An Examination of Green School Practices in Atlanta Schools



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An Abstract

The primary goal of this study is to examine green environmental practices exercised in maintaining healthy schools in Atlanta. A forty item researcher developed instrument was used to survey 30 randomly sampled schools in Atlanta area. Five schools particularly strong in green environment implementation were visited to observe their green school operation. Results of the study indicated that Atlanta schools in general earned a "fair" grade in implementing green school programs with weaknesses in green school leadership. Analysis did not find any relationship between green school implementation and school building age, school ethnicity and socioeconomic status of school communities.

Key words: green school, school environment, resource conservation, school

facility planning, school renovation, school maintenance, school

sustainability.

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Introduction

More and more examples of green school grounds have shown their contributions to children's physical, mental, social and academic performance. Green schools' healthy environments have been known to create the climate for students to learn better and adults to work better. In the energy conservation point of view, schools and universities can benefit by taking the green school approach to construction, renovation and maintenance of facilities. A green school building is designed to strive for a toxics-free environment, to create a healthy space for teaching and learning and to make school environments healthier.

School administrators today are faced with the stringent demand for performance accountability by demonstrating efficiency and effectiveness. "The Green School" concept appears logically fit because it is clear that both K-12 and higher education are struggling to address the challenges of environmental accountability. The demands are increasing particularly at a time of financial crisis and resource shortages.

This study on green environmental practices is focused on examining how effective Atlanta schools have implemented the national environmental standards as part of the green school initiative. In addition to contributing to the knowledge of the field, the findings of this study will inspire school facility planners to invest their time and effort in further adopting green school practices in response to environmental accountability.

Conceptual Framework

"Green schools offer a comfortable, attractive, and user-friendly environment that demonstrates the great importance our society places on learning and encourages students to excel." (Christopher, 2009, p. 25) The green school features the following

characteristics: (1) A commitment by the institution to develop and implement school greenness through policy establishment; (2) The design of school facilities through application of architectural and engineering devices; (3) The operational practices of schools to achieve school greenness; and (4) The development of school curriculum to respond to the green school initiative. Green school is a resource-responsible learning experience for students. Through our commitment, design, practices and education, students will become resource-responsible citizens of the world.

The Green School Concepts (sustainability)

A green school building is defined as a structure that creates a healthy environment conducive to teaching and learning while sustainably conserving energy and resources (U.S. Green Building Council, 2000). As conceptualized by Green School Initiative (2013), the little green schoolhouse consists of four pillars: One – strive to be toxics-free; Two – use resources sustainably; Three – create a green healthy space; and Four – teach, learn and engage. The future of human beings depends on protecting the health of the next generation and the earth we live in. It makes sense that we educate our children with knowledge and skills to face environmental issues of the future (U.S. Green Building Council, 2006). Sustainability of green schools was also highlighted in another U.S. Green Building Council report of 2009 (USGBC 2009a). It clearly stated that this generation of students would be sustainability natives – as a generation experienced in more sustainable lifestyles capable of driving global market transformation.

Green School Leadership

School administrators need to serve as leaders in environmental sustainability to give students the tools to be innovators and a healthy environment to learn (Green School

Initiative, 2013). They have the responsibility to develop a series of policies and procedures and essentially changing the school culture to become greener and more sustainable (Sims, 2012). Schiller (2012) claimed that school leaders needed to treat their school buildings as "living buildings" to ensure sanitation and cleanliness per LEED standards. DeJong (2012) called upon educational leaders to follow the state of Maryland in making environmental education a requirement for graduation.

The LEED Standards

Design standards have been developed by different professional organizations to set criteria for compliance with the acceptable levels of environmental greenness. These include materials, device, policies, practices, and, in the school setting, the school curriculum. Examples of these standards are LEED - (Leadership in Energy and Environmental Design); CHPS - (Collaborative for High Performance Schools); ES -(Energy Star); and GECC - (Georgia Energy Code Compliance). Among the many standards to achieve building greenness, the one most popularly referred to is the LEED because of its comprehensive coverage of areas of environmental greenness. The LEED is a voluntary participation program developed by the US Green Building Council (2007) to promote transformational change across the building industry. Six areas of standardization are established in reviewing a building for LEED compliance. These areas include: Energy and Atmosphere; Sustainable Sites; Indoor Environmental Quality; Innovative Design; Materials and Resources; and Water Efficiency. Accounting for the total credits earned, buildings can be awarded the status of LEED Certified, LEED Silver, LEED Gold, or LEED Platinum. Many school buildings, particularly those in higher

education, are moving toward LEED to provide a better control for campus costs and to promote healthy environment for learning.

