BUILDING TOMORROW: USING LANDSCAPE ARCHITECTURE TO IMPROVE EDUCATIONAL OPPORTUNITIES IN AFRICA

A CREATIVE PROJECT

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In 1997, the Ugandan Government introduced legislation mandating Universal Primary Education (UPE) and the right of every child in the nation to a free Primary School level education. This mandate, and the subsequent increase in enrollment, along with a revised primary school curriculum, has led to public schools straining to cope and a decline in student educational test scores. While more classrooms and schools are being built to accommodate the increase in student enrollment, instruction in curriculum subject areas like health and physical education, agriculture and the environment remain unaddressed. The purpose of this project was to redesign the landscape of a school in rural Uganda so that it better addressed the needs of the curriculum, teachers, community members and students of that school. This process involved a coproduction approach to the design that included interviews with teachers and community members, as well as the creation of artwork from the P5 students attending the school. The information gathered during the interviews was combined with other site analysis data to develop a site program containing the goals and
objectives that guided the design process. The products resulting from this process include a
master plan for the school site, selected section elevations depicting features found in the
proposed site, and a description of how these features improve the educational opportunities
for the students in the school.
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CHAPTER ONE: INTRODUCTION

Historical Background

A major focus of the United Nations Millennium Development Goals (UNMDG) (2000) is the reduction in the number of children in Africa who are uneducated by the year 2015 (Grogan 2009). In support of this goal, the Ugandan Government introduced legislation in 1997 mandating Universal Primary Education (UPE) (Grogan 2009; Juuko and Kabonesa 2007). This legislation ensures that every child in Uganda has the right to a free Primary School level education. This legislation is based on the premise that education provides literacy skills, income, health, political participation, liberty, and general welfare for the people of Uganda. These attributes are essential to the political, social, and economic growth of the nation (Nakabugo, Byamugisha, and Bithaghaliire 2008). In 2007, this educational mandate was further extended to include secondary education in Uganda. The extension of this legislation further ensured that all students receiving a score of 28 or less on their Primary School Leaving Examination (PSLE) were now eligible to continue their education into the Secondary Education level at no cost to their family¹. This is a significant investment

¹ The Primary Leaving Examination has a unique scoring system ranging from 4, which is the highest score a student can attain, to 28, which is the lowest passing score a student can attain.
for both the country and the Ugandan family as education has been linked to children’s survival (Nakabugo, Byamugisha, and Bithaghalire 2008).

In the first year following the implementation of UPE, enrollment in government-owned primary schools increased 58%. Since then, overall enrollment figures at the primary school level have stabilized and now average 86% of all children eligible to attend primary school (Ministry for Education and Sports 2005c). This enrollment average also appears equitable in terms of gender enrollment numbers across all primary school grade levels (Muhwezi 2003). While these enrollment figures are similar to those recorded in other African nations, absenteeism and dropout rates are still high in Uganda. Some promise exists in that the data shows dropout rates to be similar for both boys and girls, which can be attributed in part to UPE legislation. However, reasons for boys dropping out include issues related to lack of interest, attainment of work, fees and discipline, while for girls, the dropout rate appears to be primarily due to marriage and pregnancy (Muhwezi 2003). High absenteeism and dropout rates in female students may also be due to issues such as the lack of, or unhygienic, bathroom facilities in the schools (Ministry for Education and Sports 2005b), and a lower cultural expectation for women to be educated. This is of particular concern for primary schools because girls begin experiencing pubescent growth and developmental changes from Year 4 onward (Juuko and Kabonesa 2007; Nahar 2006).

The exodus of students from the Ugandan educational system, however, appears ongoing in spite of the new legislative mandate for Universal Secondary Education (USE). Insufficient secondary schools exist to meet the increased number of students now progressing from primary to secondary education, and this is particularly evident in rural areas of the country (Nakabugo, Byamugisha, and Bithaghalire 2008). Many secondary
schools are private and require payment for tuition. This, and the lack of government schools in rural areas, often means even students who pass the PSLE are not able to continue their education and leave school to seek employment. Students who do not pass the PSLE, or who pass the PSLE but at the lowest level\textsuperscript{ii} are also not eligible to continue on in an academic-based, secondary education program (Nakabugo, Byamugisha, and Bithaghalire 2008). For these children, vocational training is the only option if they are to continue their education. Unfortunately, this is often not an option as vocational education and training is not yet an integral part of the USE program. However, the Education Sector Strategic Plan for 2004 – 2015, projects that vocational education will become an alternative to academic education (Ministry for Education and Sports 2005a).

Defining the Problem

These issues have presented Uganda with a new challenge for the 21\textsuperscript{st} century. As UPE and USE legislative mandates increase the number of children receiving education at the primary and secondary levels, the country must now respond to the need for additional school facilities, educational resources, and teachers. Until enough new schools are constructed to meet this need, existing schools continue to take on greater student numbers in an attempt to address the shortfall. Unfortunately, this over-enrollment, combined with the lack of school facility infrastructure, limited educational resources, and lack of appropriately qualified teachers lowers the educational outcomes in all of the students attending these existing schools. Lack of schooling infrastructure includes small and inadequate classroom

\textsuperscript{ii} There are 5 levels assigned to Primary Leaving Examination grades for children. Levels 1 through 3 are passing grades that allow the child to continue on to secondary education in an academic based program. Level 4 is a passing grade but only allows the child to continue in a vocational education program. Level 5 is a failing grade which does not permit the child to continue on to secondary education.
space, lack of drinking water, lack of adequate latrine facilities, and the physical decline of buildings and structures (Juuko and Kabonesa 2007). From a design perspective, landscape architecture can provide options that renovate and include elements that are essential to the school’s infrastructure. Design can also enhance the learning opportunities provided by the school and improve the value and appeal of the school for students, community members, and the teachers who work there. From this perspective, the problem at hand can best be described as “how can an existing school in a rural area of Uganda be redesigned so that it better serves the needs of the students, teachers, and community members in that area.”

Research Questions

In order to develop solutions to this problem, the following research questions will be addressed in this thesis.

1. How can the landscape surrounding a school be better used to enhance educational opportunities for growth, development and wellness?

This research question will be addressed through the following sub-questions of:

   a. How can the landscape surrounding a school be better used to enhance the physical and intellectual growth and development of the children attending the school?

   b. How can the landscape surrounding a school be better used to enhance the intellectual growth and professional development of the teachers attending the school?

   c. How can the landscape surrounding a school be better used to enhance the intellectual growth and wellness of the individuals in the community that supports the school?
2. How can the landscape surrounding a school be better used to attract and retain more students, teachers, and community members to the school?

This question will be addressed through the following sub-questions of:

a. How can the landscape surrounding a school be better used to create positive learning and social experiences that attract and retain both male and female children from the surrounding community?

b. How can the landscape surrounding a school be better used to promote the health and wellness of the parents and community members?

c. How can the landscape surrounding a school be better used to create a positive working and living environment that attracts and retains teachers?

Delimitations

For the purposes of this creative project, the following delimitations have been noted. These include:

- It is not the intent of this project to develop a “one size fits all” solution to school landscape design throughout Uganda. Each school is different in terms of location of the school, the amount of land surrounding the school, and any specific priorities the school might need to address (e.g., the need for potable water, the need to produce its own food to feed the children, etc.). The results of this study will provide examples of the kinds of solutions that might work for the school being studied, and offer potential solutions for other schools in similar contextual situations.

- It is not the intent of this project to develop a complete and exhaustive list of design solutions for this school site. The solutions offered in this project are viable and
desirable examples of what can be done based on the needs of the students, teachers and surrounding community members.

- It is not the intent of this project to address problems that are inherent to the design and layout of the existing school building or facilities on the site. Any additional buildings, or changes to existing site buildings, will also address the concerns and issues related to current buildings or landscape but will be primarily included or altered for the purpose of meeting the project goals and objectives outlined above.

- It is not the intent of this project to impose the use of technology when addressing the problems being faced on this site. While new technologies can provide both a solution to a problem and a model that can be used for education, they are often quickly superseded by other technologies and are unsustainable if technical knowledge and support is not readily available and cost effective. Any technologies considered useful to the project will be evaluated on the basis of initial cost, on-going maintenance needs, the availability of service and technical support to maintain and repair these technologies, and the degree to which these technologies are acceptable and within the coherence of those who will use them.

- It is not the intent of this project to impose “expert” knowledge or opinions upon this community, the teachers of this school, or the student body. Instead, the focus will be on working with these community partners to coproduce knowledge and options, increasing the likelihood that socially sustainable solutions to the problems are found.

Assumptions

- Information collected from teachers, students and the community during the site analysis process was accurately interpreted and recorded. It should be noted that
while English is the primary language spoken in Uganda, there are over 50 other regional languages and dialects spoken here also. In rural areas where formal education is less likely, the community is more likely to speak the regional language than English. In this project, the regional language for the Lutisi school children and community is Bugandan. All group meetings and discussions were conducted in English, but where language was an issue, two interpreters were used to translate the information into English. To ensure that the information was accurate, transcripts of the recorded responses were made available to the groups participating in the project so that they could confirm or revise the recorded information.

- The groups that provided information during the site analysis process were representative of the teaching body, student body, and community as a whole. As such, it is assumed that the opinions and concerns expressed by the individuals in these groups reflected the opinions and concerns of the student body, teaching staff, and community as a whole.

- The most appropriate age group to gather information regarding school outdoor play spaces was Year 5. The Year 5 students have the best command of English, are able to create artwork that provides a good sense of the child’s ideas, and still have two years of education left at the school suggesting they might have a vested interest in the school and what it could provide for them in the future.

- The Lutiiisi Academy Primary School is a representative example of rural primary schools in Uganda in terms of the student, curriculum, infrastructure, and resource problems being faced in Uganda’s educational system today. It is assumed that the
conditions being faced in this school by the students, teachers, and community members are representative of the conditions being faced in other schools as well.

Definitions

For the purposes of this creative project, the following definitions and acronyms were used:

- **Building Tomorrow (BT) Foundation**: This is an Indiana-based foundation that raises money for the construction of primary schools in rural Uganda. The Lutisi school investigated in this project was the foundation’s first school and was built in Wakiso, Uganda in 2006.

- **Primary Leaving Examination**: A test covering traditional academic subject areas that determines whether or not students can continue into Secondary Education, and which secondary education track the student can pursue (i.e., academic or vocational).

- **Primary School**: Primary Schools are similar to elementary schools here in the United States and address grades 1 through 7 in terms of educational curriculum and standards.

- **Secondary School**: Secondary Schools are similar to High Schools in the United States educational system. These schools usually address the educational curriculum for students in years 8 through 12. Most high schools teach a college preparation curriculum. However, some secondary schools are like technical colleges and provide vocational and technical skills training for students in years 8 through 10.

- **Universal Primary Education (UPE)**: Universal Primary Education refers to 1997 legislation by the Ugandan Government allowing all children in Uganda the right to a Government-Based, Primary School education at no cost their family.
• Universal Secondary Education (USE): Universal Secondary Education refers to 2007 legislation by the Ugandan Government allowing all educationally qualified (i.e., children who have passed the Elementary School Leaving Examination at a Level 3 or higher) children in Uganda the right to Government-Based, Secondary Schooling at no cost to their family.

• United Nations Millennium Development Goals (UNMDG): This is a set of goals developed by the United Nations to end poverty and bring political and economic stability to many developing nations by 2015. These goals include educational objectives for the children of these countries, and the progress made toward these goals by participating countries can be found online in an annual report published by the United Nations each year (United Nations General Assembly 2000).

• Sustainable: For the purposes of this project, sustainable has been adapted from the US Environmental Protection Agency definition and has been defined as: the creation and maintenance of conditions under which humans and nature can exist in productive harmony and that permit the continued fulfillment of social, economic and other requirements of present and future generations (United States Environmental Protection Agency 2013).

• Coherence/Sense of Coherence: Aaron Antonovsky first coined the term sense of coherence in 1979 (Antonovsky 1979) and defined it as “a global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that:
  i. the stimuli deriving from one's internal and external environments in the course of living are structured, predictable and explicable;
ii. the resources are available to one to meet the demands posed by these stimuli; and,

iii. these demands are challenges, worthy of investment and engagement.”

• Coproduction: For the purposes of this project, co-production refers to the delivery of public services in an equal and reciprocal relationship between professionals, people using the services, their families and their neighbors. When activities are coproduced in this way, both services and neighborhoods become far more effective agents of change (Boyle and Harris 2009).
CHAPTER TWO: REVIEW OF RELEVANT LITERATURE

For the purposes of this project, the literature review covers a number of different areas including the recent history and purpose of primary school education in Uganda, current legislation pertaining to primary school education in Uganda, the primary school education curriculum in Uganda, the state of education, schools, and teaching in Uganda, and what effective landscape design can contribute to primary school education in Uganda. This review also looks at the role of the school and education in the community, and the potential for schools to become a greater community resource for on-going education, support and community development. The review concludes with an overview of the potential impact landscape design could have on primary school educational opportunities available for young children in Uganda.

The Importance of Education for African Nations

One of the primary goals in the United Nations Millenium goals (United Nations General Assembly 2000) is the reduction in the number of African children and youth who are not educated. This report sets a target year of 2015 for all children in the world to have at least completed a primary school level of education and for this education to be equally accessible for both boys and girls (Grogan 2009). This, along with other international

In response to these international charters and movements, the Ugandan Government enacted legislation in 1997 that entitled all children to a free primary school level education. This legislation known as the Universal Primary Education (UPE) act, along with the enactment of the Universal Secondary Education (USE) act of 2007, were instituted to ensure that literacy skills, income, health, political participation, liberty, and general welfare for the people of Uganda would be established, as these attributes are considered essential to the political, social, and economic growth of the nation (Grogan 2009; Juuko and Kabonesa 2007; Nakabugo, Byamugisha, and Bithaghalire 2008).

