Ecology & Sustainability
for Champaign Unit #4 Great Campus School

December 11, 2006

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Narrative: A day in the life of a student at The Great Campus

Tahleh quickly walks the few blocks to school in the fall morning light. Water-conserving prairie grasses surround the school, which is within walking distance of his house. That makes it easier for him to be there early to attend meetings with the Junior Master Gardeners or the Youth Millenium Campaign. Today he arrives early because he is responsible for watering seedlings in the greenhouse – which will be used for class projects or sold to raise funds to support their expanding school gardens. Tahleh passes the school vegetable gardens where he can see the large zucchini and other types of squash hanging from the carefully tended vines. He thinks about how fun it is to use these gardens in his science, math, reading, writing, art, and health classes.

Tahleh pauses in front of the school to glance at the outdoor bulletin board. He checks the cafeteria menu, which has a listing of fresh fruits and vegetables from local farms. He also sees a flier about an upcoming all-school poetry slam and a list of recycling sources for various items. Tahleh knows that October's edition of the school newspaper will soon be posted on that bulletin board – and shared with other international green schools. As an eighth grade editor for the October edition, Tahleh picked a story by third graders on fuzzy caterpillars and other insects they found in their school gardens. He was one of the mentors that helped them learn how to handle and identify the insects. Tahleh's science class submitted an article about solar power usage, which they wrote after talking with experts and researching how the school solar panels worked.

Tahleh enters the school building where a parent greets him at the front desk. On the wall down the hallway past the office he sees a banner that reads, "Every day we will strive to take care of ourselves, to take care of others, and to take care of our environment." Tahleh recalls how he has not missed as many school days since starting at the new school because his medical problems due to asthma have reduced; potentially due to the special materials that were used to build the school that do not give off harmful gases and the non-toxic cleaning materials used to clean the school.

Going out a side door, Tahleh crosses the protected outdoor classroom space. He enters the greenhouse hallway and walks past a study area with tall windows that let in natural daylight. His language arts teacher is doing some work and when she sees him she states, "I liked the poem about solar power use that you wrote for the poetry slam. You really say it like it is!" Then she adds, "Thank you for taking care of the greenhouse plants - they look great!" Tahleh is still smiling as he walks through the small storeroom that leads to the greenhouse. Tahleh then uses a hose to carefully fill the drip irrigation system that will slowly soak all the seedlings with water and he checks each of the plants for signs of any problems before filling out the daily report.

Tahleh hears the three chimes that signal the start of the school day. Now the lights will dim slightly and a tape of nature sounds will begin to play. A second set of three chimes will signal the start of the first class. Tahleh finishes watering and heads to class. When he enters the room students are already forming the morning ecology circle. Tahleh's teacher starts with a greeting "I'm glad to see you all here today!" After the daily announcements they talk about the

things that could impact their classroom ecology for the day. Someone might be feeling tired, sad or angry. The teacher may have special plans. A student might have good news to share. The class ecology circle closes as students take some time to think about doing their best work that day. Then they quickly form a line to go out to their garden classroom in the fall sunshine – today Tahleh's math class will be charting the progress growth of their flowers and vegetables over the past month and comparing their results to last year's class.

The Great Campus Vision

The "holistic nurturing" Great Campus is built on 4 major themes: ecology and sustainability issues integrated into K-8 curriculum, community activism and partnerships, school-wide recycling and healthy lunchroom, and school gardens, greenhouses, and an energy efficient school building.

We envision the Great Campus as a place where the curriculum is focused on ecology and sustainability through hands-on, project-based learning, a school newspaper written by the students, community involvement, recycling, healthy food in the lunchroom, and school gardens. The school will also have a holistic focus where students are learning to not only care for their environment but to also care for their needs and the needs of those around them, both in their school and beyond. Students will research social justice issues, so they can learn how they can help and make a difference and become advocates for their own education. All of these programs will be housed in an energy efficient building. Green schools use natural daylight, which studies show increases test scores. The school will use less energy, which will decrease utility bills allowing the school to allocate more funding towards educational programs. Schools built with low toxic materials, where non-toxic cleaning and pest control methods are utilized, showed a lower incidence of asthma-related student illness and missed school days. The school will incorporate hands-on, project-based learning activities that have students working on projects in every class and subject area.