The Green Environment

The green environment of a school cuts costs on its utility bills and fosters healthy and productive classrooms by minimizing risks of environmental pollution concerns. "A green school is the physical result of a consensus process of planning, design, and construction that takes into account a building's performance over its entire 50- to 60-year life cycle" (Gordon, 2010, p.1). It seeks to minimize the building's impact on the environment through concerted efforts to conserve water and energy, maximize natural light, and integrate its design with the surrounding landscape (Allen, 2007). To achieve green school environment design, Kopec (2009) agreed that proper layout was important for achieving a safe, healthy and enjoyable educational environment. Moreover, he underlined the importance of such environment factors such as proper ventilation, daylight and views, access to fresh air, minimal level of indoor pollutants, thermal comfort, green materials, and cleanliness.

Environmental Impact on Student Activities

Although research is limited, findings seem to indicate a positive relationship between building design variables and student performance (Edwards, 2006; Tanner, 2008). Among all the factors, the presence of daylight has affected the productivity and performance of building occupants (Heschong Mahone Group, 1999). Hoffman's study (2009) also reported that improved lighting and indoor air quality were related to increased progression of student reading and math achievement. Recent findings of a McGraw-Hill report (2012) indicated that improved student performance, enhancing

health and well-being, and decreasing student/faculty absenteeism were the factors involved in decision making by school districts to go "green". Additionally, Matich's study (2012) suggested that as schools implemented Green Print core practices at higher levels, student achievement in science tended to show improvement.

Green School as a Teaching Tool

A green school is not only the pride of the school district and community. It also serves its educational function. "The combination of green school design, a green organizational culture, and curriculum aligned with green practices and methodologies sets the stage for school to utilize their facilities and grounds as a teaching tool" (Barr, 2011, p. 29-30). Through the green curriculum in school, students have studied and understand the value of solar panels, wind turbines and alternative fuels. They have strong value about conservation and sustainability (DeJong, 2012). Many educational programs have proved that if students and staff went through green school training, the change of behavior indicated that they could be assigned with energy conservation responsibilities at school (Kopochinski, 2012b; Sims, 2012).

Water Conservation

Water conservation is an important aspect of the LEED standards (USGBC, 2009a). The use of automatic water control systems, and water-conserving plumbing fixtures could tremendously save water consumption in schools. High efficiency irrigation technologies together with the use of pavers and cisterns take full advantage of rainwater as alternative water sources (Vatralova, 2010). Water-wise landscaping and bio-swale located under the courtyard help reduce water use and improve water quality (Kopochinski, 2012b).

Energy Conservation

Essential components of energy conservation in the LEED standards consist of enhancing commissioning and management of energy, optimizing energy efficiency performance, measuring performance, and creating on-site renewable energy sources. (USGBC, 2009a). School designers need to consider the school building and its site in terms of energy efficiency, resource conservation and user comfort. Other strategies could include solar heating, use of natural light, high-performance windows and insulations and a ground-source geo-exchange system of heating and cooling (Kopochinski, 2012b). A school construction with zero net energy is gaining popularity. With zero net energy consumption and zero carbon emissions, buildings can be energy independent by using solar and wind devices on site to generate energy for school consumption (Kopochinski, 2012a).

Costs and Benefits of Green School

Gordon (2010) described the main benefits to building green facilities as: enhanced learning, costing savings, healthier environments, better operational performance, and increased teaching tools. Ford (2007) emphasized the benefits of green schools---children are healthier and more productive, buildings have superior indoor air quality and thermal comfort. Other studies have found that while they cost more to build initially, schools saved more over the life of the building than traditional schools. Kats (2006) verified that it cost 2% more to build a green school while the school operation efficiency was 25-30% more. The US Green School Council (2009b) reported that green schools on average used 33% less energy and 32% less water than conventionally constructed schools.

Purpose of the Study

Although professional organizations have called for increased environmental concern in educational institutions, little literature has been devoted to the accountability

issues in educational settings. Additionally, there is little consistency in developing and implementing policies for promoting green school environments.

A healthy school environment results in healthy staff and students who will perform to the best of their potential. Educational leaders have the responsibility to create and maintain environmentally healthy buildings and grounds as infrastructures to support the education process. Therefore, the primary goal of this study is to examine green environmental practices exercised in maintaining healthy schools in Atlanta.

Significance

Green school buildings are intended to promote good environmental practices such as resource conservation and maintenance cost savings resulting in staff health, morale, and productivity improvement. It also sends a positive message to the public that educators are leading the way for a sustainable future by setting solid examples for the youngsters. The findings of this study will serve as evidence of Atlanta educational leaders in the forefront of supporting green environmental initiatives with invaluable educational significance. It is anticipated that the findings of this study will stimulate enthusiastic launch of effort toward making our educational environment "green". School administrators will take a more proactive approach in dealing with environmental accountability.

Research Questions

The following research questions are developed to serve as a framework to guide the direction of the study:

 How are green environment practices implemented by public schools in Atlanta area?