The Aims and Goals of Education in Uganda

Upon the attainment of power in 1987, the National Resistance Movement implemented a review and revision of the existing education system as part of its education reform program. Findings from this Curriculum Review Task Force listed 14 aims and objectives that would become the foundation of the current primary school educational
program. These aims and objectives, taken directly from work completed by Muyanda-Mutebi (1996, p. 21), include:

1. Enabling individuals to acquire functional, permanent and developmental literacy, numeracy and communication skills in at least one Ugandan language, English and Kiswahili;

2. Developing and maintaining sound mental and physical health among learners;

3. Instilling values of living and working cooperatively with other people and caring for others in the community;

4. Developing and cherishing the cultural, moral and spiritual values of life and appreciating the richness that lies in our varied and diverse cultures and values;

5. Promoting understanding of, and appreciation for the protection and utilization of the natural environment, using scientific and technological knowledge and skills;

6. Developing discipline and good manners;

7. Developing an understanding of one’s rights and civic responsibilities and duties for the purpose of positive and responsible participation in civic matters;

8. Developing a sense of patriotism, nationalism and national unity in diversity through appreciation of the rich and diverse cultural background of the people of Uganda;

9. Developing prerequisites for continuing education
10. Acquiring a variety of practical skills for enabling one to generate income and a multi-skilled manner;

11. Developing appreciation of the dignity of work and labor and of making an honest living;

12. Equipping the child with knowledge, skills and values of responsible parenthood;

13. Developing skills in management of time and finance and developing respect for private and public property; and,

14. Developing the ability to use a problem-solving approach in various life situations.

The Primary School Curriculum

In response to these aims and objectives, the Curriculum Review Task Force identified the following subject areas (See Table 1) that would make up the primary school educational curriculum. These subject areas were believed to be the ones best able to address the aims and objectives established by the Curriculum Review Task Force. If well implemented, these subjects would produce “well rounded primary school leavers who are well endowed with knowledge, practical skills, attitudes and values that will enable these youths to effectively participate in, and contribute to the socio-economic development of Uganda and beyond. This the kind of youths who the Government and people of Uganda aspire for (Muyanda-Mutebi 1996).”

Of particular interest in this study is the emphasis in the curriculum on subject areas that can be taught outside the classroom environment. One of the primary concerns leading to
## Primary School Curriculum Subject Areas (Adapted from Muyanda-Mutebi, 1996, p. 22)

1. Basic Primary Technology* (to include Arts and Crafts)
2. Mathematics
3. Language and literature*, Mother Tongue/Pre-language English and Kiswahili*
4. Social Studies
5. Religious Education
6. Music, Dance* and Drama*
7. Agriculture and Home Economics*
8. Business and Commercial Education*
10. Physical Education
11. Community Service Scheme*

* Denotes new subject areas that were added to the curriculum by the Curriculum Review Task Force.

### Table 1: The Revised Subject Area List for the Primary School Curriculum

The revision of the old curriculum was the education system’s emphasis on theoretical subject areas and classroom-based instruction that did not appear to have any practical application for students once they left school (Muyanda-Mutebi 1996).

This concern is important to understand as education has traditionally followed a theoretical approach. While useful as an instructional approach for knowledge-based subject areas like literacy and numeracy, an experiential or more “hands on” approach is
recommended for teaching practical skills and tasks like those found in technology, engineering, or agricultural professions (Hansen 2000). Indeed the focus of the primary school curriculum on theoretical, classroom-based instruction, related to academic areas that had relevance to only a small percentage of the students continuing on through secondary education, was one of the driving forces behind its call for overhaul. Students are leaving primary school for work in agricultural professions, and many are not prepared with the practical skills needed for these jobs (Muyanda-Mutebi 1996).

Even more compelling is the growing body of research-related evidence supporting the role of practical instructional settings in educational environments. While still in its infancy, more and more studies are being conducted on the impact of outdoor education settings on student education. For example, The Brent Elementary School underwent a “green” revitalization of a parking area it had on the school premises. The environmental impact of the new rain garden on aquifer recharge and reduced storm water runoff was significant, but perhaps more significant was the impact this rain garden area had on educational variables that the school monitored. Along with the reduced heat island effect and storm water runoff, the school also noted an increase in the use of the rain garden as an instructional area for classes studying the environment, science and even music and literature. Further, the school saw an increase in student attendance, educational performance scores, and outside requests from parents wanting to have their children attend the school (Sustainable Life Designs 2010).

In light of the growing body of literature in support of experiential instructional settings, and the existing concerns regarding the lack of relevant, practical subject areas for most of the children attending school in Uganda, the new curriculum now contains a number
of subject areas that are well suited to practical, out-of-classroom, instructional settings (i.e., not just in the classroom but in real, laboratory or clinical environments as well). The revised curriculum includes traditional classroom-based subjects like music, science, language and mathematics, as well as more practical skill-oriented subject areas like agricultural education, health and physical education, environmental education, and the community service education. These latter subject areas may be better taught in out-of-classroom, applied, instructional settings. As such, renovation or construction of any school should now include well designed outside learning and activity areas that assist the teachers in these instructional areas.

The Current State of Teachers, School Facilities, and School Resources

The implementation of the UPE in 1997 produced a rapid rise in primary school student enrollment. From 1997 to 2003, primary school enrollment rose from 2.7 million to 7.3 million students. By 2003, school enrollment had stabilized at approximately 85% of all children eligible to attend primary school. Perhaps even more importantly, the percentage of girls in primary school in 2003 who were from rural areas was 47%. This figure compares favorably with the 49% female student enrollment figures at city and urban schools and suggests that the UPE had also been effective in establishing educational gender equity (Juuko and Kabonesa 2007).

This rapid increase in enrollment produced a number of consequences that neither the schools nor the government had planned for. The cost per year to educate each child attending primary school in Uganda is estimated to be approximately 5000 shillings. However, the UPE mandate ensures that each child receives a free education. Until this point in time, most public schools had been receiving the bulk of their operating cost funding
through schooling fees that were paid directly to the school by parents. This meant that in the past schools had fewer students to serve and more money coming directly to the school, rather than through government educational administration sources. The introduction of UPE has increased the number of children now receiving an education in public schools and decreased the direct income the schools once had from the parents. The reduction in direct income has left many schools without the funding needed to operate effectively as the government has insufficient funds allocated to adequately support the educational mandate nationwide. In addition, funding and support for public schools from government sources is significantly less for rural schools than for their city or urban counterparts (Grogan 2009).

The lack of funding has affected the primary schools in many ways. The first is the lack of educational resources needed to effectively teach the students. Reductions in funding lead to reductions in the number and quality of the learning materials available to teachers and students. This impacts the availability of current textbooks, chalk for teachers, paper, and pencils for students, as well as operating supplies like toilet paper for school toilets. Lack of resources now impacts both the quality of education teachers can provide and the teacher’s working environment (Andrew 2008). Rural schools are often in disrepair and the conditions under which educational instruction must be administered is not conducive to positive learning outcomes (Chabbott 2010). In many cases classrooms are open to the elements, playgrounds and recreational areas are not available for the children, and pit latrines are used because of a lack of sewer or septic tank infrastructure. Conditions like these at rural primary schools often make work environment untenable for teachers resulting in high levels of teacher absence, turnover, and attrition (Juuko and Kabonesa 2007).
Another consequence resulting from the lack of funding is increased absenteeism among students; especially among girls. The lack of quality education often causes parents to rethink the value of sending their children to school when they could be helping with work at home. The lack of facilities like hygienic toilets, water for washing, and clean bathroom facilities also leads to young girls who are starting to experience menses during their final primary school years dropping out (Nahar 2006). Personal hygiene, disease, sex, AIDS, and teenage pregnancy are important public health issues for Uganda as a nation, but are difficult topics to address when the school itself is unable to provide water and toiletry environments (Nahar 2006).

In response to the issues emanating from the implementation of UPE, it should be noted that there has been a substantial increase in governmental inputs such as qualified teachers, more classrooms, more equipment and instructional materials, and improvements to the curriculum to decrease gender disparities in the educational process. However, the quality of education continues to be strained due to the physical capacity limitations of existing primary schools and the overwhelming number of students now needing to be served by them. To date, a disproportionate emphasis has been placed on the addition of classrooms, rather than the establishment of new schools, and this has led to very large sized schools. Having large, centrally located schools, however, does not improve the quality or access to education that occurs through the reduction of home to school distance, which is especially concerning for rural areas (Juuko and Kabonesa 2007).

Although UPE mandate has made significant progress toward improving gender equity and access for all children to education in Uganda, it has also created a number of issues in terms of class size, lack of resources, lack of teachers, and lack of suitable schools
and teaching environments. These issues have resulted in teachers and teaching environments that are unable to fully address the primary school curriculum areas and in a decline in the quality of education for primary school aged children in Uganda. As noted in the literature, many of the issues experienced are the result of adding new classrooms to existing schools rather than the establishment of new schools. More new schools need to be developed, and with a significant proportion of the curriculum now focusing on subjects that can be taught outside the classroom, emphasis in the school design needs to also address the landscape and the design of external instructional environments.

**Identifying Primary School Education Curriculum Areas Influenced by the Landscape**

As noted previously, a significant portion of the primary school curriculum focuses on subjects that can be taught outside the traditional classroom environment. These subjects include agriculture, the environment, physical education, health enhancement, and community service (Muyanda-Mutebi 1996).

*Agricultural Education*

Agriculture makes up approximately half of Uganda’s annual gross domestic product (GDP). Agricultural production in Uganda includes crops, forestry, fisheries, and livestock, with food crop being the highest contributor at approximately 76% of the total agricultural production. Further, 81% of Uganda’s land is suitable for agriculture, 88% of the nation’s population lives in rural areas and earns their livelihood from agriculture. Approximately 56% of agriculture GDP consists of subsistence production for personal consumption and not monetized or grown for market sale (National Agricultural Research Organization 2001). As such, agriculture is a significant part of Ugandan life and an important component in the educational curriculum for primary school aged children.
Agriculture instruction is a high priority among rural schools and one that is supported by the local community families. Education in agriculture allows children to continue to farm family land and be more self-sufficient (personal communication, Lutiiisi Academy School Management Committee, 2012). Current educational practices focus on crop production using basic human powered technologies for clearing and tilling the land, but it does not include livestock care and husbandry. Unfortunately, keeping and caring for animals at school creates issues concerning care of the animals during periods when the school is not in session and security of the animals from theft and predators. Until these issues can be resolved, the care of animals within the subject area of agriculture can only be taught from a theoretical, rather than applied, perspective (personal communication, Lutiiisi Academy School Management Committee, 2012).

Environmental Education

The rate of population growth in Uganda in recent years has increased the demand on the nation’s natural resources. To date, both large and small projects have lacked the integration of safety measures and impact assessments needed to defend against degradation and pollution of these resources. The challenge currently faced in education is to prepare the next generation of Ugandans with a new world outlook that values the environment and the role it can play in Uganda’s social, ecological, and economic transformation (Mucunguzi 1995a).

Since 1995, environmental education has been through both formal and informal approaches. Informal approaches included programs implemented by the Uganda Environmental Education Foundation (UEEF) (Environmental Education and Advocacy 2013). This program works with a variety of organizations including local government
groups, youth groups, women’s groups, NGO’s, policy makers, institutions of learning, and farmers in areas like ecological land use management, tropical agriculture, global environment issues, and conservation and provision of drinking water. Programs like UEEF promote a people-centered, environmental participation approach to education and have begun to place special emphasis on the education of youth, women, and policy makers (Mucunguzi 1995b).

Formal education approaches in environment education parallel the informal approaches, specifically targeting children and youth. This movement has led to the establishment of a number of school-based wildlife clubs in Uganda (e.g., Wildlife Clubs of Uganda (WCU)) and have been the main impetus behind the elevated environmental conservation awareness in Uganda (Johnson-Pynn and Johnson 2005). Issues still facing the implementation of environmental education at the primary school curriculum level include a persistent need for a top-down instructional approach rather than a person-based experiential approach and the lack of emphasis on the social, economic, and ecological importance of environmental conservation practices (Mucunguzi 1995a). With such a strong dependence on agriculture as a source of both food and income for the majority of Ugandans and the increasing demand on Uganda’s natural resources as the population of this nation continues to grow, more emphasis will need to be given to environmental conservation education at the primary school level. A different mindset regarding the use of the land and the natural resources it provides will be needed in the future.

Health and Physical Education

Public health is one of the nation’s most pressing concerns. Teen pregnancy, disease, HIV/AIDS (Graffy et al. 2012), and concerns related to poor hygiene and sanitation
conditions (Health Planning Department 2009) are all issues that get addressed from an early age in the primary school curriculum. While problems such as teen pregnancy or the transmission of HIV and AIDS are social concerns that the school addresses through instruction, issues like good hygiene and sanitation are areas that the school can model as well as teach. For many rural schools, however, this is not possible. Water is precious and used very sparingly, pit latrines are used in the absence of septic or sewer system utilities, and resources such as soap for washing hands are either not available or not affordable for the school (Health Planning Department 2009). Good health and hygiene behaviors need to be both taught and modeled for children from a very early age, and this instruction and modeling needs to be present in primary schools.

New or renovated schools need to consider investing in utility infrastructure as well as classrooms. This utility infrastructure should include the collection and storage of water for hygiene uses, as well as the reuse of this water for other appropriate purposes. It should also include the updating of human waste treatment systems to help prevent the spread of disease. Pit latrines are ideal growth environments for bacteria and disease, which then spread to humans and animals through airborne carriers. Health issues like these are very important, and schools are the ideal starting point for fostering the lifelong behaviors needed to overcome these concerns.

