped up. With the emergence of MySpace and Facebook with the later dominating the marketplace now, teens can now feel more connected than ever. This shows because in study conducted by the New York Department of Health & Mental Hygiene in 2009 showed that 93% of teens 12-17 go online with 66% going online daily. 65% of that age group uses some sort of social networking site and 57% have watched a video from a site like YouTube. In the age group 12-14, 38% have some sort of online profile (Lenhart, 2009).

The information of this slightly dated study showed that online profiles of this project's target age group are on the rise. With more middle school students becoming interconnected online, the chances of the students sharing their produced videos with their friends will be far

greater. This in turn will allow for the spread of the project through the target age group in the community as friends in private schools have friends in public schools and vice versa.

Viral Videos

In February 2005 three men had an idea to create a database of user submitted videos that could easily be accessible by anyone throughout the world (Adami, 2009). Today visited by millions of users every day, YouTube is the third most visited website in the world behind only Google and Facebook (Alexa, 2011). YouTube has become a symbol of freedom of expression and a modern approach of communication. With more than 13 million hours of video uploaded during 2010 and 48 hours of video uploaded every minute, YouTube has become a hub of video sharing. The potential audience is massive because over 800 million different users visit YouTube each month. (YouTube, 2011). This exhibits the potential for displaying content to many different demographics of people all over the world.

With the rise of online videos and YouTube, people all over the world are able to connect and share videos that they feel should be shared. Reasons could range from informative, trendiness, hilarity, and viral ability. Viral videos are something of an Internet phenomenon and have picked up in popularity in the last decade. Tracing back to as early as 1995, viral videos started off as being shared through email attachments over dial-up Internet connections. During this time viral videos made their debut into society, but with the creation of video sharing sites such as YouTube in 2005, the floodgates opened for viral videos (Jarboe, 2009).

Viral Videos have a core component to them that is referred to as a hook. The hook is a way for the video creators to draw in the audience and keep them captivated. Hooks have become a part of the heart of viral videos because of their repetition inside of the video. These hooks, although a part of the video from the start, are not easily recognizable as the reason for the video's viral success until the video reaches immense viewership (Jarboe, 2009).

The rise of viral videos is increasing daily due to the plethora of video sharing sites similar to YouTube, and the low cost of acquiring a video camera. This surge in viral videos has allowed for corporations and companies to pick up on the unique way of reaching a wide audience. These businesses can take advantage of additional revenue because they are reaching people who might not have otherwise heard about their company or product. This concept is

relatively new, but is catching on as large companies are trying to focus new advertising towards this concept.

In support of viral videos associated with businesses, a great example of this can be linked to the video *Official Ojai Valley Taxidermy TV Commercial*, or more commonly known

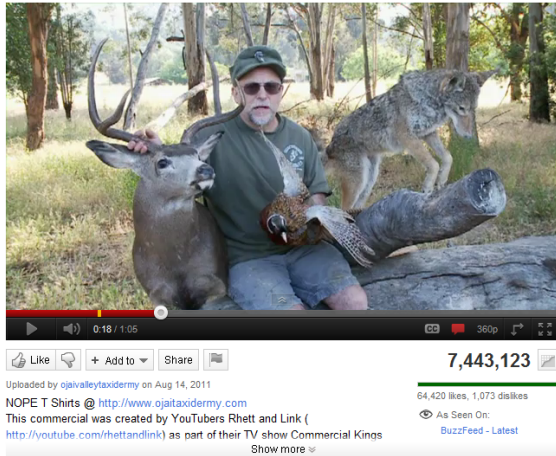


Figure 2 - Picture of Chuck Testa in his video

on the Internet as “Chuck Testa”. This video focuses on comedy to draw in the audience and simultaneously promote a business successfully. As of November 15, 2011 this video has achieved 7,696,728 views. This is a substantial number of views considering the video was posted to YouTube on August 14, 2011 (YouTube, 2011). In addition to this great accomplishment, Chuck Testa has achieved a search volume index of 35.0 for the United States (Google, 2011). The video opens up with Chuck Testa and his life like taxidermy work, and then saying, “Bet you thought they were real. NOPE!” The video continues on with things such as a bear in a bed followed by Chuck appearing saying, “NOPE!” The hook of the video “NOPE!” caught on and became an Internet meme.

Viral Marketing



Figure 3 - Troll Face

commercial applications because they are easily recognizable to youth who are engaged with the Internet.

An Internet meme is an idea that is propagated through the Internet based on just about anything that becomes very popular. One example of an Internet meme is the troll face. The troll face is used in cases where the objective is to fool or trick someone intentionally (Hiroman, 2011). According to Google Insights, search results for the troll face have started to become noticeable around 2009, and ramped up to a search volume index of 14.0 for the United States alone which is quite an accomplishment (Google, 2011). The applications of Internet memes have potential for

The rise of viral marketing has taken off since 2007 when the film *The Dark Knight* brought about a viral advertising campaign. Fake political billboards featuring a character from the movie began appearing over cities in America. A few days later the political billboards were defaced creating a large buzz around the movie. The hype created because of these billboards was staggering. More people started talking about the billboards, which led to more people talking about the movie and creating interest in it. The movie has gone on to gross over \$1 billion dollars worldwide with a production cost estimated at just under \$200 million dollars. While the budget of the company that created this viral marketing campaign is unknown, it can only be imagined to be very small in contrast to the amount of money it amassed (Readon, 2009).

To tie viral marketing into sustainability on YouTube, finding a video over 80,000 views would be difficult when using the following keywords: sustainability, going green, recycling, or renewable energy. The potential market for spreading the message of sustainable energy solutions is great due to YouTube's huge user base. To break into the viral range of viewership, one would have to create a sustainability video that combined a viral video with a current or new Internet meme. While this would be a groundbreaking accomplishment it would only be a success by taking things that appeal to the wide Internet base, and turning them into easy to view videos with an educational message behind them.

In addition, sustainability themed viral videos convey a powerful message although currently few in numbers. One example is in the YouTube video titled *Treeless Squirrel says, "Plant trees, please,"* the video shows what could happen if squirrels don't have a home. An actor dresses up as a squirrel and holds a sign that reads, "Will work for acorns". To view this video, see the link in the references. The actor then wanders about the city in search of acorns and a tree without any luck. The film closes with the message, "Everyone could use more trees" with the squirrel walking off into the distance. While this video doesn't have a humorous component to it overall, the film has garnered 354,926 hits since being posted to YouTube (thetreelessquirrel, 2008). While this by no means is a huge accomplishment compared to most other viral videos, it is a start since most viral videos don't relate to sustainability.

Social media is useful for this project because it offers the ability to spread the message of sustainability in a rapid method. With the quick spread of the videos through social media the project will be a true testimonial that powerful messages can be spread through social media

successfully. Through proven internet memes such as the trollface this project will attempt to exploit the nature of making ideas viral.

CHAPTER THREE: METHODOLOGY

The IQP group gained an in depth understanding of sustainability in Worcester through research and interviews. The group was provided with the information needed to make a lesson plan for Worcester's middle school students by interviewing National Grid employees and a teaching expert. Furthermore, the group developed a promotional plan that utilizes social media to maximize the exposure of the challenge to the public. This chapter describes the methods that the group used in order to plan and prepare the Viral Video Challenge, and it is broken down into the following sections: the lesson plan, the promotional plan, and the list of recommendations and contacts.

Lesson Plan

This section of the report describes the steps taken to develop a lesson plan for middle school students that will successfully educate them on the topic of sustainable living in Worcester, MA. The information that the students learn from the lesson plan will be displayed in their viral video challenge videos. The group conducted two interviews. First, in order to gather accurate data, which is specific to Worcester, the group interviewed employees from National Grid. Second, the group interviewed a teaching expert from Worcester State University in order to learn of the most effective teaching approaches for adolescents.

National Grid Interview

The information that was used to develop a curriculum for middle school students was largely gathered from the IQP group's interview with National Grid employees. The following three people from National Grid aided in answering the group's questions; Andrea Maris, Mike Thompson, and Kevin Shaughnessy. Respectively, their job titles were Marketing Consultant, Manager of Small/medium Business and Energy Solutions Delivery, and Community and Customer Manager. Topics that were discussed during this interview included CO2 emissions in relation to energy consumption, smart grid technology, and how people can conserve electricity and save money in Worcester. Refer to Appendix D for all of the interview questions and answers. This interview provided all of the data and information necessary to develop an effective curriculum based on sustainable living in Worcester for middle school students.

Teaching Expert Interview

In order to design the lesson plan so that the curriculum is most effective for teaching Worcester's adolescents, the group interviewed Dr. Douglas Dawson, a Professor of the Philosophy of Teaching Math and Science. The topics that were discussed with Dr. Dawson included adolescent learning styles, teaching techniques that engage adolescents, organization of a lesson plan, and the use of educational games in the classroom. By providing Green2Growth with an interactive and engaging lesson plan supplemented with accurate data that is specific to living sustainably in Worcester, they will be able to effectively educate local middle school students. Furthermore, the students will be able to produce the raw footage for videos that will be included in the Viral Video Challenge.

Promotional Plan

In order for the Viral Video Challenge to be successful, the IQP group created a promotional plan to increase the exposure of Green2Growth. With the use of social media beyond YouTube, there is an opportunity for Green2Growth's message to be spread across Massachusetts. Blogging, Facebook, and YouTube are some of the most popular social media tools and have the greatest chance of making videos go viral. The group received their information on social media through background research and by consulting with a social media expert.