Theme I: Ecology and Sustainability Integrated into K-8 Curriculum

Place-based learning:

What is place-based learning? (From: Placed-Based Education & Academic Achievement)
Place-based learning is characterized by interdisciplinary, team-taught, hands-on learning experiences that focus on problem-solving projects and learner-centered education that adapts to students' individual skills and abilities. Place-based learning involves exploration of local community and natural surroundings.

What does place-based learning look like in practice?
Place-based learning provides students with hands-on learning experiences using school gardens and greenhouse on site with more vivid experiences with interactions with local community members. Students actively participate in class projects related to gardens, recycling, and energy efficient school building with increased student motivation and meaningfulness of student investigations.

What are the benefits of place-based learning?
There are many benefits of the use of place-based learning in schools, including academic, social, and emotional benefits, which are represented in the studies below:

<u>Environment as an Integrating Context for Learning (EIC)</u> (Duffin, PEER Associates, Inc, 2005)

- This study is a compilation of the results of ten place-based learning projects that shows that students in the environmental education programs learn content better, earn higher grades, and score better on standardized statistically higher than students from traditional programs. In one

study where 14 EIC schools were compared to traditional programs, in 36 of 39 measures showed better performance by students in EIC programs.

- Statistics from the study conclude that students score statistically better on standardized tests:
  - All 3rd graders at Hawley Environmental Education School, Milwaukee, WI passed reading test (as compared to only 25% of total public school population).
  - Isaac Elementary, Asheville, NC, 4th grade students increased 31% in math scores in 1 year.
  - School for Environmental Studies, Apple Valley, MN, scores on ACT test higher than peers in district and nation.
  - 1st graders at Kruse Elementary, Bellaire, TX performed higher on Iowa Test of Basic Skills in all categories.
  - Tompkinsville Elementary, KY increased achievement in science, reading, and social studies on statewide tests.
- The studies showed that students have fewer discipline problems, better attitudes, more enthusiasm, better communication, better interpersonal skills, ownership in accomplishments, and greater civility towards others as compared to schools with traditional programs.
- Learning experiences adapted to students' strengths and interests and applied to real life issues and problems attributed to higher motivation.
- Critical thinking about environmental issues attributed to student voice and empowerment.
- The EIC schools created school connection to local community members.

<u>Closing the Achievement Gap: Using the EIC</u> (Lieberman & Hoody, 1998)

- This study highlights the key results of a nationwide study on the performance of students in Environment as an Integrating Context for learning (EIC) programs. The study scope includes a diverse student population within 40 schools, with a wide range of students from different economic groups according to the study statistics, from schools with the lowest income levels (76-100% students receiving free or reduced lunch) to schools with the highest income levels (0-25% students receiving free or reduced lunch). Students in these schools earned higher grades, had fewer discipline issues and engaged in higher-order thinking compared to traditional schools.
- Students in the EIC programs of this study had increased academic performance overall. 77% of educators reported student improvement in standardized tests overall and 73 % of teachers reported student improvement in earning higher grades in classes. 100% of schools in study compared to traditional programs found that their students outperformed the other students in language arts. 91% of the respondents of study also reported that EIC students were better able to apply language arts skills in real-world situations compared to students in traditional programs. When math is incorporated into the curriculum, EIC approaches increase student understanding in math. 100% of the respondents of study reported that EIC curriculum improved students' opportunities to learn and engage in science. Educators surveyed stated that EIC curriculum increased student knowledge, skills, retention, and attitudes in science education. 96% of educators reported that students improve learning social studies when using EIC curriculum.
- Students in the EIC programs have fewer discipline problems and, as a result, had fewer classroom management problems. 70% of educators in study reported student improvement as student misbehavior and discipline referrals decreased. These statistics were attributed to increased student engagement in learning.