Information in the literature regarding the effectiveness of the physical education curriculum within the Ugandan primary school system is limited. The Department of Physical Education and Sports was created in July 2006 within the Ministry of Education and Sport, and it is the lead agency for the implementation of policy for the development of sports in Uganda (Department of Physical Education and Sports - Profile 2006). Physical
education is considered to be institutionally based instruction in sports and movement (i.e., school based) while sport is considered to be both institutionally and non-institutionally based (i.e., community or club based). A report profiling the state of physical education for Uganda in 2006 indicated that physical education was only mandatory in primary school, and many secondary schools did not offer physical education as a subject area. The report also noted the benefits of physical education in education. These include: fostering a child’s physical, social, and psychological development, teaching positive values and life skills, strengthening education, and preventing diseases like HIV/AIDS, to name a few (Department of Physical Education and Sports - Profile 2006). The report profile also noted the challenges, constraints, and critical issues it was currently facing. These included:

1. Lack of adequate knowledge and understanding of physical education and its values by many people;
2. Low numbers of managers, coaches and teachers;
3. Lack of, or the poor state of equipment and facilities;
4. Insufficient funding for physical education programs;
5. Lack of coordinated and quality physical education development programs;
6. Insufficient data on the results of existing physical education programs;
7. Lack of sporting organizational structures from the grass roots to National level; and,
8. Lack of sporting grounds, or the loss of sporting grounds for non-sport uses.

Of note is that these challenges would be more likely to exist in rural settings where the population needed to support sport and recreation programs is much less (Department of Physical Education and Sports - Profile 2006).
While traditional sport settings are important for physical education, informal play and activity areas are also essential for early childhood development and lifelong health and activity. Play promotes problem solving and independent thinking among children while helping to develop physical control and coordination, hand eye movements, spatial awareness, laterality, and directionality. Play is especially useful for young children who have yet to develop the physical skills needed to participate in formal sports and play does not usually involve or need any formal instruction either. Children can simply explore and discover (Ginsburg 2007). Further, play environments can also include activities that promote cognitive skills like literacy, numeracy, and color and shape recognition. Color wheels and cubes with letters and numbers that can be rotated to make words or math equations are now often seen in western playgrounds and play sets (Giles and Wellhousen 2005).

Unfortunately, play and play areas are one of the first elements in school design or renovation to be overlooked or removed in favor of other educational areas because of its perceived worth to a child’s education, especially in rural areas. However, these spaces are critical to the development of young children, encourage lifelong health and an active lifestyle, can be used during after school hours, and should be an essential element in any school renovation or in the construction of any new school.

Community Service Education

The community service scheme is a new subject area in the Ugandan primary school curriculum, and one that effectively promotes a learner-centered pedagogy within community settings. Little professional literature exists describing this subject area and its impact on primary school educational outcomes; however, supporters of this approach suggest that in
spite of the difficulty in implementing this form of education, it builds confidence in young learners and provides social relevance to the information they receive at school (Sikoyo and Jacklin 2009). While research has yet to fully determine the effectiveness of the primary school service scheme to date, the concept appears to be an excellent opportunity for schools to become more immersed within the community in which it resides and to play a greater part in serving the community. This service can be in the form of student participation in community activities and programs, like apprenticeships or volunteer service programs. It can also involve school based programs operated or administered by the students that provide a service to the community, such as the maintenance of a recreational field at the school that is then used by the community during after school hours. This latter approach might also open the door for the school to consider microbusiness options with the school providing a service or product to the community for a nominal fee that can then be used to support the school’s educational resource and equipment needs.

Expanding the Role of the School in the Community

The Use of Schools for Adult Education and Lifelong Learning

The desire for adult education in rural areas of Uganda is very real. Many adults will walk for extended periods of time at the end of a physical work day to attend a class in a school that may not even have telephones, running water, or electricity. Community members are anxious to learn about many different subject areas, but most adult education programs being offered focus on Functional Adult Literacy (FAL) and the English language. Interestingly, Uganda has more than 50 regional and local languages spoken within its borders. While English is considered the national language, it is often not spoken in many areas of the country. For older community members, learning English allows them to
understand information disseminated through television, radio, and newsprint and to better appreciate the political and economic policies and processes experienced in the country (Southwood and Kafeero 2007).

The Use of Schools as a Community Center

For many communities in rural areas of Uganda, however, public facilities that can provide these kinds of educational and community services are few in numbers. In many cases, the local school may be the only public service building or facility available to the community for many miles. This makes them ideal as an adult education center, as well as a community center for many other activities and programs. For example, in some areas of Uganda, local primary schools have also become community resource centers for services like internet telecommunication and infrastructure (Mayanja 2002), teacher improvement (Engels 2001), and medical clinics (Network Beyond Projects in Uganda 2013). This is an important step toward extending the value of the school beyond the school day and the use of school facilities beyond simply educating Uganda’s youth.

Implications of the Existing Literature

The existing literature suggests that primary schools, and primary school education, have assumed an important role in the future of Uganda. Issues such as poverty, HIV and AIDS, and illiteracy are but a few of the chronic issues the nation hopes to overcome as more children receive a complete primary school education. Currently, schools are experiencing difficulty coping with the additional children eligible to attend primary school, and this is seen in the lack of school resources and facilities, the lack of teaching resources, the lack of qualified teachers, teacher absenteeism and turnover, student absenteeism and dropout rates, and low student scores on the PSLE.
Solutions being implemented include the renovation of existing schools and the addition of more classrooms to existing schools. This solution does not address the issue of accessibility to education for students in remote and rural areas and often places a greater stress on other aspects of the school such as teaching loads, teaching resources, and school facilities like water sources and toilets. Further, the new primary school curriculum requires a number of subject areas that can be taught in environments other than the classroom, and this is in accordance with the applied, student-centered learning approach being encouraged in schools. Subjects like agriculture, the environment, and physical education can all be addressed in outside learning environments. This supports the argument that all new school construction, and existing school renovation, should not only involve the construction of new classrooms, but also include the design and provision of outdoor learning spaces that are often omitted, like sporting fields, playgrounds, agricultural areas, and environmental conservation study areas.

With primary school education in Uganda currently being remodeled, this would be an ideal time to consider the potential of the school in a rural environment and the other roles the school could play. As part of their current responsibilities, a number of schools include adult education and community resource centers for a variety of programs. While extending the use of the school buildings is a good way to maximize the school’s potential, the same offer can be made of external teaching spaces like sporting fields and playgrounds. These areas can also be accessed and used during the after school hours providing recreational, health enhancement, and physical activity opportunities to rural communities that may not have access to any other community facilities.
One of the most pressing difficulties in the renovation of existing schools, or the construction of new ones, is the lack of national utilities and infrastructure to support the extended use of schools. Power for lighting, adequate drinking water for students and teachers, adequate sanitation for toiletry waste disposal, and energy sources for heating and cooking are all utilities that are missing from many rural schools. Integral to the addition of new classrooms and outdoor education areas is the inclusion of sustainable power sources, water, and sanitation systems that will allow the school to provide the education and experiences the children need while also offering the services and programs the community seeks.
CHAPTER THREE: METHODOLOGY

Identification of the Project Site

The site chosen for this creative project was the first school to be developed by the Building Tomorrow Foundation. The Building Tomorrow (BT) Foundation is a not for profit organization that raises money for the construction of schools in rural areas of Uganda. Once the construction of the school is complete, BT then hands over responsibility and control of the school to the Ministry of Education and Sport who then staff it with teachers and monitor the educational progress of the children. The US offices for BT are located in Indianapolis and initial discussions of the project with BT founder, Mr. George Srour, and BT Foundation’s Uganda Director, Mr. Joseph Kaliisa, were very positive. Upon completion of a more comprehensive project outline, I talked again with Mr. Srour, who indicated that the BT organization would be willing to help me conduct the study. Further discussion with both Mr. Srour and Mr. Kaliisa led to the identification of three potential school sites that met both the project goals and the limitations that would be encountered when working on a remote project site in Africa. These sites were the N.A. Barakat Academy Primary School of Nakaseeta, approximately 45 minutes drive east of Kampala along the Kampala-Jinja road; the Kabasegwa Academy Primary School in the Lyantonde District, approximately 3 to 4
hours north of Kampala; and, Lutiisi Academy Primary School in the Wakiso District, approximately a 1-hour drive north east of Kampala along the Kampala-Hoima road (see Figure 1).

After considering the amount of time that would be available for interviews and site analysis, the length of time needed to travel to and from the site each day from Kampala, the degree of completion of each school (i.e., some sites were still being built while others were
constructed and currently teaching classes), and the physical size (i.e., the actual acreage of the school site) of each site, the Lutiisi Academy Primary School was chosen. This school was selected because it could be accessed from Kampala on a daily basis, it was approximately 6.5 acres in size, and it had been completed and operating since 2006. This last factor was important because this meant the school had students, teachers and even a community based School Management Committee that I could meet with and interview as part of the site analysis process. Images of the site are offered in Figures 2 through 5.

Identification of the Lutiisi Academy Stakeholders in this Project

This creative project utilized a co-production approach to the design of the Lutiisi Academy primary school (Boyle and Harris 2009). Co-production involves identifying the major stakeholders of the school and seeking their input and help during the design process. This approach was considered important as it would ensure all goals and objectives are addressed, cultural norms and values are observed, and that personal, educational and even political needs are met (Woolner et al. 2007).

Six unique groups of individuals were identified as stakeholders in the landscape design and development of the Lutiisi Academy. These groups included:

1. Members of the Building Tomorrow Foundation here in the United States as well as those working in Uganda;
2. Members of the Ministry of Education and Sport in Uganda, and specifically those members who worked in primary school education;
3. The parents of the children attending the Lutiisi Academy Primary School;
4. Members of local community from the area around the school;
5. Teachers were currently teaching at the Lutiisi Academy Primary School; and,
Figure 2: The Lutiiisi Academy Primary School in Wakiso, Uganda

Figure 3: The School Kitchen, Cooking Area (Right), and School Shop (Left)
Figure 4: Children Playing Netball at Lunchtime

Figure 5: The Road from the Highway to the School. This Road Goes Through the Middle of the School Site.
6. Students attending the Lutiisi Academy Primary School.

Meetings with Mr. Srour regarding BT’s landscape design and development goals and objectives for the Lutiisi Academy Primary School indicated that they had no defined goals at this stage and that they were interested in seeing what the design of the landscape around the school could provide. Arrangements were made in advance with the BT staff in Uganda to interview the School Management Committee, which consisted of parents of children attending the school as well as community members who lived near the school, teachers currently teaching at the school, and students currently attending the school.

The Education Director for BT in Uganda, Mr. William Kajubi, personally accompanied me each day I was in Uganda. Informal discussion with both he and Mr. Kaliisa regarding the goals and objectives for members of the BT Foundation in Uganda indicated that they too were interested in seeing what could be provided to the students through effective landscape design. Unfortunately, no interview or meeting time could be arranged with any members of the Ministry of Education and Sports. As such, no information could be collected from representatives of this stakeholder group during the course of this design project.

Development of Interview Guides

Formal group interview guides were developed in advance for the students, the teachers, the school management committee and community, and Ministry of Education and Sport members. As no interview or meeting time could be arranged with any of the members of the Ministry for Education and Sport, this interview guide was not used.

The interview guide for the teachers consisted of 25 questions related to the school, the school teaching day, the working conditions within the school, the problems that the
teachers encountered in the school, the areas of the school (including aspects of teaching and instruction as well as physical aspects) that needed improvement, what they would like to see added to the school, and whether or not they would use the school facilities if there were programs made available through the school for them. The interview was conducted with 3 teachers and notes were taken by the author to record the responses. All of the teachers spoke English very well and translation of the comments and suggestions made by the teachers during the interview process was not needed. The interview guide for the teachers, along with the teacher responses to those questions, is available for review in Appendix A.

The interview guide for the school management committee and community members consisted of 11 questions regarding the school role in the community, what a regular day for the children attending the school looked like at home, the educational areas that children were being taught, their overall opinions of the school instruction, the teachers and the school as it related to their children’s education, what they would like to see added or changed about the school, and whether or not they would use the school facilities if they were made available to them (i.e., the use of recreational facilities on the weekends or the use of classroom facilities for adult education programs).

The meeting started with 7 parents in attendance, but this number fluctuated during the course of the 2-hour interview process. Numbers grew to as high as 13 at one point in the meeting with a total of 3 men and 10 women in total attending. Unfortunately, some of the community members had to leave during the interview process to attend a large community meeting that was also being conducted at the house next to the school while others arrived late to the interview. The language that most community members at the meeting spoke was Lagundan and not English so translation of both the questions and the community member
responses was needed. In response to this need, Mr. Kajubi, provided these translational
services during the interview process.

After welcoming and thanking the school management committee and community
members for giving up their time to help with this project, the interview was then
administered as outlined in the guide. Each interview question was first asked by me in
English, and then repeated to the group in Lagundan by Mr. Kajubi. The group then took
turns making responses to this question, and Mr. Kajubi would translate the response to me
as it was being said. This allowed for me to take notes while the responses were being made
and for me to quote Mr. Kajubi’s translation of the responses directly when needed. A copy
of the interview guide for the school management committee and community members,
along with the responses and comments they made to those questions, is available in
Appendix B.

The development of a children’s art activity guide was designed to overcome the
difficulty of obtaining accurate information from children who might have difficulty verbally
or adequately expressing themselves (Carlson 2010; Woolner et al. 2010). The artwork guide
was developed to ensure that the children had a good sense as to the scope of playground
ideas they could draw from and utilized drawing as the primary communication form.
Drawing was considered the quickest and easiest way for them gather and communicate their
ideas. Once the ideas had been drawn, the children then used their English language skills to
describe what was in their drawings while being videoed, with the teacher helping them
choose the English words they needed to describe their picture if needed. A copy of the
children’s artwork guide along with some selected examples of student artwork produced in
this process is provided in Appendix C.
The administration of the Children’s Art Activity Guide involved the students reviewing a large number of playground and recreation area pictures I had prepared and posted on the class wall. The 35 predominantly fifth grade children (there were a few who were younger but whose English language skills were very good) were permitted to then walk around and look at the pictures to get ideas of what they would like in their school play areas. When they were finished looking at the pictures on the wall, the children were then given paper and crayons and asked to draw the play areas they would like to see at their school.