Interview with Social Media Expert

The group interviewed a social media expert, Shari Worthington, to better understand the concepts of spreading Green2Growth's message. A list of questions was developed to maximize the knowledge gained and can be seen in Appendix C. These guiding questions allowed the group to get an in depth understanding of how to create a promotional plan. For example, one of the questions was, "In general what is that best way to engage our target audience (different demographics)?" With this question the group was able to tailor their promotional plan to get as much local response as possible. Another example question is, "Specific to Worcester, what internet tools are used most frequently (blogs, twitter, etc.)?" This question again allowed the group to focus on the Worcester area and how to effectively target its residents. The interview

provided the group with the information needed to create a successful promotional plan to grab the attention of many Worcester residents.

List of Recommendations and Contacts

There are many items to consider in order for the Viral Video Challenge to be carried out successfully in the future. These are items that could easily be overlooked, and without their completion the success of the Viral Video Challenge may be jeopardized. A list of recommendations was compiled in order to organize what needs to be done and when it has to be done by. This section provides everything that is needed to complete the challenge, starting with Institutional Review Board approval.

Institutional Review Board (IRB)

In order to gain IRB approval to enter schools for video and teaching purposes, two steps must be followed. First, the IRB must receive written consent from the participating schools. This notifies the IRB of all of the participating schools and insures that the schools agree to the carrying out of the project. Second, parental consent allowing children under the age of 18 to participate in this project must be submitted to the IRB. Without parental consent underage students will not be videotaped. To insure that a future group obtains IRB approval with ease, the IQP group created an IRB approved parental consent form. This form explains the details and potential dangers of the project and it will provide the IRB with written parental consent when signed by a student's parent or guardian. Students who submit a signed form will be videotaped for the Viral Video Challenge. This consent form can be seen in Appendix J.

Interview of Middle School Headmasters

In order to insure that a future group can gain access to local middle schools, the group interviewed local middle school principals and headmasters. These interview questions can be seen in Appendix C. With the information gathered from these interviews, a future group will have a timeline which display the appropriate times to contact schools and ensure class time. It also allows a future group to know how much time they will have in the classroom and what incentives that school might need in order to be willing to participate. Along with preparing for the future, these interviews allowed the group to prepare the lesson plan to be carried out within the allotted class time granted by the schools.

Contacts

The list of contacts for the schools in Worcester, MA is very crucial because many school administrators are very busy people and might not have time to answer calls back immediately. The best way around this issue is to directly contact the person who can best help move the curriculum into the classroom. In most cases this would be the headmaster or principal of the target schools. Generally, there is a delay in response time from these individuals, so contacting them immediately is a key component to help move the project forward as soon as possible. The list of contacts can be seen in Appendix H.

Proposals for Schools

After contact has been made with the local middle schools, the headmasters will want more information on the project. To accomplish this, the group drafted a proposal that had all the necessary details for the middle schools to review. The proposal outlined the core components of the project such as the focus on sustainability and smart grid technology. The proposed lesson plan breakdown was also included because teachers will want to see how exactly their class time is going to be utilized. Ideally, the focus will be mostly on what the students will take away from the project that can apply back into the classroom after the project. Refer to Appendix I for this form.

CHAPTER FOUR: RESULTS

This chapter describes the information obtained from the interviews, and the products of the work outlined in the methodology. Specifically, the group developed a lesson plan for adolescents based upon sustainable living, a promotional plan for maximizing the Viral Video Challenge's exposure, and a list of recommendations and contacts for facilitating the completion of this project in the future.

Lesson Plan

Interview with National Grid

The information from the IQP group's interview with National Grid employees was a critical component in the making of the lesson plan. This interview provided the group with a list of tips and tricks for living sustainably, data on Worcester's specific electricity consumption and CO₂ emissions, and a detailed description of smart grid technology. Refer to Appendix D for all of the results.

The list of tips and tricks included over 25 different suggestions that home owners or renters could follow in order to reduce their electricity consumption and live more sustainably. Many of the suggestions involve controlling the airflow throughout one's household. For example, in the summer people often have high electricity bills because of their use of air conditioners. National Grid recommends that people keep their homes cool by sealing any air leaks, using fans instead of air conditioners, and remembering to turn off fans when they leave their rooms. Additionally, National Grid informed the group of many Energy Star products that people can use in order to minimize their electricity consumption. Such products include washer and drier machines, dehumidifiers, light bulbs, and water boilers. These Energy Star devices utilize electricity more efficiently than other similar products.

According to National Grid, Worcester has 64,575 households connected to the grid and their average electricity consumption rate is ~6,500 kWhs per year. For every kilowatt hour of electricity consumed by Worcester 0.828lbs of CO₂, 0.0028 lbs of SO₂, and 0.00084lbs of NO₂ are released into the atmosphere by power plants.

During the group's interview with National Grid employees, they described smart grid as a new technology that allows for the rapid exchange of information between a smart grid meter and National Grid. Both, the operators working for National Grid and the customers, are able to monitor the household's energy consumption in real time using a computer program. This provides the customer with more control over of his/her own electricity consumption. However, the group learned from their interview with National Grid that smart grid technology is still in its infancy. This means that although smart grid technology is available for commercial use it is not fully developed. Currently, smart grid users can only monitor their overall electricity consumption of their household and not the electricity consumption of individual appliances. National Grid encourages smart grid customers to practice sustainable living by understanding what appliances consume the most electricity, and closely controlling their usage. According to National Grid, smart grid technology will be ubiquitous in the future, and it will allow for customers to have the option to closely monitor and regulate the electricity consumption of most household appliances.

Interview with Teaching Expert

By interviewing the teaching expert, Dr. Dawson from Worcester State College, the IQP group was provided with many useful suggestions and recommendations for developing a lesson plan for middle school students. Although Dr. Dawson approved the use a PowerPoint presentation for one part of a lesson plan, he stressed the importance of hands-on activities which can fully engage students. One teaching strategy that he recommended involves dividing the students into small groups of 2-4 to work collaboratively on an activity. This gives the students the opportunity to teach each other and develop a better understanding of the curriculum by working together. Other teaching strategies that Dr. Dawson recommended for adolescents include role-playing, and an educational jeopardy-style game. According to Dr. Dawson, allowing the students to have fun during a lesson is important in the learning process because they are more likely to remember the curriculum. Refer to Appendix C for all of the interview's questions. This interview provided the IQP group with the background needed to develop a lesson plan that can properly educate adolescent middle school students.

Lesson Plan

Based on the information obtained through conducting interviews with National Grid employees and a teaching expert, the group created a complete lesson plan for Worcester's middle school students. The group used a template that was provided by Dr. Dawson in order to organize the curriculum into an effective lesson plan. This involves three main components: introduction, body, and closure.

The introduction takes about 10 minutes to complete. First, the educators ask the students questions in order gauge how much they already know about sustainability. Suitable questions include: Who can define sustainability? Who knows what a kilowatt-hour is? Who can describe climate change? Then the educators introduce their sponsor, Green2Growth, and the Viral Video Challenge by showing a brief (~6min) Green2Growth educational video.

The body of the lesson takes about 30 minutes and it involves three activities: a PowerPoint presentation, educational board game, and a kilowatt hour demonstration. During the PowerPoint presentation, the educators will present the students with the most pertinent information that the group gathered from the interview with National Grid employees. Such information includes tips and tricks to reduce electricity consumption, the usefulness of smart grid technology, and data that relates energy consumption to CO₂ emissions. Additionally, the students will be given a packet to take home to their parents that outlines all of National Grid's recommendations for living sustainably in Worcester. Refer to Appendix D for the packet containing all of the interview questions and answers. The PowerPoint presentation includes all of the main learning objectives of the lesson plan; however, it is not interactive for the students and it fails to stimulate non-visual and non-auditory learners. Refer to Appendix F for the PowerPoint presentation. After the PowerPoint presentation the students divide into groups of 4-5 and begin playing an educational game of chutes and ladders. This game involves players taking turns rolling a die and advancing squares on the board; however, whenever a player lands on a latter, a fact about how one could live sustainably is read, and whenever a player lands on a chute, a fact about pollution and/or a nonrenewable resource is read. While some students are playing the board game other students are included in a kilowatt hour demonstration. This demonstration involves using a "Kill-a-watt" meter to measure the electricity consumption of commonly used electric devices. In the lesson plan, the IQP group recommended to measure the

electricity consumption of devices that adolescents can relate to, such as, a television, laptop, or video game system.

The closure takes about 10 minutes and it involves the educators asking the students questions about what they learned in order to summarize the lesson, and assigning homework. Suitable questions to ask include: In what ways can you and your family save energy? What effect does reducing your family's electricity consumption have on the environment? Can you name 3 renewable and nonrenewable energy sources? What is a KWH in your own words? The homework assignment is to have each student come up with an idea for a viral video plotline that is embedded with a message about sustainability. The students are encouraged to be creative by using humor, music, or any of their talents in order to develop the most educational and enjoyable video plotline.

In addition to the information mentioned above, the lesson plan includes the following: a brief summary of the lesson, the specific learning objectives for the students, a list of materials/resources/instructional media to be used, a summary of the use of educational technology, an optional assessment exercise, and a list of teaching tips for the educators. Refer to Appendix E for the complete lesson plan.