- 2. Is there any relationship between school building age and the implementation of green environment practices?
- 3. Is there any relationship between student ethnicity and the implementation of green environment practices?
- 4. Is there any relationship between student socioeconomic status and the implementation of green environment practices?

Definitions of Terms

Special terms used in this study are operationally defined in the following:

Green Environment Practices – Professionally acceptable practices that improve the green environment of schools. They are identified by administrators of participating schools in this study.

School Building Age – The year of original construction of the school building.

Student Ethnicity – The percentage of Caucasian students enrolled in school.

- **Student Socioeconomic Status** The percentage of students receiving free or reduced-price lunch in school.
- **LEED -** (Leadership in Energy and Environmental Design) is a voluntary, consensus-based, market-driven program that provides third-party verification of green buildings.
- **CHPS** (Collaborative for High Performance Schools) is a green building rating program providing information and resources to facilitate the construction and operation of energy and resource efficient as well as healthy and comfortable school buildings.
- **ES** (Energy Star) is an international standard for energy efficient consumer products originally created by the Environmental Protection Agency and the Department of Energy of the United States.

GECC - (Georgia Energy Code Compliance) has become effective as a building energy conservation standard effective January 2011 covering all commercial and residential construction in Georgia.

Methodology

Research Design

This study took the format of a mixed methodology approach. A quantitative survey was conducted to inventory what green environment practices were implemented in Atlanta schools. Qualitative approach was adopted in the format of case studies. Schools identified as green schools by school district administrators were visited to review the green environment practices in these schools. The unit of study is school.

Participants

Thirty out of 42 randomly sampled Atlanta Metro schools from Cobb County, Gwinnett County, Fulton County, Cherokee County, DeKalb County, Paulding County, and Atlanta City participated in the study. Five schools were identified by purposive sampling method as examples of green environmental initiatives for visitation.

Research Instrument

The research instrument used in this study is the Green School Feature Checklist developed by the researcher. It includes a section soliciting the demographic information of the school, 39 inventory questions and 1 open-ended question. The 39 inventory questions are organized under six scales, namely Green School Leadership, Student Involvement in Green School, Water Conservation, Energy Conservation, Green Environment, and Waste Management. (See Appendix 1.)

The development of the instrument involved extensive review of current related green school literature. The major concepts of essential literature were emerged into the

contents of the instrument. A cross checking of survey scales and the sources of references are listed below for readers' interest.

Green School Survey Development Based on Current Literature

Survey Area	Sources of References
Green School	Chance (2011), Dejong (2012), Fox, 2007, Orr (2007),
Leadership	Schiller (2012), and Sims (2012)
Student Involvement	Allen (2007), Dejong (2012), Kopochinski (2012b), and Sims (2012)
Water Conservation	Gordon (2010), Hoffman (2009), Kopochinski (2012b), and Schiller (2012)
Energy Conservation	Gordon (2010), Hoffman (2009), Kopochinski (2012a), Kopochinski (2012b), Schiller (2012), Sims (2012),
Green School	Allen (2007), Gordon (2010), Hoffman (2009), Schiller
Environment	(2012), and Sims (2012)
Waste Management	Allen (2007), Hoffman (2009), and Kopochinski (2012b)

To establish the validity of the instrument, a panel of school facility experts was invited to examine the contents, the language and the format of the instrument. The panel, consisting of Dr. Glen Earthman (Virginia Polytechnic Institute and State University), Dr. Kenneth Tanner (University of Georgia), Dr. Kenneth Ducote (Consulting and Planning Research Associates), and Dr. Edward Duncanson (Western Connecticut State University), provided professional feedback in substantiating the contents of the original draft of survey. The language of the survey was revised to ensure clarity and expressiveness. The use of scale and sectional division were closely examined in terms of accuracy. The survey instrument was substantially revised per advice of the panel of experts to achieve content validity and face validity.

The revised survey instrument was pilot tested with responses from administrators of 20 schools. The internal consistency of the instrument was examined by testing the pilot data with the split-half method of analysis. SPSS program was used to analyze the data resulting in an acceptable r value of 0.82.

Data Collection and Analysis

Quantitative data of this study were collected through survey instrument sent to randomly selected schools in Metro Atlanta school districts. Qualitative data were collected through an open-ended question with the survey and also through visitation to the green schools identified by the school systems. Green school design features were verified on site by the school administrators.

Quantitative data were analyzed by descriptive statistics of means and percentages of responses. The relationships of school demographics and green environment practices were analyzed by using Pearson Correlations. Future green school activities identified in the open-ended question were synthesized for readers' references. Data collected during site visits were examined by category of common green school practices.