The time needed for the children to finish their drawings was approximately 90 minutes. When all of the children had finished their drawings, they were then videoed. Of the 35 children who drew pictures, 34 were available for videoing and these 34 students described in English what they had drawn in their pictures. The classroom teacher helped them select the correct English word when they became stuck in their description and did not know the English translation for something they had included in their drawing. All of the student artwork was then digitally copied and the student’s video descriptions were transcribed and compiled into one complete transcript. The transcript was then subjected to a Wordle evaluation, and a graphic Wordle image was created for the top 30 words most used in the student artwork descriptions. A copy of this transcript along with the Wordle image created from it is offered in Appendix D, and images showing the data collection process are shown in Figures 6 through 10.

The teacher interview, student artwork activities, and the videoing of students describing their drawings were all conducted in a classroom at the school during a normal
Figure 6: School Management Committee and Community Member Group Interview

Figure 7: Some of the Many Photos Shared With the Children on Playgrounds

Figure 8: Students Completing Their Artwork Depicting What They Would Like In Their School Play Areas
Figure 9: Author Videoing the Students While They Describe Their Drawings

Figure 10: Author Collecting the Student Drawings and Thanking the Students
school day. The interview with the school management committee and community members was conducted at the end of the school day in a classroom provided by the school.

Site Visit and Analysis

The site analysis and interview process involved a 5-day visit to the Lutiisi Academy Primary School in Uganda. This visit was organized through Mr. Kaliisa. A proposed schedule of interview dates and times, along with the times I would need to conduct a site analysis of the school was sent to Mr. Kaliisa prior to my arrival, and he arranged with the school principal, Ms. Jennifer Bunkwaitse, to have students, teachers and the School Management Committee and community members available for the interviews at the times requested.

A site analysis was also conducted on the land that made up the school site. This analysis included inventories of the area climate, vegetation, landform, soil, accessibility, borders, drainage, natural resources and altitude. The site was also evaluated from a human impact perspective and inventories were taken to note school building placement, land use, the population density around the site, roads and access ways to and from the site, school utilities, the need and use for water on the site, and easements and any future plans for development. Each of the inventories were then analyzed to determine the degree to which they affect the school itself and the education being provided, the teachers, the students, and the community around the school.

Finally, observational techniques were used to determine organized and impromptu teacher and student use of the landscape around the school. These observations included the use of outside areas for instruction, where children ate lunch, where children played, what kinds of formal and informal games children played, and where children went to be alone or
to engage in quiet activities. These observations also served to validate comments and responses made during the teacher interview and children’s artwork descriptions.

Design Precedents

A number of design precedents were selected and used to help inform the design concept development and final design itself. These precedents were chosen for their relevance to school design in geographically similar areas, their use of sustainability goals and objectives, and for their ability to rationalize the value of landscape design from an educational perspective. Each precedent is presented as a case study with the relevant features highlighted, and a description of how this feature will benefit the design of the Lutiisi Academy Primary School site.

Data Analysis

Data collected through group interviews from the School Management Committee and community members and the teachers were analyzed qualitatively for themes in the comments, and specific statements of need or concern. These themes were then used to guide the design concept development. The Wordle image created from the student’s artwork description transcript was used to identify the words and ideas most used by the students in their description of their pictures. These words were used as a guide in the design concept development of student spaces around the school, with specific images and ideas from their drawings being used in the final design itself.

The site analysis was used to determine specific needs the school had in terms of education and the use of the land around the school. Findings from the site analysis were combined with the observational information, and the data obtained from stakeholders, for the development of a school land use spatial relationship model. This model provided the
structural framework for the design concept development, and in concert with features obtained from precedent case studies, formed the foundation for the final design.

Implementation of the Data Analysis

In summary, this project utilizes a coproduction approach in determining what the most important issues related to the landscape, and how best to approach them. The methodology includes gathering information related to the goals, needs and issues faced by key stakeholders at the school, and these stakeholders include the BT Foundation, both here in the United States and in Uganda; members of the Ugandan Ministry of Education and Sport; teachers working at the Lutiiisi Academy Primary School, the Lutiiisi Academy Primary School Management Committee and members of the community who support the school; and the school students themselves. Unfortunately, no meetings could be arranged with members of the Ugandan Ministry of Education and Sport so no information could be obtained from this source. Information was obtained from each of the other groups using personal interviews, group interviews and children’s art activities. The information obtained from the stakeholders was combined with the information obtained from the site analysis and observations of the teachers and students behaviors while visiting the site, to develop a site program. This program contains the goals and objectives that guide the design process, and that will form the basis for the evaluation of the designs effectiveness.
CHAPTER FOUR: DESIGN DEVELOPMENT

General Description

The Lutiisi Academy Primary School is a rural school located approximately 60 kilometers northeast of Kampala approximately half a mile from the Kampala-Hoima road. The school is a basic open horseshoe design school built on the north-facing slope of some rolling hills. Unfortunately, the school has been built facing south and this has led to some drainage problems occurring in the central courtyard area of the school. The school site is approximate 6.5 acres in size with the access road to the school passing roughly through the middle of the site.

The site is an irregular shape and appears to narrow in the center around the road area. There were no official drawings of the site and a current aerial image of the site had to be purchased as the Google Earth image that is publicly available does not show the school having been constructed yet. There were markers on the site to indicate the boundary corners, so a map of the site was determined using a Garmin Colorado T400 hand held mapping computer. The accuracy of this system varies but averaged between 8 and 14 feet, which was considered acceptable for purposes of this project. The boundary area was walked and map markers were recorded by the Garmin at turning points on the perimeter. The data from the
Garmin was then downloaded onto a computer and the perimeter points joined to show the school site. This site diagram was over laid onto the aerial photograph of the school site and appeared to match the natural features seen in the photo very well.

Site Analysis

Soil Composition

Soil maps of the Lutisi area suggests the school is situated on Sandy Loam Ferrallitic soil. These soils are often weathered and leached; high in iron and aluminum metals giving it a yellow-red color, deficient in most other minerals, and common to humid tropical regions. This type of soil is common in central Africa and is suitable for the cultivation of rice, coffee trees, rubber trees, cacao, sugar cane and oil palms (Chesworth 2007; Kaurichev 1975).

The surface soil is fine in terms of particle size and the ground is hard and compact during the dry months. This is of particular concern as slope of the land and the lack of vegetation to slow the runoff of rainwater makes this area very susceptible to top soil removal and erosion. It was interesting to note during the site visit that gully areas had developed (and in some cases had been initiated to help redirect water away from the open central courtyard area of the school) in the areas most trafficked by students, and that the vegetation coverage in these areas was very sparse. More vegetation is needed throughout the entire site to help reduce the topsoil loss due to runoff as most of the site has been cleared and was used for agriculture before being donated for the development of a school. Figure

Climate

Uganda is an equatorial country and the Lutiiisi Academy Primary School is located 30 minutes latitude north of the equator. This region of the country experiences two rainy periods, one short and one long, along with two similar dry periods. While this may appear to
be ideal for year round agricultural production, crop yields are often not as high as they are in other northern parts of the country where there is only a single prolonged rain period. This is due to the likelihood of insufficient rainfall amounts, or late rains, during the short rainy period and the loss of seeds due to lack of water after planting (National Agricultural Research Organization 2001). Total annual rainfall varies by region with as much as 75 inches of rainfall per year in areas around Lake Victoria to 20 inches per year in mountainous areas of the northeast. Annual rainfall in the Wakiso district averages 33 inches per year.

The temperature range for this region is between 80 degrees F and 61 degrees F with average temperatures consistently around 70 degrees F all year and no frost or freezing temperatures. Temperatures remain relatively consistent throughout the year due to the altitude, again suggesting an ideal growing environment. Due to its location on the equator, daylight hours at the Lutiisi Academy Primary School only vary by 15 minutes from season to season, and the average amount of sunlight per day is about 7 hours. This consistency in sunlight hours each day makes this location an ideal candidate for solar energy systems. In contrast, wind speed is very low and ranges from 3 to 4 knots consistently year round. This area would not be conducive to wind power as a source of energy (See Appendix E for climate statistics from the Entebbe Airport showing annual wind and sunlight hours for the region).

Site Elevation, Surface Shape and Slope

Attempts were made to use the Garmin Colorado T400 handheld mapping computer to determine the elevation of the site and the shape of the land. Unfortunately, the altitude could not be confirmed through any independent measure or known value for altitude and
two different attempts at measuring the change in elevation of the site produced very large
differences in values. While the data were reliable in terms of their relative elevation
values to one another in the same test, the absolute elevation values for any specific point on
the site should not be considered accurate or valid. As such, best estimates between the two
data sets were used to provide a general contour description of the land around the school.
Again, it should be noted that contour determinations provided in the site analysis are only
estimates based on the data collected and should be viewed as a generalized impression of
the elevation and slope direction on the site.

The elevation of the site was highest in the southeast corner of the site, where it was
estimated to be approximately 3790 feet, and lowest in the northern most corner of the site
where it was estimated to be 3725 feet. The slope of the site was relatively uniform at
approximately 5%, and then increasing to approximately 8% at the edge of the school’s north
agricultural crop area. Contour lines showing the estimated elevation and slope direction for
the site are provide in Figure 11.

Vegetation

The site was sparsely vegetated with natural vegetation. With the exception of a few
trees scattered around the site and in the southwest portion of the site, most of the trees have
been cleared to allow the land to be farmed. The school has two main agricultural areas it
uses for growing crops. These are the northern area between the school and the northern
border of the site, and the southern area that begins across the road from the school and
proceeds up the slope approximately halfway into the southern area of the site. Teachers are
also permitted to have gardens on the site and are given plots of land they can farm along the
southern border of the site.
Figure 11: Site Aerial Image Showing Estimated Slope and Drainage Patterns for the Lutii Academy Site
The vegetation is basically comprised of savannah bush land native trees, shrubs, and grasses. There are some trees on the site of note however. These include two large native Ficus trees that the children sit under during lunch, a Musambya Tree, a Mugavu Tree, and a Jack Fruit tree that is producing fruit the children enjoy eating. These trees in particular need to be preserved as they are central to activities and spaces the children use and enjoy.

Utilities

The site has no water, sanitation or electricity utilities. School instruction is conducted during daylight hours so electricity to power things like artificial lighting is not needed. This does save money in terms of school expenses, but restricts the school building use to daytime only and limits the degree to which the school can also serve the community. With the amount of sunlight the school is exposed to, solar energy would be an ideal way to secure electrical power while remaining independent of commercial electricity providers. There is also no power for heating and cooking. The kitchen that serves porridge to the children each day for lunch cooks over an open fire and an energy source is needed to provide heating and cooking as well. Unfortunately, there is very little potential for wind energy as a source of electricity production. Average wind speeds at ground level are very low (i.e., less that 5 knots) and technology has yet to be developed to effectively produce electricity at that wind speed level.

Some water is captured from the school building roof runoff and stored in a 2,000 liter water tank at the side of the school. However, the tank does not hold enough water to provide potable water to over 300 students throughout the year, so once the water tank is dry, students get water from a well on a neighboring property for the school. The water is collected a day in advance by students in yellow plastic containers and poured into plastic
water bottles at the school. These bottles are then left out in the sun on polished sheets of corrugated iron so that water boils inside the bottle and sterilizes itself. The water is then stored and given to the children the next day for drinking.

More water needs to be collected and stored using the water tank collections system. The current 2000-Liter tank runs out of water after 2 weeks without rain, so larger storage vessels, as well as more storage vessels are needed. As some dry periods can last up to 4 months, the school needs approximately 15,000 to 20,000 liters of drinking water storage, or 3 to 4 tanks that can hold 5,000 liters of water, to remain independent of well water needs. Further, more water needs to be collected from other hard surfaces and school buildings like the toilets, the kitchen and the shop. This water could be collected and stored for cooking, drinking, hand washing, and other hygiene and toiletry uses.

The current sanitation system is a pit latrine. This latrine is a small wood and corrugated iron building over an excavated area that is used to collect the human excrement. There is a boy’s side and a girl’s side to the latrine with 5 toilets on each side. There are a number of issues related to the latrine. These include:

i. The proximity of the boys and girls latrine to one another

ii. The lack of hand washing and other hygienic resources (i.e., soap, cleaning materials, etc.)

iii. The need for the latrine to be relocated every few years and for old pits to be filled and new pits to be dug

iv. A lack of toilets for a school student body of over 300 children. Ideally, the ratio should be 1 toilet to every 20 to 25 students.
The addition of a septic tank sewer system is needed and would be supported by the government. The seasonal use of the toilets would allow the septic system to recharge during low/no use periods and the government has committed to emptying school septic systems for those schools that have them. The sloping site means the tanks should never have the problem of being flooded and waste can now be treated in a contained area reducing the risk of disease. However, septic tanks require regular supplies of water. This water could be gray water collected from hand washing discharge and then used for toilet flushing. Water could also be collected using a tank collection system for runoff from the toilet roof. For example, a 15 foot by 15 foot bathroom facility roof could still collect over 13,000 liters of water during a low rainfall year where only 25 inches of rain was received in the area. If the water was used conservatively, this would be more than enough to ensure the effective operation of the septic tank, and would also allow for students to wash their hands as well.

Using a biodigester waste management system might be another sanitation option, although it is a technology that is relatively still new in terms of treating human waste and not well known in areas like Uganda. The low cost, simpler versions of this technology would be affordable, but may be seen as just another version of a latrine and not considered a step forward. In this project, it is evident that an effective, long term, low cost sanitation infrastructure solution is a necessary part of the overall design solution. As such, presenting as many options as possible, along with their advantages and disadvantages, and allowing the teachers and community to select the infrastructure they believe will best work for them would most likely be the best approach here.
Population Density

The land around the school is predominantly crop and livestock agriculture, with large areas of the land cleared for farming purposes. The population density in this area of the country is approximately 200 to 250 people per square mile but this density is found primarily in the towns along the main Kampala-Hoima roadway. In the rural area around the school, the population density is closer to 50 to 75 people per square mile.

Transportation and Site Access

There is an unpaved road that joins the Kampala-Hoima road to the Lutiiisi Academy Primary School site. The road itself actually passes through the center of the site heading west, and has a second road branching from it that goes through the western side of southern portion of the site heading south. There is also a road easement along the western edge of the northern half of the site. This easement is approximately 50 feet in width and is for a new road that will run to the north of the school. No one is sure as to when this road will be built, but the area should be kept clear for that potential development.