Promotional Plan

Interview with a Social Media Consultant

The IQP group interviewed Shari Worthington, who is a marketing consultant. The first part of the interview consisted of understanding the plausible target audience. Prior to the interview, the group was under the impression that they would be able to reach all possible demographics in Worcester. As pointed out by Shari, that was very unlikely. She stated that it was only possible to receive positive feedback from people that have the proper motivation. The motivations for this project are saving money, environmental guilt, and environmental "feel good." If a person wants to save money on their electric bills they will be inclined to change their habits and live more sustainably. Environmental guilt motivates some people to live sustainably because they are aware of the effects of climate change and develop an emotional attachment to the planet. Additionally there are other people who will help the environment because it will make them feel better about themselves. In Worcester, the target audience for the group's

promotional plan includes middle to upper-class residents that are homeowners or landlords and have children in middle school.

After the target audience was understood the interview turned toward a discussion on the different types of social media and how to use them. Shari stated that blogging is one of the best ways to post media because it allows readers to comment and show what they think. She also said Facebook and YouTube were useful for the same reasons. Twitter was discussed, however on such a small scale it would be ineffective for the Viral Video Challenge. The conversation then moved to talking about what media is good to post. Shari said that having essay, art, or music contests is a great way to get media to post on different social media tools. With these contests the students would be able to go home and have their parents help with their schoolwork. This also provides incentive for the teacher to make the contests a required assignment for a grade. By posting material on a plethora of different social media sites the group can acquire the interests of different viewers.

The conversation ended by Shari stating that using different types of social media simultaneously is the most effective method of increasing public awareness. She also recommended that the group incorporates essay and art contests with the Viral Video Challenge. It was also stated that using text based online or newspaper advertising is an effective way to inform parents. The interview with Shari Worthington provided the group with the knowledge to put together a successful promotional plan.

Promotional Plan

The promotional plan is an important component of the Viral Video Challenge. Through background research and consulting with a social media expert, the group developed a promotional plan that will help the circulation of the student made videos. The first part of developing the promotional plan was first realizing the target audience. The children of homeowners and landlords are the best audience to reach out to because of motivation. Their motivation stems from wanting to save money and feeling guilty about not living sustainably. Additionally, the group developed three phases to get the message out to the public.

The first phase of the promotional plan relates to media generation. In this situation the media generation involves creating the media that will be posted on the web through various

social media tools. To gain more material for the blogs, Facebook, and YouTube, the group planned two more contests to increase interest in the Viral Video Challenge. The first is an essay contest on the topic of sustainable energy solutions. This will be a mandatory writing assignment and graded by their teachers. After the completion of the essays the top ten will be picked and posted to the Green2Growth blog. From there, the top essay will be posted to other sustainable energy websites. Similarly, an art contest will be assigned to the students during art class. The art will relate to the topics of sustainability and the top ten will be posted on the Green2Growth blog, with the same outcome as the essay contest.

The next portion of the challenge is phase two, which is posting. After the completion of the two contests, the Viral Video Challenge will be ready to begin. The students will have the knowledge to create videos on the topics of sustainability through the in class lesson. These videos will be posted to YouTube, Facebook, and the Green2Growth blog, greatly increasing their chances of going viral. YouTube has millions of users that can view videos, making it a great place to post. Facebook also has millions of viewers and allows people to comment and share on their friend's pages. Finally, blogging is a system that allows people to read different stories or articles and comment on the content that is posted. These different social media tools allow media content to reach people in different parts of the state.

The third and final phase relates to advertising. In order to ensure the exposure of the videos that are posted, it is important to make sure people know that the challenge exists. In order to do this it is important to promote through local newspapers and Worcester school's websites. Although social media is a great way to spread information, not all people search the web and stumble upon sustainable energy videos. Posting text based ads on school websites or in local newspapers is two ways to promote. A lot of parents visit the school website to check on events that are happening at their child's school. Also, most residents of the Worcester area receive the newspaper making it another place to promote. With this promotional plan in place, there is a much better chance that the videos produced will go viral. The full promotional plan can be seen in Appendix G.

List of Recommendations

To maintain a successful timeline for this project one of the most important components is Institutional Review Board (IRB) approval. This project deals directly with videotaping middle school students, and required very strict IRB approval because of this. The IRB informed this group that in order to receive approval for the video challenge component of the project a few steps have to be met. Participating schools of the project must give written consent to the approval of this project, and the participating students must have a parent or guardian sign a video release form as to avoid any issues. The consent form can be seen in Appendix J.

List of Contacts

Getting in contact with the administrators of middle schools is a challenging feat. Most of them have very busy schedules that don't allow for them to sit around waiting for phone calls about IQPs. In addition they also cannot displace curriculum that has been planned out well in advance, and ties in with the Massachusetts Framework standards. With these two things in mind in hindsight it is a lot clearer to this group of why we were not able to get into any middle schools this term. One simply doesn't call up and get into schools the next week. On average it took about a week to get a solid line on any given administrator personally, and from there another week to get an answer about the possibility of our project. For a full list of contacts that this group developed see Appendix H.

Timeframe

Upon further research into the possibility of a future IQP completing this project we contact Matt Barone from the Bancroft School. His recommendations to this group was that one would require a semester of time in advance to get all the necessary approvals and allow for the project to be fully vetted by the school staff. This timeframe would not have been possibly at all during one term for this group, which is most likely why we didn't get into the Bancroft School. While we were unable to get a hold of other school administrators again to get a comment on a timeframe to get into their schools, this group assumes that a semester would be a benchmark time for all participating schools.

Proposal for Schools

Once the contact and time issues are worked out the schools will require a written project proposal to clearly see the ideas being conveyed in the project. Attached in Appendix I is the proposal developed from the first three chapters of this paper. This proposal outlines the core components of the curriculum and how the students will learn about sustainability. Through this sustainability curriculum the lesson will transition into viral videos that have a sustainability focus. This will then lead up to a video shoot and video editing session that will be taught by the IQP group.

CHAPTER FIVE: CONCLUSIONS

The lesson plan, promotional plan, and list of recommendations each have their own importance in facilitating the Viral Video Challenge in the near future. The lesson plan gives the information necessary to teach the students everything they need to know to make informative videos. The promotional plan aids the posting and advertising of the media generated to maximize the number of video views on the web. Finally, the list of recommendations facilitates getting into schools and getting IRB approval. Without these components the Viral Video Challenge cannot happen.

Lesson Plan

The lesson plan that was developed using the information gathered from background research and interviews is critical for the success of the Viral Video Challenge. The lesson plan will be used to educate participating Worcester middle school students on the topic of sustainable living. Following the PowerPoint presentation, kilowatt hour demonstration, and educational board game the students will be able to identify renewable and nonrenewable energy sources, list five ways to save electricity at home, list common sources of pollution, understand the importance of smart grid technology, and visualize a kilowatt hour. Furthermore, the students will be able to creatively display what they learned from the lesson plan by participating in the Viral Video Challenge. Each video submitted by the students will have a message regarding living sustainability.

Besides providing content for viral videos, the lesson plan also will be used as a tool for promoting sustainable lifestyles to the students and their parents. Seeing that the overall goal of Green2Growth involves making the earth more sustainable, the IQP group designed a lesson plan that encourages students to actively practice sustainable living i.e. tips and tricks for reducing electricity consumption. The students will do this by following the tips and tricks described in the lesson plan. Ideally, the lesson plan will effectively convey the importance of sustainability to the students and, consequently, they will feel inclined to help the environment. The parents of the students can be affected by the messages conveyed in the lesson plan if the students convince them to practice sustainable living. Beside the tips and tricks, parents can help the environment by adopting smart grid technology, driving electric automobiles, or by utilizing renewable energy resources e.g. solar, wind.

Promotional Plan

The promotional plan is one of the most important aspects of the Viral Video Challenge because it increases the public's awareness of the challenge. Using social media sites such as Facebook and Green2Growth's blog are crucial. These sites allow for viewers to comment and share media with other people, thus increasing exposure. Also, it is important to advertise on a local level through newspapers, so that residents know the challenge exists. Having an article in the local newspaper increases interest for Worcester's residents to search for the videos produced by the challenge.

Beyond the media going viral, the promotional plan increases interest at the classroom level. The essay and art contests that are given to the classrooms are ways to gain interest from not only the students but their parents as well. Parents with children that age are usually very invested in their child's schoolwork. Parents will be able to help their children with school work, and learn about sustainable energy solutions. Through this parents might change their living habits to live more sustainably in the future. Additionally, they will be willing to tell their friends and family to look at their child's work on the Green2Growth blog spreading the message of sustainability further. The promotional plan plays an important role in the completion of the Viral Video Challenge, and without it, it is unlikely that Green2Growth will reach their goals.

List of Recommendations and Contacts

This section describes how the list of recommendations and contacts that the group developed can be used to facilitate the completion of the Viral Video Challenge. Two variables that the Viral Video Challenge is dependent upon are getting local middle schools to participate and gaining consent from underage student's parents.

The timeframe of the project was initially based on completing the Viral Video challenge in seven weeks. After consulting Matthew Barone, the group developed a project timeframe that incorporates the time needed to ask the administrators in local middle schools whether or not they want to participate in the challenge. The IQP group recommends that the future group contact the middle schools at least one semester before implementing the Viral Video Challenge. This provides an adequate amount of time for restructuring the predetermined curriculum to include the challenge. Seeing that a larger time frame is necessary for the completion of this

project, the IQP group recommended that if this project continues in the future that it should be spread across multiple terms. Obtaining timely responses from teachers and professionals may be difficult therefore this should be considered early on in the project timeline.

