

## Value Added: School Leaders Can Promote Student Energy Literacy

Ann Toler Hilliard

*Bowie State University, U.S.A., 5372 Phelps Luck Drive Columbia, Maryland 21045, U.S.A.  
Telephone: 410 997-3875, E-mail: draph1@juno.com*

**KEYWORDS** School Leaders. Curriculum Focus. Energy Conservation Practices. Global Governments' Policies. Student Leadership

**ABSTRACT** The second highest expense beyond personnel salaries is energy cost to operate schools and other needed facilities. Therefore, there is a growing practice for school leaders to seek ways to decrease energy expenses in their schools through effective management strategies. By gaining more knowledge about energy conservation, school leaders along with teachers can teach students how to critically analyze and decipher real-world information about energy conservation in their own everyday lives. The overall objective of this study is to instill in students the importance of practicing energy conservation at school and at home. The methodology of this initial study uses qualitative interviewing statements collected from school leaders, teachers at the beginning of the year and student leaders at the end of each semester. This research addresses a longitudinal method of study; therefore, the findings will not be finalized at this time. An open-ended and close-ended questionnaire is used to collect data during this semester and the spring semester as enclosed. The focus of this study shows the importance of energy literacy awareness, typical energy costs in schools, common ways to conserve energy, the role of governments, and how to link energy literacy conservation to real-world application.

### INTRODUCTION

The awareness of conserving energy could be reinforced in the school's curriculum. This practice may inspire students to wish to study more about energy conservation and later to follow their career interests at the college-level and eventually secure employment with a strong interest in energy conservation in its many forms (Alliance to Save Energy 2015). In the school environment, students could be taught what is energy literacy and the importance of using less energy by turning off electrical and electronic devices when not in use, encouraging parents to purchase more efficient lights and appliance, controlling the thermostat, washing most laundry in cold water in the home and the school environment.

Student's ability to demonstrate being energy literate is the major objective of this study and their knowledge could help their parents and other family members to know more and practice conserving energy in the home environment. Students could help their parents see the importance of purchasing energy efficient products for their home. Looking at several principles for energy literacy in the school's curriculum may help students and individual communities make better and informed decisions as to how they can best conserve energy. Energy literacy re-

flects a composite of the consumer's values and knowledge regarding the energy system that supports daily activity in the home and commerce. Helemarie Hofman talks about the practical need to have technical energy knowledge in order for an individual to be energy literate. Hofman expresses how knowledge about an energy curriculum in schools and society are essential in preparing students to be more responsible as citizens in the use of conserving energy. Students are gaining knowledge about the important issues about energy in today's world and how energy is used. Using a prescribed framework for the curriculum helps school leaders, teachers, staff and students to know if they are competent and energy literate. Teachers could help students to see the linkage and the need to actually know and practice better energy conservation in their everyday lives and in industry (Moore et al. 2013).

### Literacy Framework

In order to promote current standards for energy literacy, a framework is used to highlight the concepts for the natural and social sciences curriculum in the five participating schools in this study. In brief, the energy literacy framework addresses skills, knowledge and professional disposition that students should have in the

(cognitive domain, affective domain and behavior). Students are expected to obtain technology literacy, environmental literacy and energy literacy information from the school's curriculum that is prescribed and shared with schools by the United States Department of Energy and the Office of Energy Efficiency and Renewable Energy. The successful participants in the energy literacy programs are expected to be able to show ways of thinking and acting, habit of mind, active involvement behavior and intentional involvement action that they are consciously making an effort to conserve energy in their own environment (USDE and OEERE 2013).

### **What is Energy Literacy and Some of the Cost Factors?**

For the purpose of this study overall, energy literacy was and is being discussed in the context of the school environment. However, other significant mentions were communicated in this study too. Energy Literacy is for an individual to have reasonable knowledge of the nature and role of energy in the world and daily lives accompanied by the ability to apply this understanding to answer questions and solve problems. Author Joan Salmon asked the critical question: what do everyday citizens need to know about energy and what purposes? What is suggested by Hofman and Salmon (2000) that informed citizenry need to know the critical importance of what are energy matters and the conservation factors of energy? In order to be energy literate, an individual will be able to basically trace energy flows and think in terms of energy systems, knows how much energy he or she uses, for what, and where the energy comes from, can assess the credibility of information about energy, can communicate clearly about energy and use energy in meaningful ways.

Conserving energy may differ based on cost factors, based on the age of school buildings and the schools' condition may differ in the ability to conserve adequate energy. Newer constructed buildings may have more ways within their own infrastructure to conserve energy. There are many different variables that may influence how well school buildings are able to conserve noticeable amounts of energy. However, there are basic ways to assist in conserving energy in typical school buildings by creating a culture where students, staff and teachers

will turn off lights, electronic devices when not in use, stop water drips, close doors, adjust the thermostat according to weather conditions, reuse, and recycle appropriate paper products (Solomon 1992).