Findings

A total of 42 schools, 6 from each of the 6 school districts, were invited to participate in the survey. Thirty schools completed and returned the survey with 71.4% return rate. In examining the demographic information of the 30 participating schools, 12 (40%) were high schools, 9 (30%) were middle schools and 9 (30%) were elementary schools. The oldest school building was constructed in 1934 and the newest was completed in 2012. Two school buildings were 1 year old, 6 were 2 - 10 years old, 10 were 11 - 20 years old, 5 were 21 - 30 years old, 4 were 31 – 40 years old, 2 were 41-50

years old and 1 was over 50 years old. The ethnic composition of the schools ranged from 0% Caucasian to 85% Caucasian with an average of 33.5% Caucasian. The percentage of students receiving free or reduced-price lunches averaged to be 54.24 with a high of 97% and a low of 0%. The percentages of schools receiving LEED Certification, CHPS Certification, ES Certification, and GECC Certification were 3.3%, 0%, 3.3% and 16.7% respectively.

The extent of implementation of green school environment practices was examined by analyzing the data using descriptive statistics of means and percentages. With a coding value from 0 (no) to 1 (yes), the mean of Total Green School Practices was .587, the mean of Green School Leadership was .209, the mean of Student Involvement in Green Project was .687, the mean of Water Conservation was .635, the mean of Energy Conservation was .550, the mean of Waste Management was .616 and the mean of the Green Environment was .679. (See Table 1)

The most common use of green school practices were found to be:

Item (14) Are timely repairs made to water leaks in your school? (96.2 % Yes)

Item (15) Have school water pipes been protected from bursting in freezes? (100% Yes)

Item (29) Does your school have adequate air ventilation? (95.7 % Yes)

Item (30) Does your school implement a regular pest control program? (92% Yes)

Item (36) Is there a regular schedule for dumpster service at school? (100% Yes)

Item (38) Are old computers, printers, cartridges recycled? (100% Yes)

(See Table 2)

The research participants identified four green school practices least commonly used (less than 20%) by schools at this time:

Item (2) Has your school adopted a green school policy? (19.2 % Yes)

Item (4) Has an action plan for green school been developed? (12.5 % Yes)

Item (16) Have solar panels been installed in your school? (8 % Yes)

Item (31) Is recycled lunch cutlery used in your school? (13 % Yes)

(See Table 2)

Pearson Correlation method was used to analyze the relationship between school building age and the implementation of green school practices. No significant relationship was found. (See Table 3)

Pearson Correlation method was used to analyze the relationship between the percentage of school Caucasian students and the implementation of green school practices. No significant relationship was found. (See Table 3)

Pearson Correlation method was used to analyze the relationship between percentage of students receiving free or reduced-price lunch and the implementation of green school practices. No significant relationship was found. (See Table 3)

When research participants were asked what other green school projects, activities or practices they would suggest in their schools, 16 participants responded with the following suggestions in their schools:

- Many schools that have not had a recycling program yet would like to plan to start
 one in their schools. The program could include bins to separate recycling
 materials and meal plates recycling.
- A couple of schools plan to move from submitting student assignments via paper and pencil to electronic mail or websites.

- 3. The green school initiative can be promoted by teaching a series of environmental lessons.
- 4. Student life science studies could include green projects such as planting trees, creating green spaces, and protecting the marsh ecosystems.
- An idle free zone could help reduce the fumes produced by buses and cars left running.
- More energy conscientious materials and products can be brought in as replacements as needed.
- 7. Auto flushing toilets could be installed to replace the old and inefficient fixtures.
- Better control of heating and air-conditioning could conserve a huge amount of energy otherwise would have been wasted.

Case Studies

More and more schools in Georgia are beginning to adopt the green school concept to develop their schools to become green. While newly planned schools have the opportunity to use many materials and designs to achieve the green environmental effect, existing schools can also implement green school practices by implementing green school policies and practices for sustainability. New devices for resource conservation have been replacing obsolete features in school repair work. In this research project, five schools in Atlanta area were recommended by local educators as examples of green school elaboration. The researcher visited all five schools and report their green school features as follows:

Green School One

Green School One is a new school located north of Atlanta area in a highly developed neighborhood. Seating on an 18 acre lot, this elementary school was well designed to fit itself into the architecture of the community as well as the natural environment. The location of the school building takes advantage of a natural creek and its surrounding woods to create a natural environment of greenness. The following green school design features were noted:

First, the design of the campus leaves a huge piece of green area for student outdoor activities. A nicely wooded area with a natural trail and a gazebo has been preserved for scenic pleasure. A flat piece of land by the creek has been reserved for development of student gardens and agricultural projects.

Second, the staff and visitor parking areas are installed with water retaining pavers to regulate the surface water flow.

Third, all windows in the school building are installed with thermal-paint tinted glass to help block off radiation created by outside temperature. The design of the heating and air-conditioning system provides the classrooms with adequate air flow to balance the effect of the glass insulation.