Parental consent form that the group made is a necessary component for IRB approval of the Viral Video Challenge. This form is required for the challenge because it is needed for videotaping underage middle school students. Without parental consent it is illegal for underage students to be videotaped by Green2Growth. Another consideration for IRB approval includes written consent from participating schools. In order to obtain this, the group developed the proposal for middle school administrators. Participating schools will submit a signed proposal to the IRB stating that they have agreed to the Viral Video Challenge.

The purpose of the contact list is to save time searching for the required contacts in local middle schools. The list of teachers and administrators that was assembled will be very helpful because those contacts have expressed interest in participating in the challenge. The other contacts included on that list, like John Odell, Andrea Maris, and Judith Schwartz, are useful people to consult with in case any unforeseen circumstances or problems arise. By starting with a list of relevant people to contact, the future group will be able to facilitate the completion of the Viral Video Challenge in a timely manner.

Besides the information obtained from the multiple interviews, this report includes a detailed lesson plan, promotional plan, and a list of recommendations and contacts. By providing this report to Green2Growth, the IQP group has organized and prepared a Viral Video Challenge for implementation in Worcester's middle schools in the near future.

REFERENCES

- Adami, E. (2009). We/YouTube': Exploring sign-making in video-interaction. *Visual Communication, 8*(4), 379-399.
- Almeida, R., Woods, R., & Messineo, T. (1998). Child development. *Journal of Feminist Family Therapy, 10*(1), 23-47.
- Arbuthnott, K. D., & Krätzig, G. P. (2006). Perceptual learning style and learning proficiency: A test of the hypothesis. *Journal of Educational Psychology, 98*(1), 238-246.
- Clark, W., & Dickson, N. (2003). Sustainability science: The emerging research program
- Clark, W. W., & MyiLibrary. (2010). *Sustainable communities design handbook: Green engineering, architecture, and technology*. Burlington, MA: Butterworth-Heinemann.
- Energy and Environmental Affairs. (2011). *Renewable energy*. Retrieved 11/24, 2011, from <http://www.mass.gov/eea/energy-utilities-clean-tech/renewable-energy/>
- Energy Information Administration. (2010). Retrieved 11-13, 2011, from http://www.eia.gov/energyexplained/index.cfm?page=us_energy_home
- eRedux. (2011). *Massachusetts energy portal*. Retrieved 12-5, 2011, from http://www.eredux.com/states/state_detail.php?id=1123
- Faruqui, A., & Mitarotonda, D. (2011). The costs and benefits of smart meters for residential customers, 1.
- Flick, T., Morehouse, J., & MyiLibrary. (2011). *Securing the smart grid: Next generation power grid security*. Boston: Syngress.
- Funnyordie. (2011). *Green team*. Retrieved 11/21, 2011, from <http://www.funnyordie.com/videos/fa1420df1f/green-team-from-will-ferrell-adam-ghost-panther-mckay-and-john-c-reilly>

Ghosh, T. K., & Prelas, M. A. (2009). Coal. In (pp. 159-279). Dordrecht: Springer Netherlands.

Ghosh, T. K., & Prelas, M. A. (2011). Solar energy. In (pp. 79-156). Dordrecht: Springer Netherlands.

Ghosh, T. K., & Prelas, M. A. (2011). Wind energy. In (pp. 1-77). Dordrecht: Springer Netherlands.

Google. (2011). *Web search interest: Chuck testa*. Retrieved 11/15, 2011, from <http://www.google.com/insights/search/#q=chuck%20testa&cmpt=q>

Google. (2011). *Web search interest: Trollface, troll face, coolface*. Retrieved 11/15, 2011, from <http://www.google.com/insights/search/#cat=0&q=trollface%2Ctroll%20face%2Ccoolface&geo=&gprop=&cmpt=q>

GPNM. (2010). *Definition of green technology by KETTHA (ministry of energy, green technology and water)*. Retrieved 12/11, 2011, from <http://www.gpnm.org/e/articles/Definition-of-Green-Technology-by-KETTHA-Ministry-of-Energy-Green-Technology-and-Water-a5.html>

Greatschools.org. (2011). *Worcester schools*. Retrieved 11/30, 2011, from <http://www.greatschools.org/massachusetts/worcester/middle-schools/>

Green2Growth. (2011). *Local motion*. Retrieved 11/30 from http://www.youtube.com/watch?v=7xuliTtX0Q&feature=player_embedded

Grunkemeyer, C. (2007). *Wind turbines - medicine bow wind project*. Flickr:

Hiroman. (2011). *Trollface/ coolface / problem?* (<http://knowyourmeme.com/memes/trollface-coolface-problem#.TsMzxPKzmSw> ed.)

Hockstad, L. (2009). *Draft greenhouse gas inventory report: Energy*. Retrieved 11/13, 2011, from <http://www.epa.gov/climatechange/emissions/usinventoryreport.html>

- Jarboe, G., & Safari Books Online. (2009). *YouTube and video marketing: An hour a day*. Indianapolis, Ind: Wiley Pub.
- Kates, R., & Clark, W., et al. (2001). Belfer center for science & international affairs. 292, 641.
- Knier, G. (2002). *How do photovoltaics work?* Retrieved 12/11, 2011, from <http://science.nasa.gov/science-news/science-at-nasa/2002/solarcells/>
- Kusnetzky, D. (2010). *Surveys and thier problems*. Retrieved 12/11, 2011, from <http://www.zdnet.com/blog/virtualization/surveys-and-their-problems/1826>
- Lenhart, A. (2009). *Teens and social media an overview*. Retrieved February, 17, 2012, from <http://isites.harvard.edu/fs/docs/icb.topic786630.files/Teens%20Social%20Media%20and%20Health%20-%20NYPH%20Dept%20Pew%20Internet.pdf>
- Massachusetts Department of Education. (2006). Massachusetts science and Technology/Engineering curriculum framework.
- Massachusetts Department of Elementary and Secondary Education. (2011). *Enrollment data*. Retrieved from <http://profiles.doe.mass.edu/profiles/student.aspx?orgcode=03480000&orgtypecode=5&>
- Meka, E. Z., & Johnson, S. (2008). Putting sustainability into practice. *Environmental Policy and Law*, 38(5), 261-261-266.
- Miller, B. G. (2010). *Clean coal engineering technology*. Burlington: Butterworth Heinemann.
- Montemayor, E., Aplatén, M., Mendoza, G., & Perey, G. (2009). *Learning Styles of High and Low Achieving Freshman Teacher Education Students: An Application of the Dunn and Dunn's Learning Style Model*. 01(4), 58. Retrieved: Dec 11, 2011.
- Official Ojai Valley Taxidermy. (2011). **Official ojai valley taxidermy TV commercial**. Retrieved November/15, 2011, from <http://www.youtube.com/watch?v=LJP1DphOWPs>

- Pike, L., Shannon, T., Lawrimore, K., McGee, A., Taylor, M., & Lamoreaux, G. (2003). Science education and sustainability initiatives: A campus recycling case study shows the importance of opportunity. *International Journal of Sustainability in Higher Education*, 4(3), 218-229.
- Pillow, B. H. (2008). Development of children's understanding of cognitive activities. *The Journal of Genetic Psychology*, 169(4), 297-321.
- Private School Review. (2011). *Worcester county private school*. Retrieved
- Readon, J. (2009; 2009). VIRAL MARKETING: Alternative reality. *Brand Strategy*, (09659390), 44-44-45.
- Recycling Centers. (2011). *The history of recycling*. Retrieved 11/14, 2011, from http://www.recyclingcenters.org/history_of_recycling.php
- Rischin, R. (2002). Exploring learning styles: Developing a flexible teaching approach: Reflections on pedagogy Saturday VI. *American Music Teacher*, , 53.
- Scientists at university of maastricht publish new data on child psychology. (2011). *Psychology & Psychiatry Journal*, 255.
- Scott, A. (2010; 2010). Sustainability building better practices. *Chemical Week*, 172(24), 24-24-27-
- Smartgrid.gov. (2011). *SmartGrid.gov*. Retrieved 11/30, 2011, from <http://www.smartgrid.gov/>
- Stark, A. (2010). *Americans using less energy, more renewables*. Retrieved 11/13, 2011, from <https://www.llnl.gov/news/newsreleases/2010/NR-10-08-05.html>
- Thetreelessquirrel. (2008). *Treeless squirrel says, "plant trees, please."*. Retrieved from <http://www.youtube.com/watch?v=k22oHm0O3Sg>

U.S, C. B. (2010). *Profile of general population and housing characteristics: 2010* Retrieved 11/30, 2010, from

<http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk>

Williamson, S. (2000). Positively adolescent. *Music Educators Journal*, 86(4), 29-32.