Many schools spend approximately \$75 or more per student on gas bills and approximately \$130 per student on electrical expenses annually. By finding ways to conserve energy through planning effectively, many schools have been able to reduce energy cost by 30 percent in older facilities. However, if buildings have been remodeled for improving energy conservation, schools could save between \$10,000 to \$16,000 or more annually. The behaviors and practices of individuals within a school building could reduce energy costs by 25 percent annually according to the United States Environmental Protection Agency (2008).

The energy smart schools participating in this study were identified by regions of the country and student population. There were five schools that participated in the energy initiative curriculum. The schools' participants in this study are from the state of North Dakota, Texas, Missouri, Nebraska and California. The developmental process for energy literacy are being led by determining what students know and understand about energy. The school leaders and teachers continue to expose students to literature reviews about various forms of energy, curriculum resources and materials, the standards at the state and national level regarding energy literacy and support from partnerships. In this ongoing qualitative study, at random, interviews were held with school leaders, teachers and students to address the research questions.

The five participating secondary schools in this study have an environmental club and student representatives and leaders from each of the five schools as part of this study are active participants based on input from school leaders at the schools. Emphases are being placed on conservation projects such as turning off lights and computers, recycling paper products and identifying other creative projects about energy conservation in its many forms. Students have the opportunity to continue to engage in energy related research projects and activities during their learning experiences. Many of the projects are research-driven and presented by students in formative and summative assessment activities. Students started their research on basic in-

formation regarding the importance of energy curriculum alignment with standards and basic energy conservation practices. Students are looking further at green energy sources, cleaning and transportation, solar, energy, wind, ocean waves and a global look at capturing energy for renewal use. All research projects are scheduled to be completed within the fall semester and presented during a late spring symposium 2016. Students' research studies are based on a qualitative design. A teacher committee and energy partners from the community will continue to guide and advise students on various energy conservation projects.

### **A Collaborative Effort**

Students have been participating in weekly lesson planning with their teacher using a variety of resources from the National Energy Education Development regarding energy practices and conservation. The schools have reached out to both English and Spanish parents to jointly participate in the energy conservation practices and their child's projects [NEED Project 2009]. The benefits of engaging school leaders, teachers, students, staff, parents and the community brings about the awareness and a conscious collaborative effort to conserve energy. The sources of energy and how humans can use energy in a more responsible manner will remain a key emphasis to this study (Lee and Liu 2010).

The schools participating in the energy literacy initiative have committees and student leaders working together to improve energy conservation in their perspective schools. The committee is comprised of teachers, staff, students, parents, and community experts. Each school has at least eight or more committee members to ensure that the curriculum is being executed as intended and that students are receiving the best advisement possible. Everyone in the schools will be encouraged to contribute to the progress of the energy initiative on energy conservation. Further intentions are being proposed that all five states to participate in a three day national research-based energy symposium and forum during the summer 2016 with the support of grants to defray expenses for travel, hotel, registration and other needed accommodations. Student leaders will present their research on their school's efforts to conserve energy during various presentations.

### **Research Questions**

1. Will the five participating schools execute an effective energy initiative program?
2. Will student participants gain high level skills, knowledge and practice notable ways promoting energy conservation?
3. Will student participants be able to link what they have learned to real-world application?

This study is limited, at this time, to five high schools with at least 25 participating student leaders from each of the participating schools totaling a 125 students. If this interest in energy conservation is deemed effective, this could impact the five schools as models in this study in a positive manner, because less energy would be used in those schools overall with efficiency and improving HVAC, lighting and plug-loading. For families in the community, state, national or at the international level, could help to impact energy conservation by improving domestic ventilation, space heating, refrigeration, cooking and water heating (Volk and Cheak 2003).

### **Significance of the Study**

This study is very significant because energy conservation is needed everywhere and it should be everybody's concern. Energy literacy and practice could start small with student leaders and others and could expand into many directions with the support of individuals and governmental agencies globally (Schelly and Price 2010). As students gain more knowledge and become mature, they could be key leaders in helping to save many facets of the environment (U.S. Environmental Protection Agency 2005) physically and economically by being active participants at the table in local and broader global communities as decision-makers for policy enforcement related to energy conservation (Duvall and Zint 2007).

The broadness of energy is not always comprehended or noticed by many people, because everything revolves around energy. The products that we make, buy, the foods that we eat, the drinking water that is pumped from the ground, our transportation system, the Internet – it's all driven by energy, yet we take it for granted according to Gerritsen, a professor at Stanford University. People need to have a basic understanding of energy to make informed deci-

sions, not only about their own consumption but also about key policy issues that can impact our lives (Gerritsen 2012).