Fourth, many interior rooms of the building are installed with solar light fixtures that connect to the solar panel design on rooftop. All solar light fixtures are buffer-controlled to adjust to the amount of light needed.

Fifth, high efficiency fluorescent light fixtures are also installed in every space of the school building with a motion sensor to allow automatic on and off functions. Sixth, the attic space is used for placement of heating and air-conditioning units and is fully insulated at the roof deck structure system and above the ceiling tiles for energy conservation.

Seventh, the heating and air-conditioning system is designed with control units centrally located for easily room by room monitor.

Eighth, the walk-in cooler and freezer in the cafeteria are installed with a temperature alert system for regulating them to the desired temperature range without wasting energy.

Ninth, GPS clocks are installed in every classroom and in all hallways for time consistency and energy conservation.

Tenth, energy efficient blinds are installed at all the windows for easy operation to adjust for lighting and heating. Windows located high on the cafeteria walls are electrically operated for efficiency.

Eleventh, all the hand wash sinks in the building are installed with automatic device for water on and off by motion sensor control.

Twelfth, the school will start housing students in Fall Semester 2013. The school principal plans to have a school sustainability program fully developed for implementation.

Green School Two

Green School Two is a three year old middle school located 25 miles north of Atlanta downtown. The school, right in the middle of a heavily populated suburban area, is beautifully landscaped to reflect the natural green environment. Special green school features are highlighted in the following:

First, the school building is a traditional construction with brick and block walls and a metal panel roof. The colors of brick, roof and exterior trimming materials are specially selected to be light to reflect the heat radiation which could otherwise affect the inside temperature of the school.

Second, the heating and air-conditioning system of the school is a four-pipe system to achieve the greatest energy conservation efficiency.

Third, all the windows are installed with light reflective glass panels to block off over heat radiation from outside the school building.

Fourth, in the restrooms, all the urinals adopt a waterless design in saving school water consumption. All the hand wash sinks have an automatic on and off design with motion sensor control. The hand drying devices have moved from paper towel to air blowers.

Fifth, the range of room temperature setting is connected to the mainframe of the district office school maintenance office. This would save huge amount on waste energy set beyond the acceptable range.

Sixth, the kitchen of the school is air-conditioned to maintain a degree of comfort acceptable by kitchen workers. At the same time, the make-up air of the exhaust hood is set at a rate to compensate for the air loss without draining hard on the air-conditioning system.

Seventh, motion detection device is installed in all the rooms to control the setting on and off of the light fixtures.

Eighth, the school works with the district office green school initiative by launching the recycling program for waste materials.

Ninth, the school curriculum includes the teaching of environmental issues at all grade levels and green school science projects are not uncommon.

Green School Three

Green School Three is an elementary school completed three years ago when its school system began trying out some of the green school ideas. It is located at northwest of Atlanta just outside the city limit in a minority concentrated community. The school has a long history but was completely rebuilt after flood damage. The following green school features are noted at the school:

First, the school is set way off the busy traffic sections of the community. Its tranquil environment merges with the green nature of the natural setting.

Second, ground pavers are installed in front of the school parking areas. They enhance the outlook of the school building and serve as an excellent design to retain running surface water.

Third, an underground cistern is installed by the side of the school building with catch basin to collect rain water for irrigation.

Fourth, a flower and vegetable garden is developed to teach life science and to serve as experimental ground for student green school projects. Water from the cistern is pumped to spray on the plants in the garden.

Fifth, heating and air-conditioning of the school building is controlled at an acceptable range by the district office design system to achieve better energy conservation.

Sixth, school recycling program includes paper, plastic products, glass bottles, used batteries and cartridges.

Seventh, daily garbage of the school is handled by a waste material compacter located at the back of the school building. This will improve sanitation of the school and help reduce the number of pick-up times.

Eighth, environmental education has been an essential part of the school curriculum teaching children the love of nature and its resources.

Ninth, the natural green setting is created inside the school building by having a nice fish pond installed around a commons area and by placing beautiful plants at appropriate places along the hallways.

Green School Four

Green School Four is a middle school at northwest Atlanta area next to the Chattahoochee River. It has a large campus making the experimentation of green school projects possible. Natural beauty and careful design of campus make this just a peaceful green environment for teaching and learning. Some of the special green school features observed on campus include:

First, rainwater from the roof is collected in a cistern for irrigation use. The irrigation system is installed with a moisture sensor which shuts off the system when it is not needed.

Second, installation of dual-flush toilets, waterless urinals, and low-flow faucets at restrooms save a large amount of water.

Third, solar panels at roof top help heat up water for daily usage.

Fourth, motion sensors and the use of natural light have tremendously help energy consumption in the school building.

Fifth, the entire school building is well insulated with high performance walls and roofing system to achieve high energy efficiency.