Worcester MA. (2011). *Quick facts*. Retrieved 12/5, 2011, from

<http://www.worcesterma.gov/quick-facts>

Youtube. (2011). *Staticstics*. Retrieved November 14, 2011, from

http://www.youtube.com/t/press_statistics

APPEDDICES

Appendix A: Worcester Middle School Information

A-1: Private Schools

Private Schools	Grades	# of students	Phone Number
Bancroft School	K-12	572	(508) 853-2640
First Assembly Christian Academy	PK-12	142	(508)-852 -5733
G Stanley Hall School (Special Education School)	4-12	44	-
Kathleen Burns Preparatory School (Special Education School)	6-12	34	-
Mercy Centre (Special Education School)	3-12	21	-
Nativity School Of Worcester (All-boys)	5-8	60	(508) 799-0100
New Jewish Academy (School with Special Program Emphasis)	K-8	83	(508) 799-7888
Our Lady Of The Angels Memorial Elementary School	PK-8	282	(508) 752-5609
St. Peter Central Catholic Elementary School	PK-8	378	(508) 791-6496
St. Stephen Elementary School	PK-8	246	(866) 639-0306
Venerini Academy	PK-8	372	(508) 753-3210
Worcester Academy	6-12	631	(508) 754-5302
Worcester Seventh-day Adventist School	1-8	24	(508) 753-4732
Yeshiva Achei Tmimim Academy	PK-11	109	(508) 752-0904

Table 3 – Private School Data (Private School Review, 2011)

A-2: Public Schools

Public Schools	Grades	# of students	Phone Number
Burncoat Middle School	7-8	580	(508) 799-3390
Claremont Academy	7-12	395	(508) 799-3077
Forest Grove Middle School	7-8	882	(508) 799-3420
Sullivan Middle School	7-8	794	(508) 799-3350
University Park Campus School	7-12	241	(508) 799-3591
Worcester East Middle School	7-8	593	(508) 799-3430

Table 4 – Public School Data (Mass DoE, 2011)

Appendix B: Consent Forms

Interview Consent Form

I agree to participate in an interview for a study about sustainable energy solutions. I understand I will be asked about recommendations on saving energy. I understand that I do not have to answer any questions I choose not to answer. I understand that any excerpts taken from this interview, written or spoken, will disguise all names of persons and places so as to preserve my anonymity and privacy. I understand that I will not receive feedback on my interview. I understand that at the end of this study, the audiotapes will be kept in the privacy of the researcher's archives for future reference if needed. I understand that although most people find these interviews engaging and interesting, should I feel like discontinuing the interview for any reasons we may do so at any time.

If you have questions about the study at any time, contact:

Andrew Bennett

John Fitzpatrick

Jon Gaffen

g2g@wpi.edu

Appendix C: Interview Questions

National Grid

- i. What are your recommendations for the average resident of Worcester if they wanted to save money on their electricity bill?
- ii. Which of these would be most effective?
- iii. Specifically are there any ways in which younger kids (10-14) can save energy?
- iv. Can you tell us Worcester's average electricity consumption per year? Per household?
- v. For every kilo-watt-hour of electricity consumed by Worcester, do you know how much CO₂ is emitted into the atmosphere?
- vi. Can you tell us about the proposed smart grid plan released in March 2009? Progress so Far?
- vii. Where do you see smart grid technology in 5-10 years?
- viii. How much do you predict smart grid technology will reduce non-renewable resource consumption in Massachusetts?
- ix. For the average household how much will it cost to implement smart grid technology? How easy is the technology to use?
- x. Are there more options with smart grid technology to save energy and money?
- xi. Is it possible to see a demo of how smart grid works?
- xii. Is there anything else you would like to add?

Interview for Social Media

- i. What media is appropriate to use for middle school students?
- ii. Is it a good idea to post Green 2 Growth Videos on Facebook?
- iii. How do we effectively get more people to learn about our project?
- iv. What's the best ways to get views on YouTube?
- v. Specific to Worcester, what internet tools are used most frequently (blogs, twitter, etc.)?
- vi. Are there specific social media tools for environmental movements?
- vii. Would it be an effective strategizing technique to advertise on the Worcester Public School Website or other websites?
 - a. If so, how expensive is website advertising?
- viii. In general what is that best way to engage our target audience (different demographics)?
- ix. Besides online resources, how can we get information out to poorer areas of the city?
 - a. Energy/ money saving tips?
- x. Is developing a flyer to send out to local families cost effective?
 - a. If so, is there anything specific that should be included?
- xi. What colors and designs are most appealing to viewers to draw them in?
- xii. Anything else you would like to add?

Interview for Teaching Expert

- i. We have to teach a curriculum of sustainable energy solutions, what ways can we engage 8th grade students?
- ii. What literature is good to read up on for how to teach adolescents?
- iii. Are in class games a good way to learn?
- iv. How can we minimize the lecture portion of a lesson plan?
- v. How do you easily organize a lesson plan?
 - a. Would you recommend using a spreadsheet template for a lesson plan?

Interview for Middle School Administration

- i. How long in advance would you need us to contact you next year to people able to complete the project? (Earth Day)
- ii. What kind of incentives would your teachers and students need to participate?
- iii. Would we be able to get two 1-hour class periods for each involved classroom and weekend session?
- iv. How many students would be able to participate in the challenge? (8th grade students)
- v. Any other recommendation to make sure this project happens next year?

Appendix D: National Grid Employee Interview

I. What are your recommendations for the average resident of Worcester if they wanted to save money on their electricity bill?

1. Change your HVAC air filter regularly

Check your filter every month, especially during heavy use months (winter and summer). If the filter looks dirty after a month, change it. At a minimum, change the filter every 3 months. A dirty filter will slow down air flow and make the system work harder to keep you warm or cool—wasting energy. A clean filter will also prevent dust and dirt from building up in the system—leading to expensive maintenance and/or early system failure.

2. Tune up your HVAC equipment yearly

Just as a tune-up for your car can improve your gas mileage, a yearly tune-up of your heating and cooling system can improve efficiency and comfort.

3. Install a programmable thermostat

A programmable thermostat is ideal for people who are away from home during set periods of time throughout the week. Through proper use of pre-programmed settings, a programmable thermostat can save you about \$180 every year in energy costs.

4. Seal your heating and cooling ducts

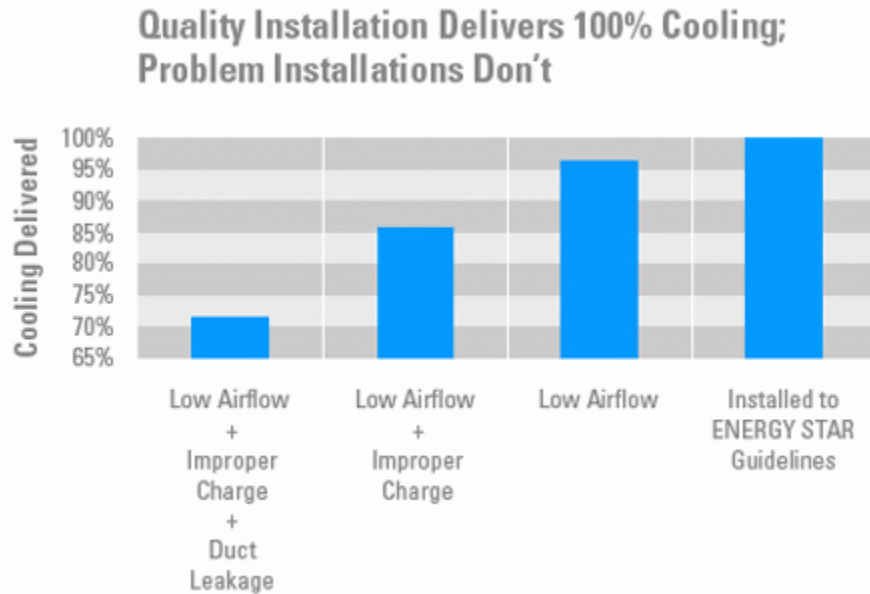
Ducts that move air to-and-from a forced air furnace, central air conditioner, or heat pump are often big energy wasters. Sealing and insulating ducts can improve the efficiency of your heating and cooling system by as much as 20 percent—and sometimes much more. Focus first on sealing ducts that run through the attic, crawlspace, unheated basement, or garage. Use duct sealant (mastic) or metal-backed (foil) tape to seal the seams and connections of ducts. After sealing the ducts in those spaces, wrap them in insulation to keep them from getting hot in the summer or cold in the winter. Next, look to seal any other ducts that you can access in the heated or cooled part of the house. See the [ENERGY STAR® Duct Sealing brochure](#) (1.13MB) for more information.

5. Consider installing ENERGY STAR® qualified heating and cooling equipment

If your HVAC equipment is more than 10 years old or not keeping your house comfortable, have it evaluated by a professional HVAC contractor. If it is not performing efficiently or needs upgrading, consider replacing it with a unit that has earned the ENERGY STAR®. Depending on where you live, replacing your old heating and cooling equipment with ENERGY STAR® qualified equipment can cut your annual energy bill by nearly \$200. But before you invest in a new HVAC system, make sure that you have addressed the big air leaks in your house and the duct system. Sometimes, these are the real sources of problems rather than your HVAC equipment.

6. Ask about proper installation of your new equipment

Replacing your old heating and cooling equipment with new, energy-efficient models is a great start. But to make sure that you get the best performance, the new equipment must be properly installed. In fact, improper installation can reduce system efficiency by up to 30 percent—costing you more on your utility bills and possibly shortening the equipment's life.



Make sure to ask your contractor if their work meets guidelines set by ENERGY STAR® and the Air Conditioning Contractors of America (ACCA). These guidelines include:

Proper sizing of equipment

Installing the right size equipment for the home is essential to getting the best performance and comfort. Many homeowners believe that bigger is better when buying new heating and cooling equipment. But in reality, a system that's too large will not keep your home comfortable because of frequent 'on/off' cycling. Incorrect sizing can also put stress on system components and shorten the equipment's life. To ensure proper sizing your contractor should provide a copy of the home's heat gain/loss calculations for your records.

Sealing ducts

To ensure that ducts are properly sealed your contractor should test the leakage rate. If the ducts are very leaky (i.e. more than 20% of the air moving through the system is leaking into spaces you do not want heated or cooled) your contractor should use duct sealant (mastic), a metal-backed (foil) tape or an aerosol sealant to seal the seams and connections of ducts. After the ducts are sealed ask your contractor to wrap them in insulation.