### **Statement of the Problem**

Schools use a lot of energy and energy resources are costly. Beyond the salaries of employees, energy cost is the highest expense for schools. Many schools have limited funds; therefore, schools leadership must find practical ways to create a school culture that will buy-into energy conservation at every level possible. Lighting use contributes to the highest use of energy in schools.

### **Literature Review**

There are some practical ways to conserve energy. By installing energy efficient lights could reduce energy cost at a lower rate. In most school buildings, the lighting system can account for up 40 percent of a building's total energy cost. When improving lighting efficiency that could also reduce unwanted heat accumulation. Lighting quality and quantity to meet occupants' needs may maximize lighting efficiency. What may help the lighting situation could be by installing an automatic control to turn off or dim lighting, keeping lighting features clean, and replacing or purchasing energy star labeled products for schools and home could lower energy costs. By participating in disposal practices properly at school and at home could also reduce energy cost (ENERGY STAR 2014). School leaders in schools must also work with the building engineer and maintenance team to ensure that the air or heat is flowing in an efficient manner. There is a need to reduce supplemental load energy consumption. Working with the technical staff, school leaders could learn about the importance of measuring heating and cooling loads by purchasing the right size heating and cooling systems and by installing energy-efficient chillers. Also, by upgrading other heating and cooling system components such as installing variable-speed drivers on pumps and cooling tower fans to optimize operations by the United States Environmental Protection Agency could be useful. When school leaders recognize this important action for the cooling and heating systems, school leaders could see how important this action could benefit schools financially [U.S.E.P.A. 2008].

### ***Creating a Thinking Culture of Energy Conservation***

Working with school leaders and parents, school systems across the nation and globally can participate in the United States Global Change Research Program, [USGCRP, 2012] could help the student leaders, staff and teachers to observe and use eight common practices in conserving energy as follows:

1. Turn Out the Lights - Lighting is one of the largest users of energy in the classroom. By turning out the lights when a classroom is unoccupied, the school can save money. The school may also want to consider "occupancy sensors" that detected whether there are people in the room. If no one is there, the switch turns off lights.
2. Stop the Drips - Hot water is another area that uses a great amount of energy. By fixing dripping hot water faucets, you can save water and save energy. If it's cold water, fix the dripping faucet anyway because sanitizing and delivering water takes energy too.
3. Close the Doors - Leaving doors wide open to a room or building may make it more inviting to come in, but it wastes energy. Don't prop doors open but allow them to close after people walk through the doorway.
4. Change the Settings - Change the thermostat settings in a responsible manner in rooms to 78 during warmer months and 68 during cooler months. Doing so will lower the heating and air conditioning use.
5. Reuse and Recycle - If the school has not set up a recycling effort, do it now. Reusing paper and recycling paper saves money and energy. Recycle aluminum cans and plastic bottles (Consumer Energy Center of California 2014).
6. Encourage everyone to get involved in energy conservation
7. Incorporate the very best of today's design knowledge and technology to provide a better learning environment for all students in a facility that costs less to operate and is less damaging to the environment.
8. Provide information for students and teachers to help them see the importance of saving energy in their schools and at home.

These common daily practices for conserving energy could be transferred to the homes of students, staff and their teachers. Students are our best marketing sources in order to help conserve energy in school buildings. When taking the lead, student leaders could continue to remind their peers and the teachers to practice energy conservation. Working collaboratively, students, staff and teachers can do a lot to help save energy in their schools and at home. Energy-saving things you do at home can also be done at schools. These are the practices that teachers, staff and students could do daily to energy conservation.

Local Governments have a vested interest in energy conservation, therefore local governments are working with schools and other industries to find ways to produce the use of energy across the nation. Local governments are working with schools to improve energy efficiency in existing older school buildings. School and government buildings are being renovated at all levels to reduce energy costs. Government agencies are working with schools and other facilities to create a range of environmental, economic and educational benefits financially and to improve energy efficiency in buildings. The United States Department of Energy is working collaboratively to bring about an improvement to energy conservation. When school leaders encourage curriculum to be taught for energy literacy, students, faculty, staff and parents become more and more aware of the importance and need for energy conservation. In many school districts, when there are data to show that less energy is being used in schools, those schools will receive funding as an incentive from the government or industries in the form of a grant (USDE 2014).