The road is only rarely used by motor vehicles as it is in very poor condition and can easily damage a car if the driver is not careful. The road is mostly used by people as a walking path. For example, teachers coming to work each day take a minibus, motorcycle or taxi to the start of the unpaved road and walk the remaining half a mile to the school. All of the children walk to school, with some as far as an hour’s walking distance away, and most will walk in along these unpaved roads.

Instructional Areas of the School Site

There are two main areas related to agriculture that are used for student instruction. These are the south agricultural field on the south side of the road opposite the school, and
the north agricultural field between the northern boundary of the site and the school building. These areas are used to teach the children farming and agriculture techniques as well as some applied science lessons related to plants and biology. These areas are very large and offer plenty of space for students to learn about a wide variety of farming crops and growing techniques.

There are three additions that would be ideal for this school in the area of agricultural instruction, and that could fit easily into the existing agricultural areas of the school. The first is a composting area that would be adjacent to the agricultural areas. This would be especially useful if biodigesters are being used to provide fuel for heating and cooking, as this could provide a fuel source for both the school kitchen and the teacher’s housing.

The second change to the agricultural area would be the addition of animals and livestock. These animals could include goats, chickens, and rabbits as they survive well on natural vegetation as well as leftover food and vegetation from the crops that have been grown. Animals would be an excellent addition to the instructional curriculum as well as an additional food source for both the teachers and the school. The animal area should be located somewhere close to people as there would be issues associated with the care and security of the animals during out of school time. This would be best addressed if teachers had housing on site as this would allow for teachers to assume responsibility for the animals and the food they produce during out-of-school periods, and help address the issue of teacher attrition and absenteeism. The final agricultural addition to the school would be the inclusion of a bee apiary and honey production facility. This would allow the children to be part of a micro-enterprise that could raise money for the school while supporting the community through the provision of locally produced honey. Honey could also be used in the preparation
of school meals, or by the teachers as part of the food they receive when caring for the animals during school holiday periods.

Physical education lessons are also conducted outside and usually consist of activities and games in open areas around the school. There are no designated activity areas for physical education, so area selection by the teacher usually depends on the type activity they have planned and the amount of space they need to safely and successfully perform it. Again, the uneven ground surface and the slope of the land around the school increases the potential for student injury. The school really needs a designated area for physical education, and this space could also be used for sport, recreation, and play times as well.

The final instructional area that should be considered is the space in front of the school for student assembly. It is not a large area, nor is one needed. However, some space should be kept in front of the school and preferably near the flag so that student assemblies and convocations can still be conducted.

*Play Areas and Games*

Children from all grade levels played outside during school break times and play areas were general those areas that were too small, or not suitable, for playing an organized game or sport. Games played in these areas included chasing games and dodgeball type activities. As the children had very little sporting equipment, balls were generally ruptured and stuffed with cloth or paper to help the ball maintain its shape. There were no delineated spaces on the ground so most games were very open in nature and played without any sense of boundaries. Both boys and girls played recreational games. However, during the time the play activities were observed in this site analysis, participants were mostly younger children (i.e., students from P5 or lower), and predominantly girls rather than boys.
Sport Areas and Games

Interestingly, there were also very few boundaries delineated in the organized sports that the children played during this site analysis. The older girls (i.e., girls in P5 through P7) mostly played netball, while the older boys (i.e., boys in P5 through P7) mostly played soccer. The girls did not have any netball goals and played a form of netball that comprised mainly of just passing and keeping the ball away from members of the other team. The girls played netball on an open grass area at the front of the school (i.e., the south side of the school building), but as there were no goals, the game would often flow into areas to the side of the school as well. The boys played soccer on a larger grassed area at the rear of the school. The boys usually used large branches that they pushed into the ground to indicate the goals. The sideline boundaries, while not marked or formal, were then understood by the boys to extend from the back wall of the school and down to the crop line of the north field, and the endlines were indicated by where the branches indicating the goals were.

It should be noted that the sport and play areas the children used around the school were not maintained and were simply open areas of ground. All of the areas had long grass, uneven surfaces, and were sloped significantly increasing the potential for a student to fall and the risk of injury. The girls also played their netball games across the school driveway entrance. While the number of cars visiting the school over the course of the year is very few, a new area away from this potential conflict is needed.

For both girls and boys, a significant amount of time during the school day is spent outside playing games. The children enjoy the games, and as seen from their artwork, follow and know a considerable amount about those teams and players who participate at the professional level both in Uganda and in Europe. Given the absence of any playing fields
within the local community, the importance sport appears to have in these children’s lives and the lack of sporting space and equipment in the school, the inclusion of sporting spaces and recreational areas in any design or redevelopment of the school site should be a high priority.

*Lunch and Non-Active/ Quiet Areas*

Lunch was eaten outside under two Ficus (i.e., Wild Fig) trees everyday unless it was raining so heavily that students needed to eat in the classrooms. There are no buildings or shelters for shade or eating lunch during rainy periods, and there are no tables or benches for eating lunch. Lunch is eaten sitting on the ground under one of three trees and a shelter was something the children indicated they would like to have in their drawings and video narratives. Given the limited number of options the children have for eating lunch when it is raining as well as when it is hot, the addition of a lunch shelter to the lunch area is an important priority.

The Musambya and two Fig trees are the only trees near the school and the kitchen, and the only shade for the children during lunch on hot days. These three trees have also become areas where some of the children will sit and talk if they do not want to participate in the sports or games others are playing. The only other non-active/quiet area found at the school was a small space of land on the east side of the school building that children, mostly girls, use to sit and talk. The space itself is too small to play games that have more than three or four students so this area appears ideal for students who wish to be left alone, or who just want to talk quietly with a few friends. This area does not have any seating either and would be an ideal location for the addition of some more trees and some benches for children to sit on.
Buildings and Structures

There are four main buildings on the Lutiisi Academy Primary school site. The largest of these buildings is the school building itself. This is a brick, steel and corrugated iron structure on a concrete slab base. It is a square horseshoe shaped building, with an open courtyard center and a covered walkway around the inside of the building that provides access to the classroom areas (See Appendix E). The windows have no glass and only iron grills and the doors are usually left open to allow for air to move through them. The roof drains into only one gutter outlet, and that outlet is connected to the water tank on the west side of the building. Unfortunately, the building roof surface area was designed to drain into two gutter outlets, and the redesign of the gutter to flow to just one single outlet has led to the gutter often overflowing into the central courtyard area. Changes in the gutter drainage system and outlet to accommodate greater water volumes being carried off the roof will be needed. Some changes to the courtyard should also be made to address any water accumulation is this area as it really has nowhere to drain.

The second largest building on the site is the school latrine. This building is approximately 20 feet wide by 15 feet long, and is divided down the center with a wall that separates the girl’s from the boy’s latrines. There are 5 toilets on each side of the latrine and the building itself is located 100 feet to the north of the school along the eastern border. The latrine is connected to the school by a small trail/path.

Having a pit latrine necessitates it being located some distance from the school for health reasons. Ideally, the latrines should be readily accessible to lunch and play areas so having a more robust sanitation system will allow the toilets to be located a little closer to the children and the spaces they most occupy. I would also consider adding a change room
facility to any new toilets that were built. The change rooms could act as a separating feature
for the latrines while also providing a space for children and the community to change when
playing sport. The addition of change rooms to the toilet facility would necessitate its
location now also be relatively close to sport and recreational areas as well.

The kitchen is a makeshift building that has been erected for the purpose of cooking
lunches for the children. A local lady comes and cooks lunch for the children each day.
Lunch consists of a bowl of porridge for each child and this porridge is prepared in a large
pot over an open fire. The kitchen building itself is a makeshift structure and does not look
very stable or safe given the open fire that is used for cooking in it every day. It also does not
look like it would keep rain out very well making it difficult to cook with an open fire.

The school needs a new kitchen that is both safe and protected from the elements.
Ideally, the kitchen could use a biodigester fuel source for its heating energy, with waste
from the crops, uneaten foods, and animals used to power it. It could also simply be a
covered area with an open fire pit in the center that is vented through the roof, allowing for
the same cooking methods and utensils to be used. Either way, a new kitchen is needed and
should be included in any redesign of the landscape.

The final structure on the school site is the shop. This too is a little makeshift building
that sells pencils and other small items to the children. The shop should be integrated with
the kitchen and be part of a new combined structure. This structure could also provide
storage for some of the foods, and the shop could be used to also sell food items like honey to
the community. Combining these structures is efficient and economically prudent. Both
buildings operate mostly during the lunch period, and need access to storage and secure
areas, and need to be readily accessible to students. (See Figure 12 for Overall Site Analysis)
Figure 12: Lutiisi Academy Primary School Site Analysis
Stakeholder Participation and Data Collection

Results from the Teacher’s Interview

Three teachers were interviewed during the site analysis visit. These teachers indicated that while the school was providing some great benefits to the children, there were also a number of areas that could be improved. Comments and suggestions from the teacher interview include:

1. **The inclusion of teacher accommodation on site to improve teacher retention and absenteeism.** One of the greatest concerns the teachers have is the lack of consistency in the teachers and the extra load that must be assumed by other teachers when one is absent. Absence is mostly due to poor teaching conditions and travel distance so providing accommodation onsite would address both of those issues. In addition, a teacher presence on site would allow for greater security and care of the school during periods when the children are not attending. This would allow for the inclusion of livestock and other agricultural endeavors that require daily attention as well as an active physical presence for security year round.

2. **Separate toileting facilities for boys and girls and the addition of a deep sewer sanitation system.** The teachers noted that one of the most important measures of work environment is the toilet and sanitation system. Clean hygienic toilets and a deep sewer sanitation system are considered ideal in rural environments and essential for a positive working environment.

3. **The opportunity for on-going learning and professional development to keep them motivated in their teaching.** One of the main difficulties of being a teacher in a rural area is access to teaching resources and knowledge that is readily available in urban
and city environments. Distance and the length of the working day often prevents teachers from attending seminars and evening classes at the city based colleges, so many feel like they are trapped if they are located in a rural school. Teachers would like the opportunity to continue to develop professionally and to pursue advanced degrees if possible while still being able to teach in a rural setting.

4. *The addition of playground equipment, sport and play spaces for the children.* The teachers acknowledged that there were no sporting facilities at the school, or locally in the community, and that subjects like physical education were not actively addressed as much as they should be. They were pleased that the children were creative in their play activities but also disappointed that more equipment of proper facilities were not available to them. The teachers indicated that the addition of sporting fields in particular would be a tremendous benefit as the school did compete against other schools in sports and athletics on occasions, and that this would generate a great deal of school pride. The teachers also suggested having designated play areas based on age so that the younger children could play in areas and not feel overwhelmed with older children playing in there space.

5. *More readily available water during the dry season.* Drinking water and indeed water in general is a significant national concern. Teachers noted that the water tank does not collect enough water and runs out after a few weeks if there is no rain. While rainfall is fairly consistent, it is not guaranteed and the past few years have included extended dry seasons that have placed a strain on water usage at the school. The school uses water provided by a community member well about a half mile from the school. Unfortunately, the well is quite shallow and this means it is prone to being
quite polluted during flooding periods and needs to be filtered as well as boiled. More water collection and water storage tanks are recommended. Water is used for drinking and cooking at the school. If used wisely, additional water could also be used to promote good hygiene practices like hand washing with the resulting gray water then being used for gardens and crop irrigation. Water is a real issue at the school and one that can be effectively addressed in the landscape design process.

6. *The addition of electrical power to the school.* The teachers would like to have power to the school but understand this is not realistic in terms of government-based utilities. Power would allow them to consider teaching about computers and other more advanced technologies that they cannot use at the moment. They feel this is a significant part of the curriculum that is not being addressed as they can only teach from books and what they have in the environment. Electrical power would also allow them to teach to the community, teach into the evening if necessary, and use computer technologies to gain access to resources and ongoing professional training programs. With the amount of sunlight hours each day, and the regularity of the day length, solar energy would be the ideal choice and one that could be set up so that the school could operate effectively while still being independent.

7. Better books and resources to teach the children. The teachers indicated that they needed more books and resources to teach with and that many of their books were either out of date, in disrepair, or lacking in numbers and having to be shared by students when in class. One way this problem might be addressed is through additional revenue, and the development of a small, school-based, agricultural micro-enterprise. This could both increase student involvement and service for the
community while providing a product or service to the community for a small
nominal fee that can be afforded locally. The additional income could then be used to
cover the costs of new books and teaching resources.

At the conclusion of the interview, the teachers were asked to rank on a scale of 1 to 10
statements related to whether or not they themselves would take a class at the school if one
was offered and they were interested, and if they would teach a class to adults in the
community in a subject area that they felt knowledgeable in. The teachers all scored the
statements with a 10 indicating that they would definitely a class themselves, and would be
willing to teach a class to adult community members as well. Figure 13 provides an itemized
summary of the concerns and comments made during the interview. A copy of the notes and
responses recorded from the interview with teachers is provided with the interview guide in
Appendix A.

Results from the School Management Committee and Community Member’s Interview

Data collected from interviews with the parents and community members indicated a
number of desires in terms of the role of education and the purpose of the school, as well as
some specific needs and issues. These included:

1. They seek an education that allows their children to speak and hear for themselves
   (i.e., to speak and understand the English language which is still the national
   language of Uganda) rather than have others tell them what they must do. This
   statement was echoed and agreed upon throughout the group. The parents all wanted
   their children to be independent and to be able to understand the economic and
   political processes that were occurring so they could make informed decisions for
Principal/Teacher Key Issues:

1. The children have no play structures. They have some sport equipment (indoor repair) but not actual sporting areas (e.g., fields, courts, goals, nets, etc.). They have a “house” system for intra-school sport and play soccer, netball, music, dance, poetry, etc. Need play space just for small children. Need sport fields for large children.