Proper refrigerant charge (central air conditioners and heat pumps only)

A properly charged system will operate more efficiently and help prolong the life of the heating and cooling system. To ensure the system has the correct amount of refrigerant a contractor must test and confirm that the system is properly charged. If the system is not properly charged the contractor should make the appropriate adjustment by adding or removing refrigerant.

Optimizing air flow

If air flow in your heating and cooling system is too high or too low, you may confront problems and higher utility bills. A contractor should test air flow and make any needed adjustments for optimal performance.

I would add convert all incandescent lighting to fluorescent or LED**The site also has seasonal tips shown below****Winter Savings Tips**

- If your heating system is more than 10 years old, replacing it with an ENERGY STAR® unit could save up to 30% in energy costs per year.
- Holiday lights using light-emitting diodes (LEDs) use one-tenth the energy of typical mini-lights and are cooler, which reduces fire risk.
- Seal air leaks before installing insulation to ensure that you get the best performance from the insulation.
- A dehumidifier can greatly add to your electric bill. Make sure you have the appropriate sized dehumidifier for your home and if replacing an older model, be sure to look for a dehumidifier that has earned the ENERGY STAR® to save the most energy and money.
- Consider installing a ceiling fan. If you already have one, make sure to change the airflow on your ceiling fan. Make sure you change the direction of airflow on your ceiling fan. In the winter, let the fan push warm air toward the floor and in summer, switch the direction and draw air upward, cooling the room and ensuring constant airflow.

Spring Savings Tips

- Spring-cleaning involves making sure all the fans in your home are working properly and are dust-free. Regularly wash or replace filters.
- In preparing for the summer, consider investing in some insulated, thermal-backed drapes for your windows to keep heat at bay during hot summer days.
- When dust and pet hair build up on your refrigerator's condenser coils, the motor works harder and uses more electricity. As part of your spring-cleaning routine, make sure the coils are cleaned and air can circulate freely.
- Doing some spring cleaning in your basement? Make sure to have a look at your foundation walls. If you have an unfinished basement or crawlspace, check for air leaks by looking for spider webs. If there's a web, there's a draft. A large amount of heat is also lost from an un-insulated basement.
- Schedule a pre-season check up of your central air conditioning cooling system to make sure it is operating at peak efficiency. If you have central air conditioning, keep your thermostat at 78 degrees. You can also save approximately an additional six to seven percent off your cooling costs for each degree above 78. If you are in the market to replace your old central air conditioner, make sure to look for a new ENERGY STAR® qualified model, which can reduce your cooling costs by 20 percent.

Summer Savings Tips

- Close window shades, drapes and blinds during the day.

- Find and seal air leaks that cause drafts and make your cooling system work overtime. When remodeling choose ENERGY STAR® qualified windows to replace older models.
- Remember to turn the fan off when you leave the room as a ceiling fan cools you—not the room.
- Keep central and room air conditioner units at highest temperature that's comfortable. A suggested temperature range for summer is between 74°F - 78°F.
- Turn your air conditioner off when not at home. Use a timer or programmable thermostat to set it to turn on an hour before coming home.

Fall Savings Tips

- Check your insulation - especially your attic. By increasing and filling gaps in insulation in older homes you keep your home warmer in the winter, cooler in the summer, and save money all year round.
- Change out your traditional light bulbs to ENERGY STAR® qualified compact fluorescent light bulbs which use 75% less energy, produce 75% less heat, and last up to 10 times longer than standard lighting.
- If you're renovating or doing home improvement projects and considering purchasing new appliances, always look for the ENERGY STAR® label on new appliances. These products are more energy efficient and can help reduce your energy costs.
- Schedule a checkup of your heating system. Just as a tune-up for your car can improve your gas mileage, a yearly tune-up of your heating system can improve efficiency and comfort. This is also a good time to change the air filter, which results in better system performance.
- Check the air filter on your heating system regularly and replace if dirty. A dirty filter will make the system work harder – wasting energy

II Which of these would be most effective?

Turning off unused or idling energy users is always an instant payback.

For electrical savings the upgrade from incandescent to CFL is usually the quickest payback given the incentives available.

For fuel savings on a typical heating system the setback thermostat has a very good payback.

III Specifically, are there any ways in which younger kids (10-14) can save energy?

Many items that younger kids use every day, such as the tv, laptop, video games, cell phone chargers, continue to draw a small amount of power when they are switched off. These are called "phantom" loads and can be avoided by unplugging the appliance or using a power strip and using the switch on the power strip to cut all power to the appliance.

Another thing to remember is that using rechargeable batteries is more cost effective than throwaway batteries.

Also, one of the best things kids can do to save energy is encourage their parents to invest in ENERGY STAR appliances when they need to replace older refrigerators, washing machines, freezers, dishwashers etc

IV Can you tell us Worcester’s average electricity consumption per year? Per household?

According to recent data, 64,575 residential customers (meters) in Worcester used an average of 537 kwh’s per month. That’s just under 6500 kwhs per year.

V For every kilo-watt hour of electricity consumed by Worcester, do you know how much CO₂ is emitted into the atmosphere?

According to the EPA website http://oaspub.epa.gov/powpro/ept_pack.charts For Worcester there is about

828 lbs of CO₂ per MWh or 0.828 lbs per kwh
2.84 lbs of SO₂ per MWh or 0.0028 lbs per kwh
0.84 lbs of NO₂ per MWh or 0.00084 lbs per kwh

VI Can you tell us about the proposed smart grid plan released in March 2009 & progress so far?

On April 1, 2009, the Company submitted its proposed Pilot to the Massachusetts Department of Public Utilities for approval according to Section 85 of the Massachusetts Green Communities Act. In the fall of 2010, National Grid resubmitted its Plan to address the directives, including reducing the budget. Just before the end of the same year, the Department of Public Utilities requested detailed costs for the Plan and in the first week of 2011, National Grid provided a detailed cost breakdown. On February 11, 2011, before providing any written comments on the Plan, National Grid filed a Motion to Withdraw the Pilot proposal. In the Withdrawal, the company indicated its intention to reach out to state and local governmental officials, industry experts, consumer advocates and customers, to design a pilot that will more clearly educate customers about the costs and benefits of Smart Grid technology, and allow the company to test Smart Grid implementation more effectively. Through these efforts the Company sought to update the infrastructure and technology options based on advances in the marketplace and use a wide-reaching stakeholder approach to define value for the Pilot to customers, consumer advocates, industry experts and government officials. Also, the company wanted to identify smart infrastructure and technology at potentially lower cost than was originally envisioned. The company refiled a complete plan on December 23rd 2011 which is based on community support and the company’s most current analysis of smart grid technology. The aim in the updated Outreach and Education plan is to bridge the outputs of stakeholder input with new technology to achieve a high level of customer engagement which ultimately leads to meeting the 5% savings target. The company continues to be committed to investing in Massachusetts and helping to achieve the Commonwealth’s energy savings goals.

VII Where do you see smart grid technology in 5-10 years?

With ever increasing agreement between local communities, business leaders, policymakers and other key stakeholders that a Smart Grid is essential if we are to keep up with the growing demands on our electric system, implementation is not only needed but well within reach. Some of the technologies associated with the

system are already in place today, such as electric vehicle charging capabilities and these can be seen in some parts of Worcester, with more soon to follow.

In the short term, smart grid technology will function more efficiently, enabling it to deliver the level of service people expect more affordably in these times of rising costs, while also offering many benefits to us as a society, such as less impact on our environment.

Within five to ten years we can expect a Smart Grid to bring about the kind of transformation that the internet has already made in the way every one of us lives, with impacts being felt in the places where we learn, play and work.

VIII How much do you predict smart grid technology will reduce non-renewable resource consumption in Massachusetts?

This is difficult to calculate as it depends on a number of factors, ie how much will customers embrace the smart grid and shift consumption to when renewable energy is available? One of the aims of the Worcester Pilot is to demonstrate how smart grid can allow for the integration of renewable energy technology, such as solar panels on your roof and clearly, the shorter the distance from generation to consumption, the more efficient, economic and green it can be. It will empower Worcester consumers to become active participants in their energy choices to a degree never before possible.

IX Is it possible to see a demo of how smart grid works?

Demo to be installed in Milbury in spring

¹ http://www.eia.gov/cneaf/electricity/page/co2_report/co2report.html#table_1

Appendix E: Learning Activity Plan

Lesson Plan

Title: How to be Sustainable in Worcester

Subject: Sciences

Intended Grade Level: 8th Grade

MA State Frameworks – Standards addressed

This lesson plan doesn't fit directly into the Massachusetts Framework at this given time, but can be incorporated into the Earth sciences part of teaching due to the importance of this subject matter.

Summary of the Lesson

The students will learn about energy consumption in addition to what they themselves can do to save electricity at their homes. The students will learn this information through a PowerPoint presentation and a kill-a-watt hour demonstration.

Learning Objectives for Students

- Students will be able to identify renewable and nonrenewable energy sources
- Students will come away with five ways to save energy at home
- Students will be able to list common sources of pollution
- Students will be able to visualize a kilowatt hour

Materials / Resources / Instructional Media to be used

- 3 Kill-a-watt meters
- 1 manual power generation device
- 1 Powerpoint presentation
- 5 copies of Chutes and Ladders

Educational Technology

In supplementation to the PowerPoint presentation, there will be hands on activity of using a Kill-a-watt meter that will engage the students to plug in commonly used devices into the meter, and monitor how much electricity is being consumed by those devices. This particular exercise will bring awareness of the amount of power that is being consumed on an individual level to the student's attention. By applying the individual amount consumed, the students will then be made aware of the average amount of electricity consumed at a household level. Then that can be turned into a comparison of how many hours that would equal of using their Xbox or other commonly used device by the students.