### ***A Look at Energy Conservation School Programs in Selected States***

#### *California*

The sunny state of California has over 55 percent of its schools in need of repair or replacement. Many of the 55 percent of schools in California are 30 or more years old. In essence, most of the schools need to be brought up-to-standard with appropriate repairs or be replaced with new buildings. The State of California's legislature invested billions of dollars for new schools in 2002. School Bond legislation, de-

signed to match funds from local school bonds. The investment would be money that would be well spent. In addition to improving the learning environment, school districts could avoid millions of dollars in unnecessary energy costs. The State of California's school system is one of the largest in the country. One out of every eight students in kindergarten through 12<sup>th</sup> grade in America attends school in the State of California.

Every year more than 100,000 new students enter the California School System. Members of the legislature encourage all new schools to be even more efficient than the Energy Commission's energy efficiency building standards. California schools spend \$700 million or more a year - nearly three percent of their total budget on energy. That is about the same amount that schools spend on books and supplies each year! By employing energy efficiency practices and products in schools, the schools' energy bills could be cut by 20 percent to 40 percent, leaving money for other educational priorities (California Energy Commission 2013).

#### *Missouri*

In the State of Missouri, the State Energy Office for Missouri is the Division of Energy, in the Department of Natural Resources. From this department, technical and financial assistance for energy efficiency and renewable energy projects are encouraged by state and local government, school districts and other consumers. Missouri has a plan of support for energy conservation that advances the use of clean, domestic energy resources and technologies such as solar, biomass, alternative fuels wind to power building and vehicles. Missouri provides information to the public on research related to energy issues. A focus is on students and homeowners to participate in energy conservation practices. The Division of Energy for the State of Missouri collects and reports Missouri energy data, and conducts policy research and analysis and maintains a plan for energy emergencies.

During 2009 the State of Missouri did not have an official energy plan. However, governor Nixon during 2009, by Executive Order 09-18, required that state agencies whose buildings are managed by the Office of Administration, adopt policies to reduce energy consumption by 2 percent each year for 10 years (Office of Administration 2009).

*Nebraska*

There have been specific requirements made by Nebraska's School Board, by requiring all schools to make an intentional effort to improve energy efficiency by replacing old furnaces and replacing outdated control systems in its efforts to improve energy efficiency (Kimball, 2014.) The Public School System has retained the services of an energy engineering company and this company has outlined ways how schools can improve their energy use. The engineering company stated that school districts need to replace low efficiency T8 and T12 fluorescent bulbs with low-wattage LED lamps. Additionally, the engineering company stated that school districts should replace the school windows, some which are more than 50 years old and have poor thermal performance. Because of the recommendations set forth by the engineering company there have been four school districts as of 2009 Energy Star award winners. One school was so successful in decreasing its energy bill; it was recognized for saving over \$1 million since 2003. Schools in need of repair must follow the district plan to have a follow-up meeting to determine its upgrades and repair priorities for energy conservation (Western Nebraska Observer 2013).

*North Dakota*

In North Dakota, there are a number of energy conservation and renewal programs in the public and private sector. There are partnerships with local and state government plus industry, business and schools that are strongly interested in energy conservation. Many of the programs are supported by the United States State Energy program. Some of the programs include alternative fuel pilot to renewable energy projects. For the schools, energy conservation includes the installation of 10 kilowatt photovoltaic system on schools. Emphasis is also placed on solar energy advantage. It is all about preparing the next generation of energy industry employees for careers working with this renewable energy technology. In North Dakota there is an effort in many industries beyond schools and colleges to conserve energy. North Dakota is awarding 23 grants to state agencies, cities and to town to incorporate energy efficiency equipment into their facilities to reduce energy usage. The grant funding would yield a pay cheque of less than

ten years where there is evidence of energy saving within the energy participating agency. In order to make further awareness of the importance of energy conservation, North Dakota is offering various workshops to students' parents are farmers and ranchers how they can best conserve energy. Because of these efforts using renewable energy and bio fuel, students' parents who are farmers are producing more corn than ever because of cultivated acreage from 1.9 million in 2010 to 2.1 million in 2011 (National Energy Center 2012).

*Texas*

A total of eighteen energy efficient measures were considered in the State of Texas. These include measures for the building envelope, lighting, HVAC system, DHW system, and renewable energy systems. It was found in the State of Texas that renewable energy options such as solar PV and GSHP had the largest annual total energy savings for all industries. Lighting measures such as daylight dimming controls and decreased lighting power density also resulted in high energy savings (Texas Comptroller of Public Accounts 2006). Many counties in Texas varied based on the conditions of school buildings and the application of different savings for energy conservation. For example: Four base-case school models that are compliant with the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Standard 90.1-1989, 1999, 2004, and 2007 were developed for each climate zone in the State of Texas. In order to impact energy conservation, a total of eighteen energy efficient measures were considered using solar PV and GSHP which had the highest total energy savings. Some areas in Texas cited specific savings that took place based on solar PV ranged from 17.9 percent to 22.8 percent across the climate zones. Again, weather patterns did influence the outcome of savings per county location in the State of Texas (ASHRAE 2010).