- Students in the EIC program are engaged, enthusiastic, and highly motivated. 98% of educators reported student improvement in engagement and enthusiasm.
- Educators reported that students participating in EIC programs had improvement in thinking skills. 96% of educators reported student improvement in critical thinking skills and 94% reported improvement in higher-order thinking skills. Study also reports that 94% of educators observed that students increase decision-making skills.
- The report also found that students in EIC programs showed improvement in interpersonal skills. 98% of educators found that their students improved in collaborating on projects with other students, 94% found that students communicated ideas to others more clearly, and that 93% of students showed improvement in civility towards others.
- The study on EIC programs also found that 94% of educators reported that the quality of interaction between teachers and students increased using this non-traditional curriculum.

Curriculum & projects: course work connected to ecology & sustainability in all subject areas

How is course work connected to ecology and sustainability?

- *Arts*: Students will participate in poetry slams, plays about environment, artistic contests for newspaper and challenges, and create artistic graphs and diagrams for other courses.
- *Social studies*: Students will investigate farming techniques, crops, and agriculture of different cultures and countries. Students can analyze why we grow the food we grow in our climate. Students will communicate with international schools to discuss their environment.
- *Math*: Students will chart progress of plant growth, work with money and basic math skills through a school store where they are participating in selling flowers to community members, and work on problem-based strategies.
- *Science*: Students will research crops and plants, participate in ecology studies of plants grown in schoolyard, investigate effects of animal and insect populations, and research different energy sources.
- *Reading/Writing*: Students will participate in monthly school newspaper that increases writing/reading, read and write about environmental issues, and write letters to community members, local businesses, and politicians about environmental issues.

School Newspaper:

Basics of the School Newspaper:

- To share their "green" school experiences the students will be making a monthly newsletter, available both on-line and in print, that will be used to communicate what different classes are doing within the school. This newsletter will be distributed to students in the school, parents, community members, other schools that are part of the Greening Schools network in Illinois, the United States, and abroad.
- Each grade level will be responsible for a different section of the newspaper so students feel a sense of ownership and pride in their school paper.
- The newspaper will be coordinated with the curriculum, so each month's issue will focus on what students are learning that month and how it relates back to the green school concept. Students and teachers will work together to decide what should be presented in the newspaper.
- School newspaper can be used to communicate with community members, parents, other local schools, international schools, and other green or sustainable schools. Students will be aware

of what all grade levels are doing to contribute to the ecology of their school through what is published in the newspaper.

Results of newspaper in a K-4 school (Ecosystem Journalism; Amy Robertson & Kathy Mahlin):
- Students in study demonstrate the depth of their understanding of content fully.
- The student writing skills was found to be at a higher level and very creative due to enthusiasm for the topics.
- Students spent more time in the writing process, including outlining, writing, and editing, than in traditional instructional methods because students knew their work would be published.

Mentoring Program:
Basics of the Mentoring Program:
- The school will set up mentoring programs where older students will mentor younger students.
- Older students provide younger students with academic, social, and emotional support.
- Student mentors aid younger students with jobs in school gardens and on school newspaper.

What are the benefits of a mentoring program?
- The classes and grade levels will collaborate together as mentors and mentored students are paired together.
- The mentoring program provides mentor students with confidence and compassion.
- The mentoring program helps younger students learn specific content and interpersonal skills, such as communication and civility.
- The mentoring program helps all students, and the school as a whole, create an environment of conscious, caring individuals who strive to uphold the standards of the ecology and sustainability school.

Essential Resources
- Requires commitment of all educators, school staff, community, and parents. When educators, staff, community, and parents do not support the curriculum and the goals of the program students will not have the proper supports to achieve in ecology & sustainability based schools.
- Subjects that are not incorporated into theme show equal to or lower scores to traditional methods. For example, when math was not incorporated into EIC programs, achievement scores were equal to or lower than to scores for students of traditional schools (Closing Achievement Gap, 1998).