2. Teacher housing on school site. Good for security and good for teacher attendance and retention. Some concerns with teacher attitude — difficult teaching environment — some are lacking motivation.

3. Fences are needed to identify the school site and to help keep neighboring livestock off the property. They have already started a living fence in some areas.

4. Some basic agriculture taught in the curriculum and children tend the garden areas around the school. There is room in the curriculum for more agricultural topic areas (e.g., animal care), as well as environmental and energy related issues.

5. Lack of clean water is an issue. They have a 2000-liter tank and want a 10000-liter tank. They really need around 30000 liters in order to have about a 90% rainwater dependency. At the moment, water is taken from the tank until dry and then from a well. Well is not as deep as would be liked so flooding and muddying of the water is a concern. Water needs to be cleaned (solar) before drinking at the moment. It affects everyone from a drinking standpoint as well as a hygiene standpoint (i.e., washing hands before eating – Ecoli outbreak while I was there).

6. Pit latrines are used at the moment. Would prefer septic system and for teacher, female and male student bathrooms to be separate.

7. There is no power to the school of any kind. The addition of an energy source would open up opportunities in many other areas of education.

Figure 13: Key Teacher Issues and Concerns

themselves. While English is still the national language of Uganda, many people in rural areas only speak the local language, and this often alienates them from information related to the economic and political conversations that are being held.
They are skeptical of those who would come and translate what political and economic change means for them as they have been taken advantage of in the past.

2. **Regular/stable work and lifestyle (not day-to-day existence).** The school management committee and community members also agreed that they would like the children to be educated so that they could then get stable work. Most of the people participating in the interview were community farmers who lived on or just above subsistence level and they wanted more stability and security for their children in terms of employment and lifestyle.

3. **More agricultural education including sustainable farming, water and drainage management, land management, and livestock care.** The School Management Committee and Community Members were pleased that the school placed importance on agriculture in its instruction. They indicated that they would prefer more instruction, particularly in areas like sustainable farming techniques, the use of water and drainage of the land and the care, and livestock management. It was also interesting to listen to these parents talking about having the children grow flowers at the school and the school being a place where many of the plants and flowers that the adults had seen in the area when they were children, but that were no longer present in the community, could be grown and cultivated again.

4. **More resources for the children in academic areas like computers and technology.** The parents at this interview indicated that they would like to see more computer technology in the primary school curriculum. While they themselves did not use any computer technology, they realize that this is an important skill to have if you are to
obtain work of more stable professions and one that severely limits the education and employment potential their children have.

5. Playgrounds and sporting play spaces for both children and the community. The School Management Committee and community members were all in agreement that play and sporting facilities were needed for the school. Interview participants agreed that play areas and sporting facilities would improve student attendance at school and provide a sense of pride in the school. They also agreed that sporting facilities would be good for the community as there were no facilities available in the community and that they would use the recreational facilities as well if they were allowed.

6. Access to learning and school facilities for the community. The interview participants all agreed that they would use the school facilities if they were made available to them. This use included the taking of classes on topics related to things that interest them and the use of sporting facilities and play space during out-of-school times (i.e., the weekends, during holidays, or in the evenings).

At the conclusion of the interview, the participants were asked to rank on a scale of 1 to 10 statements related to whether or not they themselves would take a class at the school if one was offered and they were interested, and if they would use the school sporting facilities if they were available to them. The School Management Committee and community members scored a 10 for both statements indicating that they would definitely take class themselves, and would be very interested in using the sporting facilities at the school if they were available to them. Figure 14 provides a summary of the concerns and comments from the interview. A copy of the interview guide and responses from the interview with the School Management Committee and community members is provided in Appendix B.
Community Member Key Issues:

1. Learning about agriculture is important and family members would like the curriculum extended to cover livestock, and issues related to permaculture and sustainable farming practices as observed in this part of the country.

2. Environmental issues are important but some are more important than others. E.g., plastic bottles are a concern, but it is not as significant as concerns related to the use of herbicides, or obtaining clean drinking water. Water is a day-to-day survival concern where as plastic bottles require recycling. Out there, no one can recycle this plastic, and they don’t have anywhere they can store them until someone comes to take it from them, so it is just easier to burn them.

3. Sport, recreation and an active lifestyle is considered important by the community members and they believe development in the sporting areas would help promote school pride. They would also like to see play equipment for the children like slides, swings, and climbing apparatus. The community also indicated that they would participate in sport programs at the school as this would be the only facility to allow them to do this for many miles around.

4. The community members would like more plants grown for food production, and more plants grown for their flowering and aesthetic appeal. There was also a wish that flowers could be grown so that flowers once common to the area, but now rare, could still be kept and seen by the children at the school.

5. They would like the teachers to live on the school site itself, and would like the school painted in the School Colors. There is also concern about the safety of the children going to and from School and the desire for some children to have the option of boarding at the school rather than commuting each day.

6. Power and clean water are an ongoing issue at the school. Power would allow for extended education hours, community education programs, and the inclusion of subjects like computers into the regular education curriculum. A deep well and clean water is also sought and this is a high priority.

7. The community would like to also use the school and would attend educational programs if these were available as the school is really the only available place in the region for them to do these kinds of activities.

Figure 14: Key School Management Committee and Community Member Concerns
Results from the Student Artwork and Video Descriptions of Their Drawings

The artwork and video descriptions provided by the children clearly identified a number of specific elements that they would like to see in their school ground. These included:

1. *Sport fields for soccer, netball, volleyball, etc.* The children enjoy sports and playing games outside during all of their school break times. The sports are gender based, with the girls primarily wanting to play netball and boys wanting to play soccer. Other sports that the children indicated they would like to play included athletics, volleyball, boxing and swimming. The key here would be to provide a sporting field that is large enough (or adaptable enough) to accommodate all of these sports.

2. *Flowers to make the school look nicer.* The pride the children had in the school extended to the school’s appearance as well. Some children noticed that the school did not have any flowers or things of beauty that were more common in other urban center schools. There were a number of drawings showing flowers as a central theme and these drawings were by both boys and girls in the class (it should be noted that some of the children had quite the flair for landscape design and started planning where those flowers would be located as well).

3. *Access to water for drinking.* The children were very aware of the lack of water and that they were the ones that usually went and got water both at school and at home. The children indicated that they would like more water on hot days especially after playing games outside.

4. *Shelters and sheds for sitting under to eat lunch.* Of particular interest was the number of children who drew lunch shelters as part of their school play areas. These
children made reference to eating their lunch porridge outside and how they would like to be able to sit in a lunch shelter to do this.

5. The inclusion of swings, slides and climbing playground equipment (perhaps in the shape of animals or boats, etc.). During the discussion period where the children had the opportunity to look at pictures I had brought of different playgrounds, there had been some significant interest in the playgrounds that had animals or climbing equipment in the shape of a tree house or boat. This was evident in the drawings I received back from the children and it was interesting to note the number of children who wanted an animal to climb on in their playground.

The “Wordle” analysis of the transcripts provides a visual representation of the number of times a word is used. The larger the word in the Wordle image, the more the word has been used in the transcript. The Wordle generated from the transcript of the children’s artwork descriptions clearly shows their desire for new elements like football, netball and volleyball fields and equipment, flowers, and a lunch shed (the term the children used for the lunch shelters they drew). The Wordle also notes the terms Uganda and School suggesting the students have a sense of pride in their school and country. The elements that support this pride (e.g., the Ugandan Flag) are also noted and should be included in any future landscape designs as well. Figure 15 provides an itemized summary of the concerns and comments made during the interview.

Site Analysis Summary

The information gained in the site analysis suggests that climate strengths like average number of sunlight hours per day, rainfall, and suitability of the site for agriculture can be used to address some of the key concerns expressed by school stakeholders. For
example, solar energy appears ideal as an independent source for electricity. With electricity, the school can extend its operational hours to include classes for the community at night. Electricity would also provide the opportunity for the school to introduce computers and technology into its curriculum, and this in turn would provide teachers and the community the opportunity of professional development and continuing education.

Figure 15: Key Issues Taken from the Children’s Artwork Descriptions Wordle

example, solar energy appears ideal as an independent source for electricity. With electricity, the school can extend its operational hours to include classes for the community at night. Electricity would also provide the opportunity for the school to introduce computers and technology into its curriculum, and this in turn would provide teachers and the community the opportunity of professional development and continuing education.
Electricity could also provide the power needed to pump water through solar distilling equipment that is able to purify the water for drinking, and up to elevated storage locations so that gravity can provide water pressure. If more and larger water tanks are available, and water collection is a priority for all building roof construction, there is potentially enough rainwater for the school to become independent in terms of its drinking water needs. With conservation and sensible water reuse practices in place, there could now be enough water to also address sanitation and hygiene concerns as well. The availability of water and the improved sanitation facilities would provide a significant improvement in the work environment for teachers working, or looking to work, at the school.

The site slope and apparent lack of vegetation is important to note as soil erosion appears to be a significant problem. However, revegetation of the site with more trees and plant life for both agricultural and aesthetic purposes would help address this concern and slow water runoff from the site. The added vegetation, in turn, could expand the type of food grown on the site and also act as a source of food for animals. The animals could be cared for by the students at the school as part of their agricultural education. Food products coming from these animals like eggs, milk and meat could be used to support the diet and well-being of the teachers, students and community members. This in turn would improve the working environment experienced by the teachers and help reduce teacher absenteeism and attrition.

The plants could also help support an agricultural micro-enterprise like the keeping of bees for honey production. The production of a product like this that could then be sold to the local community would not only address the curriculum area of community service, but also provide a revenue source for the purchase of teaching resources. Plants and vegetation waste could also be used as a fuel source for methane production. Methane is a combustible gas
that can be used as a fuel for heating and cooking. As the school has a kitchen that prepares cooked food each day for the children and teachers, this would be a productive way to use agricultural crop and animal waste.

The potential for the site to independently address its water, electricity and food needs creates an opportunity to address a particular need expressed by teachers. Onsite housing for teachers would make the school very attractive as a place of employment. The provision of a small home with a garden area for a teacher would be an attractive benefit when included with the base salary of a primary school teacher in Uganda. The housing of teachers’ onsite would also ensure the continued care and security of the animals even during periods when school was not in session. The housing may also be offered at a significantly lower rental rate and this too could act as an addition income source for the school.

Finally, the school needs play, sport, recreational and sitting/quiet areas around the school. First priority should be the addition of a playing field that can accommodate sports like soccer, netball, track and field, and volleyball. This addition would serve students, teachers and the community, while improving school pride, enhancing community wellness and providing a safe education space for the instruction of physical education. Priority should also be given to the development of play areas and play equipment. There should be at least two of these areas and each area should be designed for a specific age group. This will ensure that younger children do not have to compete with older larger children for opportunities to play in the space. Designated space is also needed for students who just wish to sit and read or quietly talk with friends. This space can be large and in the form of a lunch shelter with seating and tables, to benches placed under trees in the secluded area on the east side of the school building. These areas are important to the children and can incorporate plants and
flowerbeds to also improve the aesthetics of the surroundings. This site analysis has also been summarized in terms of the site’s Strengths, Weaknesses, Opportunities and Threats (SWOT) and a copy of this summary can be found in Appendix G.

Case Studies and Precedents

*School Building Construction and Design:*

*A Primary School in Gando, Burkina Faso (Varanda 2011):* This school was designed by Diebedo Francis Kere of Kere Architecture and was the recipient of the 2004 Aga Khan Award for Architecture. This project is notable as a precedent because of the materials selected, the design and layout of the building, and the design of the roof structure to promote water collection and distribution to a garden while promoting ventilation and cooling of the classrooms. The principles used in the construction of this school would be well suited to any new building structures proposed for the Lutiisi Academy Primary School (e.g., teacher housing, toilets, change rooms, lunch shelters or kitchens).

The compound walls for the school in Gando are built with sun-dried mud blocks, or banco, although these appear to have eroded quickly due to their exposure to high wind and rain. Designs of this nature could also use concrete blocks instead of the mud brick, increasing the life expectancy of the building but given that the wind and rain would not have the same eroding effect on the walls in Wakiso, mud brick walls would appropriate. The windows are a wooden-shutter type that allows the sunlight and airflow through the building while limiting rain entry into the classroom. The use of wood in shutters is an attractive and strong alternative to traditional glass windows or wrought iron window grills. Shutters allow air to move through the window opening while still shading the room from sunshine, and alleviate the need for cleaning and maintaining glass panels.
The roof is corrugated sheet metal on a steel frame that runs the full length of the building. The school roof is designed so that the wind and air is allowed to pass through the open eaves providing a cross breeze in the ceiling of the classrooms and ventilating the warm air that has accumulated inside. The roof also extends out over the walk space surround the building acting as cover and shade for these areas as well. Finally, the roof is curved and angle down to the back where the water runs off the roof and into a ditch that transports the water directly to the small garden that the children have developed. This would be similar to the roof needed for buildings on the school site, except the roof would be flat and angled toward one edge that would have a gutter and carry the water to a nearby storage tank. The number of storage tanks served by the roof would then depend on the size of the building, and the tank overflow outlets would then send excess water to the school gardens (See Figure 16).

Figure 16: 2004 Aga Khan Award for Architecture – The Gando Primary School in Burkina Faso
Promoting Sustainable Goals

The NA Barakat Building Tomorrow Academy of Nakaseeta: This school is one of the more recent schools to be constructed by the BT Foundation and was the winner of the 2009 Open Architecture Network Classroom Challenge. Designed by Gifford, LLC, a British structural engineering firm, the design incorporates many of the new sustainability features needed for a school of this region, while promoting many of the shared values being sought in this current landscaping project. This school is unique in that it is also in the Wakiso district so the design also takes into account regional environmental conditions (Gifford 2009).

This project was chosen as it identified goals and objectives that were relevant to the area and to education in Uganda. These goals and objectives include:

1. Health and Wellbeing: This design focuses on the health and wellbeing of the children while they are in school and emphasizes ventilation, shade, noise buffering and acoustics so that the environment is optimal for both teaching and learning. The Lutiisi Academy school site design will also promote these goals with strategies for water collection and solar energy systems to improve access to drinking water, provide better human waste sanitation, and allow for disease prevention through better hygiene practices.