The overall goal and objective of this study is to have students from each of the participating identified states to serve as key leaders in practicing energy conservation in their school building. Students will become acquainted with the role of government in energy conversation and various federally supported energy programs from the United States Department of Energy and the Office of Energy Efficiency and

Renewable Energy, the United States Department of Energy and the United State Department of Energy Wind programs as a resource that supports the school's curriculum.

### METHODOLOGY

During September 2015, school leaders were asked if their school had a focused and structured energy literacy program and were student leaders strongly participating in the program. The preliminary findings were that: 1). Each school leader acknowledged that their school had an energy literacy program and a number of students were motivated to participate in the program initiative. 2). student leaders (with the support of their teachers) continue to play a key role in reminding their peers and others about the importance of conserving energy in the school at all times. 3) Student leaders also work with the school engineer to see how their school uses energy and how to best conserve energy. This is a longitudinal study; therefore, it is ongoing. By using a longitudinal study prospective design for this research helps to capture how these secondary students are using energy wisely in the school environment (DeWaters and Powers 2011). The same N=25 students, per school, being interviewed with the support of school leaders and teachers help to show how they are using their skills and knowledge to conserve energy for this academic year. Data are being collected from these students as a representative panel 2-3 months during this year (fall 2015 and spring 2016). The panel survey continues to trace individual student participants in order to detect individual change on how they conserve energy. Students participating in this study are well-suited to the statistical analysis of both social change and dynamic behavior in their action toward energy conservation. Working with those same schools, a new group of students from grades nine thru twelve will be participants in a representative panel starting fall 2016.

A qualitative research design which employs a questionnaire and interview survey is being continued in use this academic year to assist the researcher in collecting data about the habits of students at the participating schools when it comes to conserving energy. Structured questionnaire with both close and open-ended questions are being administered to at least 25 or more students electronically, at each of the five

schools participating in this study would total at least 125 students for the year. A sample of the survey is attached. For privacy matters, the names of participating students nor schools are not given or identified in this study. Students are identified by a number, 1 thru 25 at each school. This sample size gave the researcher confidence to generalize research findings.

### Data Collection, Procedures and Data Analysis

More comprehensive data collection will occur at the end of each semester this academic year as participating students conclude their major studies in regular classes. Gathering of information electronically should take no more than one week per semester. With the Institutional Review Board (IRB) submission to the participating school districts/schools, letters of approval and support of parents and the school leaders, the identified 25 students, per high school, will return the electronic questionnaire as enclosed to the researcher expected within a week. As indicated, this will be an ongoing study and the researcher is only looking at the attributes of the participants at this time. Participating students could be asked to further describe what they do to conserve energy at home. Data collected that were limited to early interviews with school leaders and the results were positive based on the research questions.

Again, this is an ongoing longitudinal study. The survey questionnaire completed by student participants gave a broader view of the students' voices in this study. This study was subjected to open coding in order to capture the perception and thoughts of the participating students (Leedy and Ormond 2005).

### RESULTS AND DISCUSSION

This progressive longitudinal study was and is important because it is giving some measurement of students' awareness and engagement, knowledge gained, skills and attitude about energy literacy and the need to conserve energy where and whenever possible. This experience affords students as a group and individuals, the opportunity to participate in developing research projects to show how energy can be conserved and how to capture energy and use energy wisely. By being a participant in the energy literacy

curriculum, students can further gain basic scientific facts about energy, knowledge of issues related to energy resources, importance of energy uses for individuals and society as a whole, energy conservation trends in the United States and Global Communities. Using knowledge of the impact on energy development on society and the environment, policy decision-makers can show how building sustainable energy sources as being a priority. By practicing conserving energy in the school environment, more students may be the key leaders to encourage behavioral changes in their family members, school leaders, governmental agencies and larger communities to practice conserving energy (Zografakis et al. 2008).

This longitudinal study is being presented and discussed how students are key participants in their school on energy conservation. Emphases are being placed on data information per state participants, participants' views of energy conservation needs and practice of use. The targeted participants were high school students (N=25) from each school in each of the five participating states. The total number of all participating school student leaders were 125 students. School leaders and teachers are helping to facilitated this study and the five questions and expected results represent an ongoing activity for this study as indicated such as: 1) Will the five participating schools execute an effective energy initiative program? – give students the opportunity to participate in an energy conservation program that incorporates approaches that are hands-on, address real problems, and build confidence and hope, 2) Will student participants gain high level skills, knowledge and practice notable ways promoting energy conservation? - give students hands-on opportunities to learn about the benefits of smart energy, 3) Will student participants be able to link what they have learned to real-world application? - give students a reason why the material in class is being taught—the semester in class was not a waste of time after all, and the skills gained are relevant and could be applied in the real world environment. Based on telephone interviews and the honesty of the interviewees that are participating in this longitudinal study, it was concluded up-to-date that over 98 percent of school leaders expressed that their individual school had an effective energy program because students gained a great deal of