Sixth, the use of recycled materials for school construction gives the school extra credit for being green.

Seventh, the organic garden serves as a working lab for agricultural students and provides vegetables for the school cafeteria.

Eighth, electronic use for document processing has saved thousands of trees cut nationwide.

Ninth, a wind mill is installed on campus to generate 200-400 kilowatt hours of electricity per month for school use.

Tenth, carbon dioxide sensors are installed in densely occupied spaces to allow the ventilation system to activate to neutralize the carbon dioxide density in the air.

Green School Five

Green School Five is a middle school south of Atlanta area. Many green school features are incorporated in the design of the school building addition 4 years ago. Some of the green school designs are observed at the school as follows:

First, an underground water retention area is developed to serve as a cistern to store rainwater for irrigation.

Second, the roof of the building is colored white to produce high reflectivity and emissivity resulting in a cooler roof even in hot summer.

Third, water saving is achieved by using water faucet aerators, low flow urinals, low flow shower heads and toilets.

Fourth, "solarban" selective coatings are used on the window glass to maximize the amount of visible spectrum into the building while reflecting the outdoor heat radiation.

Fifth, highly efficient lighting is installed to allow control of multiple levels of lighting as needed.

Sixth, natural lighting is engineered into the building using "solartube" skylights tremendously reducing the electricity consumption.

Seventh, high insulation level of exterior walls and metal studs with lapped and seamed building materials serve a good energy conservation purpose.

Eighth, carbon dioxide sensors are installed in densely occupied areas to monitor the flow of fresh air.

Ninth, recycling bins are placed in multiple areas of the school building to promote recycling practices.

Tenth, the classrooms are designed with high acoustical value insolating materials to provide a tranquil learning environment.

Discussion

The findings of this study have been both informative and exciting. Many areas of the findings deserve further discussion for meaningful learning experiences. The topics for discussion are divided into four components: policy and leadership, building design, operational practices and education program.

Policy and Leadership

From the findings of the quantitative analysis, the leadership component of the green school survey was found to be particularly low. The indication is clear that green

school initiative is lack of leadership at school. Many site administrators are unclear about the roles they are supposed to play in the green school program. They probably learn about green school activities from other progressive schools without understanding the full picture of what they could possibly involve. Rather than passively reacting to the calls for environmental concerns, administrators must understand the requirements of green school initiative and make major contributions.

Building Design

Schools participating in this study have identified common building design features that can be easily installed to start the green school program. Water conservation can be achieved by using dual-flush toilets, waterless urinals, water faucet aerators, and low flow shower heads. Energy conservation can be performed by using motion sensors for lights, multiple lighting controls, maximizing the use of natural light, "solartube" lighting device, highly efficient heating and air-conditioning system and high level insulation on the building shell. Some of the more innovative green designs are still under testing for cost efficiency such as the installation of cisterns, solar panels and wind mills. In the planning and management of school facilities, administrators are moving cautiously not to over react and end up making major mistakes. Green school designs with minimal additional costs can be approved easily particularly items that have proved to work in other school districts. Most school facility planners are operating under a limited budget and are unwilling to invest huge amount of dollars to innovative green designs that may prove to be inefficient.

Operational Practices

Many green school activities are simply a set of daily school operational practices. They need an administrative commitment for implementation. Starting a school recycling program, keeping a clean school, testing to ensure a hazard free environment, and centrally monitoring school temperature range are typical examples of operating a school to meet the green school goal. Most of these practices do not incur additional costs. It is simply a matter of understanding what they will do, what they can do, how they can be done and what to check to ensure they are done.

Education Program

One of the key components of the green school program is to get the students involved by offering an environmental program in the school curriculum. Students can be directed into developing their love for earth and nature. Environmental projects such as planting trees, starting a vegetable garden, raising a small animal farm or constructing a nature trail are meaningful activities to get them started. It is important to educate children at an early age to understand that green school program is not for saving money but for saving natural resources.

Implications

The findings of this study have called the attention of educators to the significance of supporting green initiatives in their schools. They need to understand that green school program carries a most important mission to educate the next generation of youngsters to build a better world for the future by protecting its environment.

School superintendents and school business managers of local school districts who make decisions concerning school construction, maintenance and operations need to understand basic knowledge and skills for creating and sustaining environmentally safe

schools. Professional workshops are needed to provide them current information about the best available sources for green school products.

The findings of this study do not indicate any significant relationship between school building age and the implementation of green school practices. However, the initial finding is based on a small sample size. Further studies to involve a larger and more representative sample size may yield a different result. As a matter of fact, school administrators may find it easier to incorporate green school design in planning new facilities than in modifying older ones. But, in recent years, the use of "green" technique in school renovation work is becoming more frequent.