2. Education and Learning: The classroom not only houses the students for instruction, but also acts as a working model for teaching different science principles. For example, the classrooms incorporate a solar chimney that show the children how warm moves and how adaptations like these can improve classroom temperatures. The Lutiisi Academy site design will also incorporate agricultural learning areas for
crop production, animal care and food production, as well as collection of agricultural plant waste for compost soil treatments and as an animal food source.

3. Inclusion and Participation: The NA Barakat Building Tomorrow Academy is considered a building block for the community and has been designed for use by both community members and students. This goal is also important to the Lutiisi Academy project and will be promoted in objectives for shared use of sporting fields, change rooms, toilets, and classroom educational opportunities.

4. Fun and Play: The NA Barakat Building Tomorrow Academy design emphasizes fun and play as being central to the children enjoying their schooling experience. This goal is shared in the Lutiisi Academy school project as well with sport, recreation and play spaces also having a high priority in the design process.

5. Security and Self-sufficiency: The NA Barakat Building Tomorrow Academy primarily works toward ensuring the safety and security of children and their property while at school. The Lutiisi Academy project also promotes these goals, but through the safety and security of the school environment. This is necessary to ensure the appropriate use of shared school facilities and the care and maintenance of livestock during periods when students are not attending school, and is established through the year round presence of teachers and onsite teacher housing. Self-sufficiency is also emphasized through water collection and solar energy systems that allow the school to be independent of government or private utility needs.

6. Adaptation and Flexibility: While this goal relates primarily to the ability of the classrooms in the NA Barakat Building Tomorrow Academy to change in size and shape so as to meet the needs of the teacher and students, the same principle can be
Figure 17: The Sustainable Goals for the NA Barakat Building Tomorrow Academy, Nakaseeta, Uganda

applied to the landscape setting. While sections of the Lutiisi Academy school site have been allocated for vegetables, livestock and an orchard. These space sizes can be varied depending on the needs of the school. In addition, the selection of vegetable type, fruit type, and livestock can also be altered as needed. Flexibility can also be found in the use of water that is collected and stored from all building roofs. This means that water harvested from buildings like the lunch shelter can be used for either drinking by the students or for cooking in the kitchen.

The NA Barakat Building Tomorrow Academy was opened for teaching in July of 2012 and an example of how much architectural design has changed for schools being built in Africa since the construction of the Lutiisi Academy Primary School in 2006 (See Figure 17).
Environmental, Educational and Social Benefits of Landscape Design

The Brent Elementary Schoolyard Greening (Phase 1): The Robert Brent Elementary School is an older school in downtown Washington, DC, that has undergone some selective retrofitting. While not a school in Africa, it is significant as a precedent because it supports two design principles that are important to this project. The first is the use of rain gardens to collect water, recharge the aquifer, and reduce runoff from the site (i.e., in this case, into storm water drains). The children at the Lutiisi Academy would like to see more flower gardens, so this is a good solution for areas on the site experiencing drainage issues. The second principle of note here comes from the school’s supporting documentation describing the benefit the rain garden has had on students’ overall education. Brent Elementary has monitored the progress of the students since the renovation of the parking area into a rain garden. During this time, the school has experienced an increase in the number of teachers teaching in the rain garden, number of class hours spent in the rain garden, educational performance scores of the students at the school, and new student enrollment at the school due to the presence of the rain garden. For these reasons, the Brent Elementary School is considered a strong precedent in the design process for the Lutiisi Academy Primary School.

The Brent School Greening was designed by Sustainable Life Designs and involves the return of a blacktop parking area to mostly rain garden and paved walkways (Sustainable Life Designs 2010). The project highlights the importance of vegetation over paved surface for the reduction of in an area, and the value of a rain garden in terms of its capacity to absorb rainwater and recharge the aquifer. The rain garden itself also acts as a “Nature Classroom” for instruction. This teaching area has been used for subjects ranging from
science to art, music and English, and is in constant demand by teachers. The rain garden includes a butterfly garden and maintenance of the garden is through student, parent and community volunteer events that promote environmental stewardship, as well as parent volunteers who take turns watering the garden during the summer months when school is not in session.

This school is one of the few that has documented the impact of garden space on different aspects of its educational role. The benefits of the Brentwood Elementary Schoolyard greening rain garden renovation include:

1. A reduction in the daytime surface temperatures in the area of approximately 23 degrees F, and a reduction in the air temperature of the area of approximately 9 degrees F;
2. The rain garden holds approximately 720 gallons of storm water, or about 79% of a one-year storm. The ten trees in the garden are estimated to intercept a further 1,600 gallons of storm water annually;
3. The garden provides 1 to 2 hours per week of outdoor instruction for Grades 1 to 5, and 4 to 5 hours per week for preschool and kindergarten aged children;
4. Along with other improvements to school, the garden helped increase enrollment by 191%; and,
5. The garden helped increase student attendance, reading test scores, parent engagement, and parent/staff satisfaction with the school.

While the Lutiiisi Academy primary school does not have any parking surface blacktop that can be replaced by a rain garden, but it does have a significant amount of bare exposed ground that gets hot during the dry season, and that enhances surface runoff of rainwater.
Water runoff around the school is particularly evident along the west side of the school building and drainage swale has been dug there in an attempt to keep the water away from the school building as it runs past so as not to undermine the school foundations. Water also overflows from the gutters on the school building and this water collects in the central courtyard area as it has nowhere to drain. Given the slope and drainage pattern of the site, the use of rain gardens along the west side of the school could act as holding and detention areas that would slow the runoff of the surface water and increase its ability to recharge the aquifer. A garden in the central courtyard area would also provide a holding space for water that accumulates there and help keep the water away from the building and the classroom entrances. Most importantly, this case study rationalizes the use of gardens as an environmental protection strategy, a teaching environment, and as an aesthetically pleasing addition to the school environment that promotes community involvement and increases student attendance and school performance (See Figure 18).

Site Program

From the information obtained in the site analysis and from the precedents, the following site program as developed for the Lutiisi Academy Primary School. The program is broken down into three priority levels and is shown in Table 2.

Site Concept Development

To establish a framework for the layout of the school site, a conceptual model showing the spatial organization of key usage areas was developed. For example, energy is needed to move water through solar hot water treatment systems, and both energy and water is needed for spaces like teacher housing and school instructional areas (i.e., classrooms). So energy and water are critical and need to be located in close proximity to the areas that need them
Figure 18: Before and After Photos of the Brent Primary School Parking Lot Greening
Design Program:

| PRIORITY 1: | PRIORITY 2: | PRIORITY 3: |

**Goal 1:**
- Provide recreational spaces and amenities around the school that serve students, teachers and community member needs.

**Design Objectives:**
- Develop a sporting field area approximately 300 feet by 170 feet as a multisport playing field in close proximity to the school.
- Identify and develop play areas for children of different age groups.
- Provide a covered space that can be used for recreational and lunch purposes.
- Provide new toilets and change rooms to support the recreational areas.
- Provide additional flowerbeds, trees and vegetation to improve the aesthetic around the play areas.

**Goal 2:**
- Increase the collection and amount of water available to the school.

**Design Objectives:**
- Include water tanks and roof rainwater collection with every building on the site.
- Increase the number of water tanks used at the school to ensure the school is independent of well water needs.
- Include a solar hot water treatment process for water that is used for drinking and cooking purposes.
- Include a solar powered pump system for the solar hot water system.

**Goal 3:**
- Add trees and vegetation to slow water runoff from the site and increase aquifer recharge.

**Design Objectives:**
- Utilize permaculture and farming techniques that detain and hold water to slow runoff from the site.
- Utilize hedged shrubs for living borders and fencing
- Include an orchard and more fruit bearing trees in the landscape to increase food production on the school site as well as re-vegetate the site.

Table 2: Lutiisi Academy Primary School Program Goals and Objectives
### Goal 4:
- Provide an appropriate septic human waste disposal system for teachers and students at the school.

**Design Objectives:**
- Design and locate toilets that are located near key teacher, student, and community use areas, and that can meet the needs of community, teachers and students.
- Design and locate a septic well system for the toilets that can be easily accessed and emptied by government sanitation trucks if necessary.

### Goal 5:
- Expand and develop the agricultural potential of the landscape.

**Design Objectives:**
- Provide design options that address concerns related to soil erosion and flooding around the school building itself.
- Provide livestock options for both instruction and food production services.
- Provide on-site teacher housing that allows for teachers to be present and monitor the animals and crops during times when school is not in session.
- Define on-site teacher crop spaces for teacher gardens and livestock accommodation.

### Goal 6:
- Provide a renewable energy source and energy storage system for the school.

**Design Objectives:**
- Provide enough roofing Solar Panels to the school roof and surrounding buildings to create electrical energy for:
  - for the lighting of a single classroom; and,
  - the power needs of 10 computer systems for approximately 4 hours.
- Ensure solar panels are included as part of all new buildings (i.e., latrines, kitchen, etc.) for lighting, pumping water, etc.

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**Table 2: Lutiisi Academy Primary School Program Goals and Objectives (Continued)**

(i.e., lunch area, kitchen, etc.). In turn, the lunch area needs to be relatively close to the instructional areas and the kitchen, have access to drinking water, and also have access to toiletry facilities. Ideally, this area should also be in reasonable proximity to a food waste collection and composting, which in turn would be located near the agricultural area. This
ensures that these spaces not only the meet the needs of the program design, but also address the personal needs of the teachers, community members and students, as well as the educational needs of teachers and students. A diagram of this model is provided in Figure 19.

The site analysis, precedents, and information collected from teachers, students and community members have provided a road map for the development of site program goals and objectives. These goals and objectives can now be applied with the spatial organization concept model in the development of a master plan for this site.
CHAPTER FIVE: FINAL DESIGN, CONCLUSIONS AND RECOMMENDATIONS

The information gathered from the site analysis, interviews, video transcripts, and observations made of the teachers and students during the school day, along with the space usage organization concept model and the precedents formed the foundation for the design for this site. The site program has identified priority areas that need to be addressed and the design offers sustainable solutions for addressing these issues. It should be noted, however, that the design offered here only provides a starting point in the development of this site. For example, there are a number of other more sustainable options for the sanitation system than septic tanks. However, a septic tank system is both understood as a sanitation system and seen as an acceptable step forward in the development of the school. While the implementation of an alternative sustainable sanitation system would be environmentally sound and provide an excellent teaching model for students and adults learning at the school, it may not be culturally acceptable those using it, and ultimately not embraced and replicated as a practice. Social sustainability, as well as environmental sustainability, are needed for the successful implementation of these design features, and this will only be achieved by presenting all of the options, and discussing these options with the teachers, students and community members who are involved in the school.
The design should also be viewed as a blended outcome that takes into consideration both the site program and the site itself. For example, the sporting field is a large area of space that can only fit on the school site in specific places. The size, shape and orientation of the site may also make it necessary for the sporting field to undergo some modifications if it is to be included in the final design. Ultimately, the way in which these areas and spaces are included in the site balances the benefit the space provides with the impact the space has on the site and the environment surrounding it.

Site Design Considerations

In addition to the spatial organizational model used to help layout the different usage areas for the school, six other considerations were made to ensure the project goals were met and enhance the quality of the site. The design underwent a series of revisions and iterations before the final design was established and a visual summary of this revision process can be seen in Figures 20 through 22.

Siting the Sporting Field

The siting of the sporting field was limited in that it would only realistically fit in one area of the site and still large enough for a youth sized soccer field\(^3\) to be marked on it. As good fortune would have it, the field is actually located in an excellent position in terms of drainage on the site. The terracing of the sporting field will slow runoff from the site and this will help keep the turf on the field well watered. The primary difficulty in locating the field at the north end of the site was that it was in the steepest location of the site and terracing that area of the site would involve the movement of a significant amount of soil. It also meant that

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\(^3\) Boys sports like soccer and rugby require large areas to play. Sports like these need a playing area of 100 yards by 70 yards to be considered a full size adult competition field.
Figure 20: Master Plan Design Iteration #1
Figure 21: Master Plan Design Iteration #2
Figure 22: Master Plan Design Iteration #3
the field would need embankments, and these would need to be reinforced. Embankment slopes would need to be 45 to 50 degrees for the field to be flat (i.e., with a 2% to the north) and not to impact neighboring sites, and these embankments would erode easily if left exposed. Terracing the slopes would be ideal, especially on the south, school side of the field, as this would also provide seating for spectators. This could be done at some expense using retaining walls, or at less expense using rock filled gabions. The cheapest approach for protecting the embankments would be to place a rock rip rap over the surface, and this could even include recycled crushed concrete if local rock was not readily available.

Even with the field now located in the largest area available for it on the site, adaptations were still needed. The soccer field would be a reduced sized field, large enough for children of primary school age to play on and compete, but significantly smaller than a regulation fields for adults. In addition, the field does not run north and south, so there will be times of the day when one team would be looking toward the sun while playing. While suitable for practices, these compromises may make the field ineligible for competition play at the adult level should the community seek participate in a soccer league with other community teams. For other sports like netball or volleyball, however, the field is more than large enough. For many of these sports, the field is actually able to accommodate more than one court in the field space. For example, two or three netball courts could be marked out on a sporting field of this size and played on simultaneously, or a netball court and a volleyball court could both be marked out on the field, with enough space for both to be played at the same time.
Teacher Onsite Housing

The provision of teacher housing on the site can have a significant impact on issues related to teacher work ethics, attrition and absence, as well as the overall quality of instruction. By providing accommodation, the need for transportation to work each day will also be removed and teachers can support one another more closely. If the housing includes land that allows the teacher to have a garden and keep animals of his or her own, this would be a significant benefit above that of just a salary, and would change the primary school from being an undesirable teaching location, to one that is actively sought out for employment.