knowledge about energy and energy conservation through the school's curriculum as measured on formative and summative assessments. School leaders further expressed that they would like to see more students being actively involved in the actual practice of energy conservation. School leaders further stated that students are gaining more hands-on practices, a number of students' behavior show that they are more conscious now about energy conservation practices and students are gaining real-world experiences about the importance of conserving energy based on learner outcome assessments and evaluations.

The overall research questions had positive results per school. The preliminary findings further suggested that each school in the study has an energy initiative program, more students are gaining skills, knowledge and are practicing energy conservation based on the eight suggestions in this study, students are also encouraging their parents to be more energy conscious and students continue to link their learning experiences to real-world application. Evidence of student learning according to school leaders in this study is being demonstrated at the participating high schools, because students are able to overall communicate clearly, analyze, and interpret in simplified language, present using both text and graphic projects and being receptive to give feedback on the meaning and interpretation of energy literacy through conservation practices. Students mastery of leadership skills are being demonstrated because students as leaders, show being optimistic and willing to take action to ensure that their peers and school personnel are practicing energy conservation. When interviewing student leaders, they expressed qualitatively that they were participating in the energy literacy program in a practical manner, but some of their peers were not always consistent in practicing the eight common behaviors in conserving energy.

It is expected based on outcomes that school leaders and teachers in this progressive longitudinal study will continue to support the energy literacy curriculum and promote student leadership and engagement in energy-based learning projects. With further expected outcomes based on the research questions used in this study, there is being an execution of an effective energy initiative for all five schools. Students will continue to have the opportunity to gain knowl-

edge, skills and professional disposition about energy conversation that will help students to link what they are learning to real-world application (Bang et al. 2000). The energy initiative appears to be positive in each of the five schools because these schools are seeing less use of energy and are saving money. Therefore, the three research questions are being met. These continued efforts could serve as a model for other school districts to follow nationally and globally for their participation in the promotion of energy literacy for real-world application (Owen and Driffill 2008).

The preliminary findings suggested from the informal interviews with school leaders, teachers and students at random that participating schools are executing an effective energy initiative program. Second, student participants are gaining high level skills, knowledge and practice in notable ways by promoting energy conservation because students continue to remind their classmates and the teachers to turn-off lights, close doors and unplug electronic devices when not in use. Third, student participants were able to link what they have been learning to real situation, because students and their family members are practicing replacing all light bulbs with energy-efficient light bulbs, recycling more paper products at home and at school, reducing household waste, reducing power consumption at home, plan to keep thermostat at 18 C or less during the winter, buying local produce in season and spending less than five minutes in the shower which contributes to a change in behavior and how energy is used in their home (Cohen 2014).

Again, this longitudinal study is part of a more extensive study which will be examined by the end of the academic year during 2016. A brief overview of this study does capture current observations made by school leaders and teachers regarding student leaders willingness to serve as key leaders in the energy initiative program. School leaders and teachers were interviewed by phone and asked questions related to the identified research questions and their answers were yes overall to all questions. However, it is very early in this study because it is at the beginning of the school year; therefore, additional information in a more comprehensive manner will be given or available for review by the end of the academic year.

During September 2015, school leaders were asked during an interview session, if their school had a focused and structured energy literacy program and were student leaders strongly participating in the program. The preliminary findings were that: 1) Each of the five schools leaders acknowledged that their school had an energy literacy program and at least N=25 students, per five schools, totaling 125 students were motivated to participate in the program initiative. 2) Student leaders (with the support of their teachers) continue to play a key role in reminding their peers and others about the importance of conserving energy in the school at all times. 3) Student leaders also work with the school engineer to see how their school uses energy and how to best conserve energy. 4) Student leaders, per state are participants in group research projects with their peers at the end of the semester. The research study is descriptive and is valuable because it helps the readers to gain more knowledge about what happens in the participating schools that are promoting energy literacy.

The evaluation of the energy initiative is based on the overall outcome of the research questionnaire and survey results in this study (Osbaldiston and Schmitz 2011). This study is longitudinal, but it is significant, because it is hoped that students participating in an energy conservation initiative at school will extend beyond the school environment, but to the homes of students, teachers and staff. Hopefully, there would be more of an awareness in the future that student participants, as leaders, in the energy initiative program could influence their peers and family members about the importance of energy conservation at school, home and at work. School leaders could continue to influence the practice of energy conservation at their school by working closely with the school engineer, government agencies and energy companies in finding ways to conserve energy.