Sometimes, it is safe to take a conservative approach not to start any new and uncertain green school projects advertised to be sustainable. However, nothing ventures, nothing gains. Administrators are encouraged to explore new grounds by trying out some innovative green school activities as long as they do not result in becoming a school district liability. Experience tells us that many unsuccessful attempts are actually paving the way closer to success.

For recommendation for future studies, attention of researchers is drawn to the outcome of green school programs. This study has explored and disclosed the current implementation of green school practices in Atlanta area. Future research effort needs to concentrate on collecting data as evidence to substantiate the extent of effectiveness of such green school initiatives.

Conclusion

The result of data analysis has satisfied the purpose of this study by indicating that the implementation of green school programs in Atlanta schools has earned an average grade. Nothing in the implementation process is particularly surprising. In fact, the leadership role in green school implementation is disappointingly low. Recognizing the importance of green school program to the future generation, school leaders need to commit themselves to establishing green school development policies, adopting

sustainable school designs, initiating substantial green school operating practices, and developing educational programs to promote green school concepts. School leaders have major responsibility in turning our schools green.

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Appendixes

Table 1 Descriptive Statistics – Means by subscale of Green School Practices

	N	Minimum	Maximum	Mean	SD
Leadership	30	.000	.800	.209	.266
Student Involvement	30	.000	1.000	.687	.294
Water Conservation	30	.200	1.000	.635	.215
Energy Conservation	30	.170	.830	.550	.249
Waste Management	30	.440	.890	.616	.168
Green Environment	30	.330	.890	.679	.225
Total Green School Practices	30	.340	.760	.587	.188

Table 2 Descriptive Statistics – Percentages of Positive Responses by Research Item

Green	School	Leadership	"Yes	%"
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- 24.0 (1) Does your School Improvement Plan include energy conservation and environmental protection?
- 19.2 (2) Has your school adopted a green school policy?
- 26.9 (3) Does your school have a green school committee?
- 12.5 (4) Has an action plan for green school been developed?
- 29.2 (5) Has the school involved the community representatives in energy conservation and environmental protection activities?

Student Involvement in Green School "Yes %"

- 84.6 (6) Does your school teach environmental education?
- 80.8 (7) Does your school ask students to participate in recycling activities?
- 58.3 (8) Are green school projects assigned to students in class?
- 73.1 (9) Does your school have an outdoor garden or a designated green area for instructional use?
- 52.0 (10) Do your students practice energy conservation in school?

Water Conservation "Yes %"

- 30.4 (11) Does your school have programmed timed irrigation for the lawn?
- 50.0 (12) Has your school installed automatic water faucets?
- 23.1 (13) Are your school toilets and urinals installed with automatic flushing?
- 96.2 (14) Are timely repairs made to water leaks in your school?
- 100 (15) Have the school water pipes been protected from bursting in freezes? Energy Conservation "Yes %"
 - 8.00 (16) Have solar panels been installed in your school?
 - 57.7 (17) Do your classrooms have natural lighting?
 - 70.8 (18) Does your school schedule regular light fixture cleaning?
 - 42.9 (19) Does your school have an energy conservation audit?
 - 68.2 (20) Does your school use energy saving equipment?
- 83.3 (21) Does your school use an energy management system for its HVAC?

Green Environment "Yes %"

- 88.5 (22) Is smoking prohibited throughout the school building?
- 70.0 (23) Does your school have annual air quality testing?
- 55.6 (24) Does your school have annual water quality testing?
- 58.3 (25) Does your school have annual radon testing?
- 76.9 (26) Has the soil around your school been tested for lead?
- 30.4 (27) Is mold a problem in your school?
- 72.7 (28) Is your school asbestos free?
- 95.7 (29) Does your school have adequate air ventilation?
- 92.0 (30) Does your school implement a regular pest control program?

Waste Management "Yes %"

- 13.0 (31) Is recycled lunch cutlery used in your school?
- 60.0 (32) Is recycled paper used in your school?
- 73.1 (33) Has your school adopted electronic paperless practices?
- 65.4 (34) Does your school have recycling bins to categorize wastes?
- 66.7 (35) Is there a regular schedule for grease tank cleaning at school?
- 100 (36) Is there a regular schedule for dumpster service at school?
- 50.0 (37) Does your school use hand dryers instead of paper towels?
- 100 (38) Are old computers, printers, cartridges recycled?
- 30.0 (39) Does your school have a litter abatement program?

Table 3 Pearson's Correlation – Relationship between green school practice implementation and school building age, percentage of Caucasian and percentage of students receiving free or reduced-price lunch.