Theme II: School-wide Recycling & Healthy Lunchroom (Healthy School)

School Recycling
Why have a school recycling program?
Many school supplies are produced in environmentally unsound and socially unjust ways. "Some brands of school notebooks and filler paper are being used from rainforests in Indonesia and other abuse," says Jim Ford, Research Director for the group Forest Ethics. "The companies making these products stand accused of gross human rights and other abuses." In addition to this, recycling programs is an example of place-based project learning in which the students can get involved.

How can the school recycling program tie to the curriculum? (Take Care of Mother Earth)
At Waikele Elementary School, first grade students were responsible for investigating the amount of litter they produced. Each month, students had to record the amount of litter, and they then made charts and graphs about the results. This taught students to:

- Collect, analyze, and organize their data
- Work together in order to minimize the litter produced in their classroom
- Learn the importance of having the entire community working together on keeping the environment clean
- Learn problem-solving skills, increase data analysis skills, and learn about the many uses of technology.

- Incentives could also be provided for students to encourage each grade level to minimize their waste. For example, classrooms could have competitions with themselves to see if they could produce less waste from the month before to motivate the students to participate.
- The community could also become involved in the project if the school had a drop off area for community members without home access to recycling. This would help the families stay involved with the work the student was doing at school with their recycling projects.

Lunchroom
There are several ways that we can make the lunchroom an ecological and sustainable environment.

- Students will work together to minimize waste in the lunchroom.
- No Styrofoam products will be used, and materials should be recycled or composted.
- Composting bins will be established. Composting involves collecting uneaten food and putting them into bins outside. There are many benefits of composting. It provides a way to recycle natural resources. Composting can also teach students social responsibility by having them take care of their food waste. Composting also helps degrade some toxic compounds and provides soil amendments for the gardens. Materials produced from composting could also be sold at a farmer's market booth as a fundraiser.
- Healthy foods, including fresh fruits, vegetables, and whole grain bread products will be served in the lunchroom. Research has shown that if foods are presented in an appealing way, students will eat them. Since the school is focused on taking care of the students as well as the environment, it is important to keep the students healthy. No soda or candy machines will be allowed on school grounds.
- The community could also become involved in the lunchroom through a Farm to School program. In this program, local farmers help supply many of the food that is eaten in the school lunchroom. More information about this project can be found at The Green School Project.

Theme III: Community Activism & Partnerships

How will the green school affect our community?
No green school exists yet with all of the 4 themes (project-based curriculum, recycling, community activism, and school gardens). In order to implement these themes the community must become involved. Champaign is full of rich human resources, so we hope that community members will come into this school and share their knowledge of gardening, ecology, healthy

foods, cooking, and farming/cooking methods practiced in other regions or countries as well as gardening, ecology, healthy foods, cooking, and farming/cooking methods practiced in other regions or countries, etc.

The following partnerships and levels of activism are required to make this Great Campus a success:

- Community members come in and talk to the students to share their experiences and their rich wealth of knowledge about the local community, recycling, gardening, cooking, foods. Community members are welcome to come in and help at any time. Parents, Peace Corp, church groups, and local service groups can volunteer to work in any area of the school. The school will utilize the knowledge base in the community and will look for experienced gardeners in the community, at the University, and through the Master Gardener program. Master Gardeners from the University of Illinois Cooperative Extension office can help assist students as we set-up the school garden. The Cooperative extension office also sponsors programs like Junior Master Gardeners which offers lesson plans, activities, and awards for students who participate in gardening activities.
- Students learn to become activists and fight for social justice by becoming involved with and meeting with local businesses, superintendents, and politicians.
- A program similar to the Farm-to-School project can bring organic foods in from local businesses and farmers like Curtis Orchard (The Green School Project).
- Naturalists from the Anita Purvis Nature Center, Busey Woods, the U of I Veterinary Medicine Wildlife Clinic, or Allerton can come into the school and present about the local habitat, local animals and plants or students can go on field trips and nature discovery time to these areas as well as Meadowbrook Park.
- The energy efficient building could be studied by University of Illinois engineers and architects. The building can be focal point for the community and an admired landmark in the local community.