## CONCLUSION

This research is not concluded yet, because it is a longitudinal study at intervals of three years to actually see at a glance of the impact of broader savings in energy conservation in each of the participating schools in this study. Schools participating in the energy conservation program could contribute to the reduction of energy consumption by purchasing energy efficient appli-

ances, composting, recycling, limit water use and more around the school environment. A mind set of energy conservation sends a message to everyone of the importance of what to do to conserve energy.

However, this study to-date does reveal that the research questions helped to meet the purpose of this study based on the views of school leaders, teachers and input from student leaders. The revealing voices of student leaders gave a broader perspective of what the thoughts were of participants who are helping to lead the energy conservation initiative. However, the actual evaluation of data from meter reporting numerically using a quantitative approach for the study, by the school engineer and school leader, for three years comparatively will give a more accurate or comprehensive view based on the practices of energy conservation. All efforts by staff, students and teachers in each of the participating schools and the actual level of energy conservation obtained will have to be evaluated annually.

### RECOMMENDATIONS

This longitudinal study is worthwhile for this topic, because it helps to create a thinking culture of conserving energy in the school environment over a long period of time. It can further help staff members, teachers and students to see the effects of energy conservation in school buildings from an economical point of view in the form of reduced energy expenses or costs. These are the recommendations for this study to move forward by increasing the number of schools and participating student leaders per school, involving more teachers as advisors to students, expanding the invite to more parents and partnerships, having students to connect with more student leaders at other schools in the district/system and region and conduct group related research projects. This could be an opportunity, in the future, to have more student leaders to work collaboratively with their building engineers under the supervision of their teacher advisors to promote effective energy conservation through management planning practices. In order to continue to incorporate a broader study, there is a need to have a larger sample of participating schools and students to do a follow up each year by having a student led regional and national energy conservation con-

ference. The participating schools in the study could share the energy savings report with the public, per school, results with energy carriers, look at future trends on energy conservation as manufacturing companies produce more efficient goods, products and services. Finally, each school system across the nation could communicate an awareness and the need to include energy conservation practices in their own school's curriculum as emphasized in their school's strategic plan.

### NOTE

\*This paper was presented at The International Conference on Lifelong Learning and Leadership for All (ICLEL-15), in Olomouc on October 29-31, 2015.

### REFERENCES

- Alliance to Save Energy 215. Alliance to Save Energy | Programs | Green Schools About Green Schools.15 From <<http://ase.org/section/program.>> (Retrieved on 24 August 2009).
- American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. 2010.
- Bang HK, Ellinger AE, Hadjimarcou J, Traichai PA 2000. Consumer concern, knowledge, belief, and attitude toward renewable energy: An application of the reasoned action theory. *Psychology and Marketing*, 17: 449-468.
- California's Building Energy Efficiency Standards Energy Standards Documents, Los Angeles, U.S.A., California Energy Commission. November 25, 2013, (PDF file, 263, 1.9 mb).
- Center for Consumer Energy Center of California 2014. *Center for Sustainable Energy Annual Report Impact Statement*. California Energy Commission Office of the Governor. Oakland, California, United States of America. November 24, 2014. pp. 1-36
- Cohen L, Manion L, Morrison K 2011. *Research Methods in Education*. 7<sup>th</sup> Edition. New York: Routledge.
- DeWaters JE, Powers SE 2011. Energy literacy of secondary students in New York State (USA): A measure of knowledge, affect, and behavior. *Energy Policy*, 39: 1699-1710.
- Duvall J, Zint M 2007. A review of research on the effectiveness of environmental education in promoting intergenerational learning. *The Journal of Environmental Education*, 38(4): 14-24.
- Energy Star 2014. K-12 School Districts Partnering with ENERGY STAR is a Commitment to Your Students as well as to the Environment. From <[http://www.energystar.gov/index.cfm?c=k12\\_schools\\_bus\\_schoolsk12](http://www.energystar.gov/index.cfm?c=k12_schools_bus_schoolsk12)>. (Retrieved on 30 December 2014).
- Environmental Health Committee (EHC) Minutes*. January 2011. American Society of Heating, Refrigeration and Air Conditioning Engineers. Winter Meeting – Las Vegas, NV.. United States of America