		Implementation of Green School Practices
School Building Age (School Completion Year)	Pearson Correlation	.833
	Significance (2-tailed)	.080
Student Ethnicity (% of Caucasian students)	Pearson Correction	.410
	Significance (2-tailed)	.493
Student Socioeconomic Status (% of students receiving free Or reduced-price lunch)	Pearson Correction	672
	Significance (2-tailed)	.214

Green School Feature Checklist

This Green School Feature Checklist is designed to inventory some of the basic practices schools are pursuing to achieve energy conservation and environmental protection. Your assistance in reporting the current school status is appreciated.

School Demographic Info	rmation:			
School Level: High	Middle	Element	ary	
Year the school was first co	onstructed:			
School ethnic composition	Hispanic: Other:	% %	Asian American:Native American:	% %
Percentage of students rece	eiving free and r	educed p	orice lunch at school:	
Has the school earned any (Please check all that apply		onmental	certificate?	
LEED Certifi	cate (Leadershi	p in Ene	rgy and Environmental I	Design)
CHPS Certifi	cate (Collabora	tive for H	High Performance Schoo	ls)
ES Certificat	e (Energy Star)			
GECC Certif	icate (Georgia E	Energy C	ode Compliance)	
Other Certific	cates			
Please answer the followin Green School Leadership		checking	either "Yes", "No" or "D	on't Know".
Don't	•			
Yes No Know	C -11 I		Dian in also de consensos	
1. Does y	-			onservation
	vironmental pro			
·	1	Ü	en school policy?	
3. Does y	your school have	e a green	school committee?	
4. Has ar	action plan for	green so	chool been developed?	
5. Has th	e school involve	ed the co	mmunity representatives	s in energy
conserv	vation and envir	onmenta	l protection activities?	

Vec	No	Don't Know
		6. Does your school teach environmental education?
		7. Does your school ask students to participate in recycling activities?
		8. Are green school projects assigned to students in class?
		9. Does your school have an outdoor garden or a designated green area
		for instructional use?
		10. Do your students practice energy conservation in school?
Wat	er C	onservation
Yes	No	Don't Know
		11. Does your school have programmed timed irrigation for the lawn?
		12. Has your school installed automatic water faucets?
		13. Are your school toilets and urinals installed with automatic
		flushing?
		14. Are timely repairs made to water leaks in your school?
		15. Have the school water pipes been protected from bursting in
		freezes?
Ene	rgy (<u>Conservation</u>
Yes	No	Don't Know
		16. Have solar panels been installed in your school?
		17. Do your classrooms have natural lighting?
		18. Does your school schedule regular light fixture cleaning?
		19. Does your school have an energy conservation audit?
		20. Does your school use energy saving equipment?
		21. Does your school use an energy management system for its HVAC

Green Environment

Yes	No	Don't Know	
			22. Is smoking prohibited throughout the school building?
			23. Does your school have annual air quality testing?
			24. Does your school have annual water quality testing?
			25. Does your school have annual radon testing?
			26. Has the soil around your school been tested for lead?
			27. Is mold a problem in your school?
			28. Is your school asbestos free?
			29. Does your school have adequate air ventilation?
			30. Does your school implement a regular pest control program?
		anager Don't Know	
			31. Is recycled lunch cutlery used in your school?
			32. Is recycled paper used in your school?
			33. Has your school adopted electronic paperless practices?
			34. Does your school have recycling bins to categorize wastes?
			35. Is there a regular schedule for grease tank cleaning at school?
			36. Is there a regular schedule for dumpster service at school?
			37. Does your school use hand dryers instead of paper towels?
			38. Are old computers, printers, cartridges recycled?
			39. Does your school have a litter abatement program?
	Vhat	ded Qu other g	reen school projects/activities/practices would you suggest in your

END OF SURVEY

Outdoor Green Environment



A green activity lawn opens to nature.



School building matches with natural environment.

Outdoor Green Environment



A nature trail adds to the green environment.



A pond with water fountain brings life to campus.

Indoor Green Environment



Bringing our community indoor.



A fish pond at the school lobby

Green Gardens



A plant garden on roof top



Vegetables from the garden serve student lunch.



Students nurture little plants from seeds.

Energy Conservation



Insulation of both roof deck and ceiling



Installation of high-performance HVAC system

Solar Energy



Rooftop solar energy tubes



Solar light fixtures brightening up the classroom

Energy Conservation



Reflective windown glass blocks off outdoor heat radiation.



Planting screens help cool down the temperature of the school building.

Restroom water conservation



Use of waterless urinals



Use of motion sensors at water faucets and hand dryers

Collection of rainwater



Collecting rooftop rainwater from gutters and downspouts



Pavers retain surface water for ground absorption



Diagram of an underground cistern

Other green school design features



Sanitary use of garbage compacter saves the number of pick-up times.



The use of wind mill for generating electricity



High windows with mechanical blind bring in natural light.

Recycled materials



Restroom partitions can be made of recycled materials.



Floor tiles can be made of recycled materials



Counter tops can be made of recycled materials