Theme IV: School Gardens, Greenhouses, and Energy Efficient School

School Gardens and Greenhouse

Why have school gardens and a greenhouse?

For students to develop a critical voice regarding ecology and sustainability issues they need the opportunity to interact with their natural environment in a positive way. (Chin; Sax)

- Texas A&M researchers found that students participating in Project GREEN [Garden Resources for Environmental Education Now], had more positive environmental attitude scores than those students who did not participate. In addition, this research found a significant correlation between the number of outdoor related activities students had experienced and their environmental attitudes. (Skelly)
- Junior Master Gardeners program of the UI Extension highlights opportunities for independent- and group-learning experiences, life/skill and career exploration, and service-learning opportunities for youth.

Gardens and greenhouse set the stage for placed-based project lessons and provide an outdoor classroom for students. (Gruenwald)

- The garden can reinforce important life skills, such as how to grow food, observe, think long-term, and cooperate. In the teacher-developed greenhouse of Growth Race project, teams of students compete to grow the tallest, healthiest zinnia. Students research soil and air temperatures, nutrients, soil moisture content, and light. Teams then design investigations in the greenhouse. (Kindergarden Website)
- Junior Master Gardeners program provides correlations of projects to IL state learning standards (UIL Junior Master Gardener Website.)
- Greenhouse extends plant growing season and opportunities for learning year round (National Gardening Association Website.)
- On-site access to garden field trips or visits can increase the depth of student learning by decreasing the novelty effect that is associated with off-site field trips. (Orion & Hofstein; Alsop & Watts)

Work in garden or greenhouse can facilitate improved student-student and student-adult communication.

- Younger students and older students can work together in mentor groups. (Kindergarden Website)
- Grade level jobs mean that students at all grade levels and abilities can accomplish a variety of garden tasks, including planting, weeding, spreading compost, watering, harvesting, and plant research. (Kids Gardening Website)
- Students can communicate with and relate to student farmers in other parts of the country and world. (Berkeley Ecology Center Website)
- Students can work with adult volunteers from the local community, school PTA, Master Gardeners, University of Illinois students and Agriculture Extension employees, and 4H members.
- Students can provide tours of gardens for community members and other school groups.

Gardens and greenhouses provide students with a meaningful way to raise funds in support of their school and other projects.

- Students can sell plants and produce from gardens and greenhouse at local farmers markets or for school fundraisers. A school in Oregon raised $4000 from a plant sale, while students formed budgets, decided how much to charge for their produce, learned to work with money, got involved with community and took pride in their school. (Kindergarden Website)
- Numerous grant opportunities are available for school utilizing gardens, greenhouses, and environmental theme. (Kids Gardening Website; UIL Junior Master Gardeners Website)
  - National Gardening Association Youth Garden Grant (National Gardening Association Website)
  - Fund for Teachers Grant (Kindergarden Website)
- Students can choose to donate produce to local shelters and food banks. (Kindergarden Website)
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Potential Obstacles for the Gardens and Greenhouse

- Extra land space and expenses to construct and maintain garden and greenhouse.
- Students, teachers, volunteers, and community members may have plant and insect allergies.
- Teachers will need to gain experience with garden and greenhouse environments.

- One employee or volunteer required solely for organization of activities and maintenance for greenhouse.
- Greenhouse will utilize extra energy for heat and light.
- We propose a year-round school to maximize the use of the school gardens which would follow the same schedule as other year-round schools in the area. This would require that staff be available to teach year-round versus a typical school year.

Green Buildings:

Why have a green school building?