- Gerritsen M 2012. The Critical Need for Energy Literacy in the US. *Stanford Report*, March 6, 2012.
- Hofman H 1980. Energy crisis - Schools to the rescue again. *School Science and Mathematics*, 80(24): 468-478.
- Kimball Newspaper on Energy, *Minn Post*. September 16, 2014. 091514mp.
- Leedy P, Ormrod J 2005. *Practical Research: Planning and Design*. Upper Saddle River, NJ: Pearson Education
- Lee H, Liu OL 2010. Assessing learning progression of energy concepts across Middle school grades: The knowledge integration perspective. *Science Education*, 94(4): 665- 688.
- Moore M, Turcotte A, Walp B, Winter J 2013. *Energy and Energy Literacy in Canada: A Survey of Business and Policy*. The School of Public Policy. Alberta, Canada.: University of Calgar.
- NEED Project 2009. National Energy Education Development Project. From <<http://www.need.org/>> (Retrieved on 24 August 2009).
- Osbaldiston R, Schmitz H 2011. Evaluation of an energy conservation program of 9<sup>th</sup> grade students. *International Journal of Environmental and Science Education*, 6(2): 161-172.
- Owen S, Driffill L 2008. How to change attitudes and behaviors in the context of energy. *Energy Policy*, 36: 4412-4418.
- Salmon J 2000 Are we building environmental literacy? *Journal of Environmental Education*, 31(4): 4-10.
- Schelly C, Price JM 2010. Environmental stewardship. In: Dustin Mulvaney (Ed.): *Green Energy: An A-to-Z Guide*. Thousand Oaks, CA: Sage Publications, Inc.
- Schoff L 2009. Energy management in K-12 schools. *School Planning and Management*, 24: 129.
- Solomon J 1992. *Getting to Know About Energy: In School and Society*. Washington, D.C.: United States of America Energy Literacy 20. State of Missouri, Office of Administration 2009.
- Texas Comptroller of Public Accounts 2006. *Current and Future Facilities Needs of Texas Public School Districts*. Austin, TX: Texas Comptroller of Public Accounts.
- The National Nebraska Observer – Energy* 2013. Nebraska Chamber of Commerce, January 3, 2013, 128(27): 3.
- The Role of Local Governments in Promoting Energy Efficiency 1981. *Annual Review of Energy*, 6: 309-337. (Volume Publication Date November 1981) DOI: 10.1146/annurev.eg.06.110181.001521
- United States Environmental Protection Agency 2005. Teaming Up to Save Energy: Protect Our Environment Through Energy Efficiency. WEEB - Our Mission. (2008). From <<http://www.uwsp.edu/cnr/weeb/about/mission.htm>> (Retrieved on 2 June 2011).
- United States Environmental Protection Agency. EPA's Report on the Environment (ROE) (2008 Final Report). U.S. Environmental Protection Agency, Washington, D.C., EPA/600/R-07/045F (NTIS PB2008-112484), 2008.
- United States Department of Energy. Office of Energy Efficiency and Renewable Energy. Washington, D. C., United States of America, 2013.
- United State Department of Energy.Wind For Schools Program – Details About How To Apply For This Grant Program. From<[http://www. windpowerinamerica. gov/schools\\_wfs\\_ project.asp](http://www.windpowerinamerica.gov/schools_wfs_project.asp)> (Retrieved on 1 January 2014).
- United States Global Change Research Program, 2012
- Volk TL, Cheak MJ 2003. The effects of an environmental education program on students, parents, and community. *Journal of Environmental Education*, 34: 12-25.
- Zografakis N, Menegaki AN, Tsagarakis KP 2008. Effective education for energy efficiency. *Energy Policy*, 36: 3226-3232.

**Fig. 1. Survey Questionnaire (electronic submission only)**

1. Which of these is a renewable source of energy?  
A. Coal, B. Geothermal, C. Oil, D. Natural Gas
2. How long do you shower during the am and pm?  
A. Less than 3 minutes, B. Less than 5 minutes  
C. Less than 10 minutes, D. More than 10 minutes
3. Do you have any of these energy efficiency measures installed in your home?  
A. Insulation – loft, cavity walls, floors, etc., B. Draught-proofing of the windows and doors, C. Use of low voltage lamps, D. Insulation of the hot water cylinder  
Other:.....
4. Do you turn off lights when you leave a room?  
A. Yes, B. No
5. Do you put on the washing machine when it's not full? A. Yes, B. No
6. Do you put on the dishwasher when it is not full?  
A. Yes, B. No
7. Do you fill the kettle with water when you only want one cup of tea? A. Yes, B. No
8. Can you name 2 ways you can save energy that would cost nothing?  
A. ....  
B. ....
9. Have you ever heard of the Kyoto Protocol? A. Yes B. No
10. What is your grade level?.....  
What is your gender?.....
11. What do you think would be a good incentive to people to be more active in saving energy?.....
12. Please make other comments that you think would be pertinent to this study.

Figure X. Some survey thoughts from the above questionnaire were taken from: An Taisce - The National Trust for Ireland. Permission was granted to use survey.