Similar to the kill-a-watt meter, the concept behind the manual power generation device is that the students will be able to visualize what a kilowatt hour is.

Introduction / Beginning the Lesson (10 minutes)**Students Prior Knowledge / Possible Misconceptions**

- Asking questions that will be able to gauge the student's knowledge into the given subject matter

Engaging Experience:

- Show Green2Growth video to introduce the project in a fun manner

Carrying Out the Lesson (30 minutes)**Description of Activities:**

- PowerPoint Presentation
 - Will be filled with pictures and charts pertinent to living sustainably in Worcester that will be described
 - The causes and effects of pollution specific to Worcester
 - Different types of energy sources, and the frequency of use
 - Definition of sustainability
- Chutes and Ladders
 - At the base of every ladder will be a fun fact that is good for the environment
 - At the top of every chute will be a fact that is not good for the environment
- Kill-a-watt hour demonstration
 - Will have device plugged into commonly used devices
 - Comparison of identifiable devices to relate to students

Completing the Lesson / Closure (10 minutes)**Review / Wrap up With Students**

- Summarize what the students learned
- Ask questions about the material taught
 - In what ways can you save energy?
 - What types of energy sources are there?
 - What is a kilowatt hour in your own words?
- For Homework
 - Come up with an idea that could be used for a commercial related to sustainability

Assessment

Assessing Student Understanding:

A few short answer and multiple choice questions will be given to the students to review the process to help gauge if the students learned from the lesson plan.

Sample rubric:

Objective	3	2	1	0
List five ways to save energy at home	Five different ways to save energy well thought out	Four well thought out ways to save energy	Different ways listed, but very vague and not thought out	No relevant methods provided
Describe in your own words a kilowatt hour	Great description that shows the student understands this concept	Description is acceptable but lacks complete details	Description is vague and shows student did not take lesson seriously	Little to no work shown that shows the student understands concept

Teaching Tips

The science lessons you plan, write up, and carry out in classrooms should be:

Hands on as much as possible – Instead of talking about topics or filling out pencil and paper worksheets, base your lessons on the use of real objects (animal skulls, cars, balloons, seeds, rocks, - whatever) – and bring enough materials so all kids can get their hands on things at least some of the time

Inquiry: Your activity should not be just following a recipe, but instead should be an investigation, with chances for kids to try different things, change things, experiment with things, and keep track of their results

Quantifiable: There should be things to measure or observe, so that at the end kids can say “I changed this and it caused the result to change by X amount. (for example, giving seeds different amounts of water and measuring how high they grow, Pouring the same amount of water through two different cups of soil and measuring how much water comes through, etc.)

DON'T rely too heavily on

Worksheets – use them as a supplement but not as the main lesson. (You can use a worksheet if it is a thinking exercise that is creative and has multiple right answers, such as drawing a picture of an invention or designing an alien creature to live in a particular habitat.

Lectures – Give only as much background as needed to do the investigation
Teacher-directed recipes - You can start with a recipe as long as there are places along the way for students to vary the recipe and see how the result changes

You CAN and SHOULD feel free to use

Models, Demonstrations, Photos, Storybooks, Diagrams, Brief Videos, (NOT having them sit and watch a science-themed DVD program as a substitute for you teaching them), Games, Songs, and Art projects as parts of your lesson as long as there is also some hands-on investigation

In the Classroom

You can spend the first week or so just observing the class – watching how the students interact and what kind of classroom culture the teacher has established – but then...

Be Active

After the first few weeks, you should be an active part of the teaching staff – That means don't hang back with your arms folded – Even if you are not the “lead” teacher for the week, you should still go around talking to kids, assisting them if need be, and also asking them questions about why they are making the choices they are making. Pose challenges, make them defend their explanations, and generally keep them on their toes.

Be Safe

Be VERY conscious of any material that might pose a danger if used incorrectly – Sharp knives, pointed scissors, open flames, straight pins, dry ice, blow dryers, harmful-if-swallowed chemicals, etc. If such materials are essential to the activity, be sure they are ONLY used by the adult who is teaching, and are NEVER accessible to students unsupervised. Also be aware of peanut or latex allergies and modify activities accordingly.

Be Flexible

If something is running long and going great, don't bring it to a screeching halt just because you think you need to stay on schedule. Teachable moments are precious things and as long as students are engaged and learning, it's OK to let one activity spill over into the time allocated for another. Conversely, if you planned for something to take 20 minutes and they are obviously bored in five, don't drag it out just to fill the time – Move on to the next thing!

and ALWAYS have a next thing!

NEVER run out of stuff - Over-prepare, bring more than you think you will need – It is MUCH better to have it and not need it than to need it and not have it-

Keep it Moving

Especially when working with the younger grades, it's better to plan for several short (10-15 minute) related activities rather than one long one – Kids today have short attention spans and unless the activity is VERY engaging they may get restless and distracted.

ALWAYS have a back-up plan

An activity or activities you could fall back on if the one you planned can't be done ... What will you do if the lead person in your group is out sick or forgets their materials? You could just develop a low-materials activity and bring it with you every week just in case it is needed – Another way is to always have two weeks of activities, the current week and the next week, in case you need to switch them.

Assume NOTHING

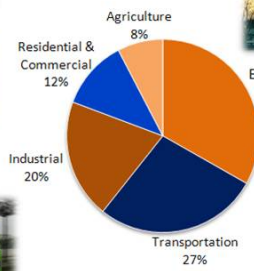
If you want to play a CD, bring your own CD player, don't assume the classroom will have one - That goes for Internet access, magnifying glasses, even cups, bowls, paper towels and water. When it doubt, bring it with you - "Fortune favors the prepared"

Appendix F: Lesson Plan PowerPoint

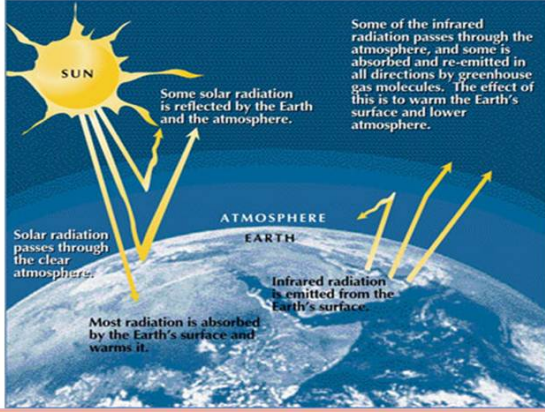
Sustainable Living in Worcester

Andrew Bennett
John Fitzpatrick
Jon Gaffen

Pollution



1. <http://www.eles.org/technology/overview/electricity>
2. <http://www.environmental.com/2011/12/01/a-new-guide-to-the-dangers-of-plastics/>
3. www.ford.com
4. www.ohioancient.com
5. ohioancient.org



The diagram illustrates the greenhouse effect. It shows the Sun emitting solar radiation. Some of this radiation is reflected by the Earth and the atmosphere. The rest passes through the clear atmosphere and is absorbed by the Earth's surface, warming it. The Earth's surface then emits infrared radiation. Some of this infrared radiation is absorbed and re-emitted in all directions by greenhouse gas molecules in the atmosphere, which warms the Earth's surface and the lower atmosphere.

SUN

Some solar radiation is reflected by the Earth and the atmosphere.

Solar radiation passes through the clear atmosphere.

ATMOSPHERE

EARTH

Most radiation is absorbed by the Earth's surface and warms it.

Infrared radiation is emitted from the Earth's surface.

Some of the infrared radiation passes through the atmosphere, and some is absorbed and re-emitted in all directions by greenhouse gas molecules. The effect of this is to warm the Earth's surface and lower atmosphere.

CLIMATE CHANGE

Warmer temperatures, dangers to wild life, increased risk of disease, rising sea levels, erratic weather.

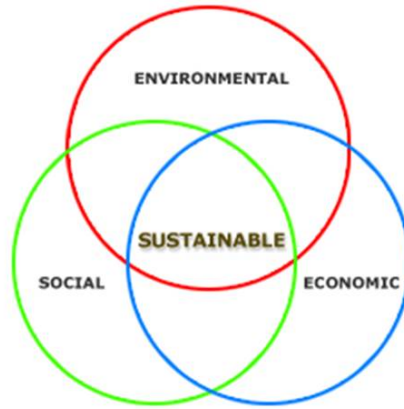
1. <http://www.nature.org/ourinitiatives/regions/americas/usa/ourinitiatives/ourinitiatives/climatechange/learningpack/index.htm>

Emissions in Worcester

- In Worcester, there are 64,575 households.
- Average 537 kwh per month (6500 per year)
- With that amount of energy consumed...
- 828 lbs of CO₂ per MWh
- 2.84 lbs of SO₂ per MWh
- 0.84 lbs of NO₂ per MWh
- ...is polluted into the atmosphere.

Hand out the national grid packet (Appendix D) to the students

What is Sustainability?