A green school building conserves energy resources, is built from the recycled and non-toxic building supplies, and uses environmentally friendly means for cleaning and pest control. "The green school building will serve as a great project for the students - they can be inspired by the building itself, as well as by what they learn in the classroom," Jack Levin, Director of Commerce and Energy Opportunity, discussing Cuba Middle School in Illinois. (The Healthy Schools Campaign)

- Examples of place-based learning projects that include alternate energy resources, tracking building energy use, non-toxic building supplies, recycled building components, and integrated pest management.
- Green school serves as a model to encourage future green school construction. (The Healthy Schools Campaign)

The geothermal heating system, possibly in combination with solar panels or wind turbines, natural daylighting, zoned lighting and motion sensors in classrooms and hallways will save school district energy cost funds. (Illinois Waste Management and Research Center)

- Natural daylighting sources are shown to save energy and increase student test scores. (Greening Schools)
- Saved energy funds can be reallocated to education programs. The U.S. Department of Energy asserts that up to one quarter of school energy expenditures are unnecessary. (The Green Schools Initiative)
- This lower energy use will reduce the carbon load in the atmosphere.

A green school building can reduce the number of student asthma-related illnesses, which are presently associated with the majority of school absences. (The Green Schools Initiative)

- The building is constructed using the least toxic components available.
- Integrated Pest Management practices use no toxic pesticides and also provide students, teachers and parents with the opportunity for proactive involvement in a school project.
- Use of non-toxic janitorial cleaning supplies reduces student and staff exposure to harmful chemicals and is beneficial for the environment.

Utilizing recycled components as part of the school building will reduce the landfill load and serve as example for the school's curriculum and goals for the reuse/recycle theme (Healthy Schools Campaign.)

- 100% recycled/recyclable carpeting
- Crumb rubber athletic fields
- Gymnasium bleacher seating created from recycled materials

Potential Problems for a Green Building

- Geothermal system sites are not possible in some geographical locations and have higher start up costs than traditional systems.
- Solar panels have high initial cost, can be expensive to repair, and are not always reliable in the Illinois environment.
- The majority of present district maintenance personnel are most likely not familiar with maintaining or repairing either geothermal or solar energy sources.
- Illumination by natural daylighting will have higher initial cost than traditional windows.

Conclusions

The Great Campus will be a innovative school for the Champaign Unit #4 School District where the curriculum is focused on ecology and sustainability through hands-on, project-based learning, a school newspaper written by the students, community involvement, recycling, healthy food in the lunchroom, and school gardens all housed in an energy efficient school campus. The campus will also have a holistic focus where students are learning to not only care for their environment, but to also care for their needs and the needs of those around them, both in their school and beyond. The school will incorporate hands-on project based learning activities that have students working on projects in every class and subject area. Students will research issues of social justice and ecology, so they can learn how they can help and make a difference while also learning how to become advocates for their own education.

The initial expense of setting up a school incorporating these four themes could be large, but the long-term benefits of the school outweigh the initial cost. The time and effort of the initiation could be alleviated if themes were instituted in phases and if the help of community members listed in theme III are utilized. In order to reach the curriculum goals outlined in the curriculum section teachers will require some form of professional development to learn how to teach the curriculum successfully and how to coordinate and make the curriculum project-based and interdisciplinary. This professional development could be done in phases as the different themes are initiated. Once the curriculum is adopted the educators, such as those in the place-based studies, will be more pleased with the new school because statistically, there is a significant decrease in the number of discipline referrals. Additionally, students will feel a sense of increased success, purpose, and enthusiasm as they engage in this new innovative school environment. Students will be able to critically examine how current practices that have been established by society can be extremely environmentally detrimental. They then can use this knowledge to become advocates for both the environment and themselves

Our hope is that this vision for the Great Campus will one day become a reality, so that a student like young Tahleh can walk into a beautiful, energy-efficient school where he encounters issues related to ecology, sustainability, and social justice in all of his classes through a firmly established place-based curriculum, creating a classroom where all of his intellectual, emotional, social, and health needs are met.