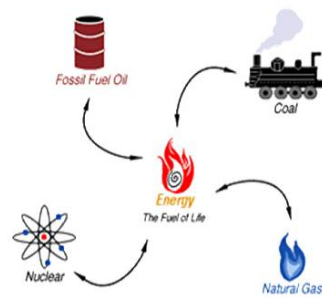
1. eventsharmatter.co.uk

Energy Sources

Renewable Energy



Non-Renewable Energy



1. green-the-world.net

Smart Grid Technology



1. [energystar.co.uk](http://www.energystar.gov)
2. <http://www.gutenberg.org/cache/epub/2009/11/images/10000.jpg>
3. <http://www.aboumyplanet.com/wp-content/uploads/2011/11/energy-star-appliances1.jpg>
4. Define Kilowatt hour to the class

Energy Saving Tips

- 1) Replace five lights with ENERGY STAR® light bulbs and save 62 kwh for a total savings of \$9 per month.
- 2) Turn off lights, appliances, TVs, stereos and computers when not in use. You will save 58 kwh and \$9 per month
- 3) If you have a large television (greater than 32"), turn it off when not watching. You can save 50 kwh and \$8 per month.
- 4) Unplug your electric space heater or hot tub and save \$41 (or 270 kwh) per month.
- 5) Unplug and recycle your old, second refrigerator and you can save \$23 (150 kwh) per month.
- 6) Washing your clothes in cold water can save you 63 kwh—or \$9 per month.
- 7) Repair leaky faucets and save on your electric hot water. You can save 40 kwh or \$6 per month.
- 8) Unplug chargers, laptops, anything with remote control or "instant on" features and save \$4 (29 kwh) per month.
- 9) On your electric dryer: clean the dryer filter, and clean and straighten the exhaust hose/ duct and vent outside. You will save 23kwh—or \$3 per month.
- 10) When buying new appliances, always choose ENERGY STAR. This can save you 75 kwh—or \$11 per month.

1. Nationalgrid.com
Replace this slide with pictures and inform class of these facts.

Divide into groups of 4 or 5

- Chutes and ladders
- Kilowatt hour demonstration

Appendix G: Promotional Plan

- Phase 1: Media Generation
 - Generate interest on the topic by physically going into classrooms and teaching middle school students the concepts of sustainability and smart grid technology.
 - At the end of this lesson, the students will be given an essay topic for an essay contest.
 - This allows the students to think more about the topic and inform their parents about their schoolwork.
 - By the video script writing session, the essays should be complete. The top 10 essays will be posted to the Green2Growth blog and judged by everyone.
 - The student with the essay with the largest response is deemed the winner and their essay will be posted on other social media sites.
 - Similarly an art contest will be conducted in the middle school art classes.
 - This contest will happen concurrently and all paintings or other pieces of art will creatively depict a sustainable message.
 - Similar to the essay contest, the top ten will be posted to the Green2Growth blog.
 - After the lesson plan, essay and art contest, the students will be encouraged to participate in the Viral Video Challenge.
 - The Green2Growth team will work side by side with the middle school students to develop storyboard and produce videos.
 - These videos will contain facts about smart grid technology and sustainability in a fun but serious and informative manner.
- Phase 2: Posting
 - The materials gathered will be posted through different social media tools.
 - The materials and what social media tool they will be applied to can be seen the table below.

	Materials and Where to Post		
	Facebook	YouTube	Blog
Essay Contest			
Art Contest			
Videos			

- Phase 3: Advertising
 - Text based images that would be incorporated into Worcester School's websites
 - <http://www.wpsweb.com/>
 - <http://www.bancroftschool.org/>
 - Advertising in school newspapers / local newspapers

Appendix H: List of Contacts

School/ Organization	Name	Phone	Email
Bancroft School	Matthew Barone	508-853-2640 EX 316	mbarone@bancroftschool.org
Holy Name School	Ed Reynolds	508-753-6371	ereynolds@holyname.net
Holy Name School	Arlene Maurello	508-753-6371	
Forest Grove	Mark Williams	508-799-3420	williamsm@worc.k12.ma.us
Worcester Polytechnic Institute	Elizabeth Tomaszewski	508-831-5454	ltomasz@wpi.edu
Green2Growth	Judith Swartz		judith@tothept.com
Worcester Government	John Odell	508-799-1400 EX 268	OdellJ@worcesterma.gov

Appendix I: Proposal for the Schools

The Project

Green2Growth is a community-initiated organization sponsored by National Grid. They are dedicated to making Worcester a green powerhouse by promoting sustainable living. To accomplish this goal, Green2Growth has created a Viral Video Challenge. This video challenge plans on having middle school classes compete against each other in order to create a video that gathers the most views on YouTube. Green2Growth can provide a project group to teach middle school students about the topics of sustainability, specifically relating to smart grid technology. After the education of the middle school students, the process of writing scripts and creating videos on these topics will be completed. Finally the videos will be posted to YouTube for the competitive portion of the challenge. The main goal behind this project is that Worcester's residents will be more aware of their city and adjust to make it more "green."

Educating Middle School Students

An important part of this project involves the project group educating middle school students on the topics of sustainability and smart energy to local middle school students from participating schools. The IQP group will develop a curriculum that they will teach to the students over the course of one week. Some of the teaching approaches mentioned in the background will be utilized on the students. The following is a list of the topics that will be taught to the middle school students.

1. Causes of pollution
 - a. Fossil fuel burning power plants
 - i. Coal, natural gas oil
 - b. Transportation
 - i. Automobiles, planes, boats
2. Effects of pollution on the environment
 - a. Concept of global warming
 - b. Acid rain/ acidification of the oceans
 - c. Smog
 - d. Algae blooms
3. Sustainability
 - a. What it means
 - i. Balance between the need of the society, economy, and environment
 - b. Sustainable energy solutions

- i. Wind, solar, smart grid
4. Tips and tricks to living a sustainable lifestyle
 - i. Monitor energy usage (ex: turn off lights after leaving a room)
 - ii. Recycle
 - iii. Walk or ride a bicycle instead of riding in an automobile
5. Smart Grid
 - a. Teach students what smart grid does and how to use it.

In addition to the lessons that will be taught to the students in class, the project group also intends on founding an after school sustainability club in each middle school. This club will help to further reinforce the importance of sustainability in the students by encouraging them to live sustainable lifestyles and have an active voice in their community. The club will provide its members with the information needed to identify wasteful energy systems inside or outside of the school. The club will be organized with a middle school faculty member a club supervisor. This insures that after the completion of the Viral Video Challenge, the sustainability club will continue to hold meetings and impact the community.

Viral Video Production

The video production aspect of the project will be focusing on the middle school students to create the best possible videos about sustainable energy solutions. These short videos are aimed at educating the public on ways their homes, schools, and businesses can become more sustainable. The middle school students will be provided subject matter and be given help in filming and editing the videos. The educators will provide insights on how to most effectively deliver sustainability information to other children and their families. A goal of this project is to empower youth to act as influential voices in educating the community about sustainable energy solutions.

The video production will be focusing on the basics of videography. This will involve teaching the children how to use a video camera in addition to giving them a general overview of how to produce raw footage for a video. As many of the students might not have used video equipment, they may require assistance after the initial introduction. Green2Growth will be responsible for the editing of the resulting footage.

Summary of Project

The Green2Growth hopes to have a project team teaching in the classrooms by the week of _____. The following week would consist of writing scripts and developing the videos. Finally, the weekend _____ would be a session to film the videos in a video studio. In order to implement this challenge, the Green2Growth will require written consent from your school and two ~1 hour blocks of class time per classroom. Along with this document is consent forms for the students to have their parents sign if they wish to participate in the video aspect of the challenge. Thank you for your time.

Appendix J: Parental Consent Form

Informed Consent Agreement for Participation in the Green2Growth “Viral Video Challenge”

Sponsor: Green2Growth

Introduction

Your child is being asked to participate in the Green2Growth Viral Video Challenge at the Holy Name School. The purpose of this project is to inform your child of sustainable energy solutions and then to produce a video on the material that they learn. This video will then be posted on the Green2Growth website, YouTube, and Facebook.

Purpose of the study: Green2Growth is spearheading an initiative to make Worcester, Massachusetts a more sustainable city. They believe that by teaching the youth about the importance of going “green” and by producing viral videos, people in Worcester will live more sustainable lives. Specifically, they will lessen Worcester’s carbon emissions by reducing their consumption of electricity.

Time Required: Students will be spend a total of 90 minutes in the classroom with the Green2Growth project group during the weeks of _____ and _____, and about 3-4 hours at our video shooting site (_____) on _____.

Risks to study participants: As you are aware, there are potential risks associated with the posting of your child’s personal images/ photos in the form of a video on a web site since global access to the Internet does not allow us to control who may access such information.

Benefits to research participants and others: By participating in this project the student will develop an in depth understanding of what it means to go “green” and will learn how to live a sustainable lifestyle in Worcester, MA.

Confidentiality: The personal information of the students (i.e. name, address, phone number, etc) will not be posted on any websites associated with the project. Only the student’s image in the form of a video will be posted online.

Voluntary participation: Your son or daughter’s participation in this project is completely voluntary. There is no penalty if students decide not to participate. If they do not wish to participate in these experiments, students should notify their instructor who will arrange an alternate assignment that involves equivalent time and effort.

Compensation or treatment in the event of injury: Seeing that this is a low-risk project, Green2Growth is not liable for any injury that your child sustains while shooting the educational videos.

For more information about this research or about the rights of research participants: Please feel free to contact the Green2Growth.

By signing below, you acknowledge that you have been informed about and consent to your child being a participant in the project described above. Make sure that your questions are answered to your satisfaction before signing. You are entitled to retain a copy of this consent agreement.

Date: _____

Student's Name (Please print)

Parent/ Guardian Name (Please print)

Date: _____

Signature of Parent/ Guardian