The location of the onsite teacher housing was carefully considered. While the presence of teachers year round would promote security at the school and allow livestock to be cared for year round, the location of the housing should also be in an area that allows teachers to disconnect themselves from their workplace as well. To achieve this, the southern end of the site was chosen for teacher housing. This area is readily accessible to the school using the south branch road, able to accommodate a number of teacher housing units, and as far as one can be from the school itself while still being on school land. This separation is further enhanced by locating the agricultural areas (i.e., crops, orchard, and livestock areas) between the teacher housing and the school. These provide a visual barrier between the housing and the school while still keeping places like the livestock area close enough for teachers to monitor and care for.

The Locating of Livestock and an Orchard

The area allocated to livestock and animals needs to be close enough so that the presence of the teachers enhances the security and on-going care of the animals (i.e., gathering of eggs from chickens, milking goats and feeding animals). However, the types of
animals being kept (e.g., bees, goats, etc.) may not appeal to all teachers, in terms of smell or potential risk. As such, the teacher housing has been separated from the livestock area by an orchard. This ensures the animals are still close enough to be tended, while far enough from the housing area to be separate as well. In the case of the bee apiary, the orchard and surrounding vegetation support the production of honey while ensuring the bee hives are located a safe distance away from human activity.

Enhancing Site View Lines

The southern portion of the site was also chosen for teacher housing as it is the highest area on the site and has the greatest potential for views down into the valley. The views from the teacher housing were angled to be more in line with the direction of the slope, and so that the teacher housing would not look directly onto the school; again attempting to separate teachers from the school and work areas visually. The directing of views for the teacher housing was accomplished by creating view corridors through the orchard area using the spacing between the trees. The only exception to this rule was the school principal’s house. This house faces toward the school and has a direct view line through the orchard, livestock and crop field to the school playground and Nandi tree located on the school site.

Using Vegetation to Enhance the School as a Place in the Community

There are 3 different types of tree that have been added to the site to increase the aesthetic value and visibility of the school. First, there are two rows of Wild Magnolia, or Tabernaemontana stapfiana, trees that create a colorful welcome corridor to those arriving at the school and entering the site for the first time. The second tree is the Cassia, or Senna spectabilis, tree that is a small and very attractive ornamental tree. This tree has been located by the small children’s playground at the rear of the school. It has very attractive yellow
flowers when in bloom and will make a nice, colorful, shaded area for the smaller children to sit and talk under. The final tree is the Nandi Flame, or Spathodea campanulata, tree. This is a very large tree that can grow up to 80 feet tall and has a very colorful red or yellow flower. It has been chosen as a landmark tree for the school because its height makes it easily seen from a distance and has been located between the two existing trees in the lunch area at the center of the school. If available, a yellow cultivar would be used as this matches the school colors of blue and yellow.

*The Inclusion of a Micro Enterprise*

The inclusion of a microenterprise attempts to expand the existing agricultural component of the curriculum while introducing a potential community service component as well. The community service component allows the school to provide a product to the community at a subsidized rate. In this way, the students are learning a new skill in agriculture while the school supplements its income and uses this funding source to improve their teaching resources. The raising of bees and apiary honey production is just one opportunity available. Other options might include the sale of meat harvested from animals kept at the school, the sale of milk and eggs produced by animals at the school, the production of foods like jellies and sauces from fruit and vegetables grown on site, food preservation techniques like the drying and canning of fruit and vegetables, and even the collection and sale of compost fertilizer. It should be noted that the school could also sell excess livestock that then become livestock herd “starters” for families in the community.

The school may also want to consider “viral type” pay forward schemes. This means that one member of the community may complete a class or volunteer at the school caring for the animals for a period of time. He or she then receives a pair of goats with the provision
that they give one of the first offspring (goats have multiple offspring in their litters) to a neighbor so they can start their herd, or back to the school so that the animal can be sold or given to someone else as part of a pair. In this way, animal care fulfills both the agricultural and community service educational requirements of the primary school curriculum while strengthening the community in the process.

Site Master Plan and Elevations:

The resulting master plan, elevations showing different section views through the site, and site perspectives are offered in Figures 23 through 36. The key features on the master plan are numbered and labeled. These key feature descriptions are also assigned icons indicating the key issues identified in the interviews from the site analysis\(^4\) that they address.

Addressing the Design Program Goals and Objectives Through the Site Master Plan

The site master plan is best summarized in terms of the way in which it addresses the site program\(^5\). As can be seen from the design explanation, many of the features offered in the master plan benefit more than one site program goal, and often support the provision of design features that in turn provide other benefits. This concept is discussed further in the conclusions for this section.

*Program Goal 1: Provide recreational spaces around the school that serve students, teachers and community member needs.*

This goal includes objectives that address the need for a recreational sporting field, play spaces for children of different age groups, a covered seating area, toilets and change

\(^4\) For a review of the issues and comments obtained from the interviews and artwork activities done with the children, the reader should refer to Figures 4, 5 and 6 beginning on page 54.

\(^5\) To review the site program goals and objectives, please refer to Table 2 again on page 73.
Figure 23: Site Master Plan and Surrounding Context
Figure 24: Site Master Plan and Design Features
Site Master Plan Design Feature Descriptions

Figure 25: Site Master Plan Design Feature Descriptions
Figure 26: Master Plan Showing Elevation Section View Lines
Figure 27: Section A-A’ Elevation

Figure 28: Section B-B’ Elevation
Figure 29: Section C-C' Elevation

Figure 30: Section D-D' Elevation
Figure 31: Section E-E' Elevation
Figure 32: Section F-F' Elevation
Figure 34: View of the School From the P3 to P7 Playground
Figure 35: View of the Tree Line Along the Sporting Field
rooms for the sporting field, and the addition of vegetation to improve drainage as well as aesthetic concerns. In response to this goal, the site design includes the following features:

1. The addition of the multisport recreational field has been offered at the north end of the site. This was the only place a sporting field big enough to hold boys sports could be located on the site. Ideally the sporting fields should run north and south so no team has to play while looking directly into the sun, but due to the shape of the site, this was not possible, and the best compromise appeared to be placing the field at an angle. At 270 feet in length, and 150 feet in width, it is a reduced-size soccer or rugby field. However, the field is still large enough for 3 netball courts or 3 volleyball courts and would also be large enough for a reduced size athletic track to be marked out. The field needed to be on a terrace with a 2% grade for drainage from south to north, and this created some interesting issues in terms of stabilizing the embankments that resulted from leveling of the land in this fairly steep part of the site. A low cost solution to the embankments needed around the field might be the use of local rock or recycled, crushed concrete rip rap on the slopes to prevent erosion while grasses and trees on the slope are also still getting established. For a little more cost, rock filled gabions could be used to form small terraced steps instead of a slope, and these gabion terraces could also be used for seating and watching sports from the side of the field. To maintain the field and keep it grassed takes care and water, especially during the dry seasons. The field is well located for this in that it is located in the lowest area on the site, catching and detaining runoff from the entire site, while reducing and slowing the water runoff from the site onto the neighboring sites that lie below it.
2. Two play areas have been included on the school site. The first is located on the north side of the school and is designed to accommodate children in grades Kindergarten through P2. Play equipment for children in this age group would focus on activities that promote balance, coordination, and spatial awareness, as well as social interaction spaces that are smaller and well contained (e.g., sand boxes or playhouses). This play equipment could also incorporate educational features like shape recognition, numbers and the alphabet manipulative activities. This area would be covered or shaded, and made from materials like wood as much of this play equipment could become hot during the day when exposed to long periods of sunlight and heat. The addition of screens and covers would be a great way to add the school colors of blue and gold to the school site landscape as well.

The second play area is located in an area north of the road and new parking area, on the west side of the school. This space would be for children in grades P3 through to P7, although many of the children in grades P5 through P7 choose to participate in games being played on the sports field. This play area would contain equipment that promotes gross and fine motor skill development, physical strength, endurance and agility. This equipment would also contain challenge activities that promote initiative and resourcefulness, and could even include animals or theme type play areas that encourage imagination during play. Again, I would recommend that play equipment be shaded or made of cool materials like wood so it does not become too hot and unusable during the dry season.

3. A new covered area for eating lunch and just sitting and talking with friends has been added to the site west of the lunch area. In addition, new toilets and change rooms
have located on the west side of the school site between the lunch shelter and the sporting field. This location is ideal as it allows the community access to the sporting field and change rooms without them having to walk through students or other school facilities. The new toilets are close to the lunch, sporting field and play areas, and the boys and girls toilets have been separated by placing the change rooms to the middle of the structure and the toilets at the ends. Both lunch shelter and toilet/change room structures have 5,000 Liter water tanks for rainwater collection, and this water could be used in either the toilet facilities, for drinking at lunch, or for cooking in the nearby kitchen. The septic tanks for the toilets would be located under the soccer field, on the west side, and this would enable any government truck coming to empty the tanks to access them from the road easement on the western border of the school site.

4. A large number of natural trees and flowers have been added to the site to improve the site aesthetics as well as increase the shade in the area. The vegetation will also help slow the run off of water from the site and increase the aquifer recharge rate, reducing the overall amount of water leaving the site. The trees would be a mix of large and understory native trees with a selection of different fruit bearing native or naturalized trees (e.g., Annona squamosal or Wild Custard Apple) that can also provide food for the school. The native trees would include a mix of Albizia (i.e., Albizia amara) and Arcacia (i.e., Arcacia hockii or Acacia mellifera) (Dahrani 2011), as these are attractive flowering trees that are also preferred by bees and would support the Apiary honey production (Personal communication, Najma Dahrani, 5 March 2013). Many of the children wanted more flowers at the school so flowerbeds have been added around the water tank and in the courtyard area of the school. These
flowerbeds have been located in places that were areas of concern in terms of drainage and water erosion (e.g., down the west side of the school where drainage swales have been dug to reduce the undermining of the school foundations, and in the school courtyard where water collects and has difficulty draining away). Flowers in the garden would include Birds of Paradise (i.e., Strelitzia reginae) and Aloe (i.e., Aloe vera and Aloe zebrinata). These are colorful plants that promote both insect and birdlife, while also being native to eastern Africa and tolerant to dry weather.

**Goal 2: Increase the Collection and Amount of Water Available at School**

The objectives found in this goal include an increase in the size of the water tanks used on the site, the addition of more water tanks alongside collecting water from every roof surface, the addition of solar hot water heating systems on the roofs of the buildings on the site, and the addition of solar energy powered pumps that move the collected water through the solar hot water heating systems. In response to this goal, the site design includes the following features:

1. The water tanks used in this design are 5,000-liter tanks rather than the 2,000 liter tank size already being used. The information collected from the teachers indicated that the 2000-liter would only last approximately 2 weeks if used conservatively during a period without rain. Increasing the volume of the water tank to 5000 liters would increase the water available from one tank alone by 250%. For a 6.5-foot tall water tank, this would only increase the tank radius footprint on the ground from 1.85 feet to 2.95 feet.

2. To ensure water for a dry period of at least 4 months, four 5000-liter tanks were added to the school building roof water collection system. The surface area of the
school roof comprises two, 60 foot by 20 foot wings of the school, and one central joining wing of approximately 40 feet by 20 feet. In a year with the total rainfall at only 66% of the average estimated rainfall (i.e., 20 inches when the average estimated annual rainfall in the Wakiso District is 33 inches per year), the water collection capacity of the roof would be 9,216,000 cubic inches per year, or 151,000 liters of water. Even with a roof and gutter water collection efficiency of 60%, this would still allow for approximately 90,600 liters of water to be collected in total. As such, the inclusion of four 5000 liter tanks, in place of the one 2000 liter tank, would extend water use for more than 4 months, still be less than maximum collection amount that could be obtained from the school roof during a dry year, and could still provide enough water to be used for other purposes, like hygiene and sanitation.

3. Every building on the site now collects water. For example, there are two 5000-liter water tanks that collect water from the lunch shelter, two 5000-liter tanks that collect water from the new toilet and change room facilities, two 5000-liter tanks that would collect water in the livestock agricultural area, and each of the teacher housing units has a 5000-liter tank attached to it. The roofs for each building noted above, except for the livestock buildings, have solar energy panels that support an electrical pump and a solar hot water system. The pump is designed to move the water from the tank to the hot water system on the roof, where gravity then provides the energy to move the water to a lower storage area where it can be stored until used. The solar hot water

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6 The water collected for the livestock would be collected in water tanks but stored in smaller irrigation reservoirs under the shelter roof to help keep the water cool. The water would not be treated using a solar hot water system and any extra water from the water collection tanks would be directed to the agricultural area to the north of the livestock site.
system is used to boil and treat the water so that it can be used for drinking and cooking purposes.

Goal 3: Add trees and vegetation to slow the water runoff from the site and increase the aquifer recharge.

This goal addresses objectives related to the use of permaculture and farming techniques that detain and hold water to slow runoff, the use of hedges to act as borders and living fences, and the addition of an orchard and more fruit bearing trees to increase food production while also re-vegetating the site. The features addressing these objectives include:

1. The creation of four main agricultural areas at the school. These are the southern end Orchard, the livestock area, the southern crop field that now includes both sides of the southbound branch road, and the easement area for anticipated north branch road on the western side of the school site. The orchard will contain two different fruit tree varieties: one high and one lower. While the actual choice of trees would be up to the teachers and School Management Committee members at the school, it is recommended that the high trees be Plantains. Low trees could be a citrus fruit tree like a lemon or lime trees, or even a hybrid mango tree like the Casimorea edulis that produces a large amount of this sweet and nutritious fruit. Given the level of experience teachers and community members have in agriculture, grafted fruit trees might also be an option and this technique might a useful subject area to address in the school curriculum as well (Personal communication, Najma Dahrani, 5 March 2013). The main school crop field would now be located on the south side of the road. This field could be planted with a wide variety of crops along the contour lines of the slope. Permaculture methods could also be used to help retain water on the slope and
reduce runoff. These methods might include planting crops using mounds to force the water to move in a zigzag pattern down the slope and using recessed planting areas the collect and hold water before filling and letting the water overflow and continue down the slope. The agricultural area in the anticipated north branch road easement would be a teaching area for younger children showing them different forms of permaculture growing techniques. This would include small plot farming techniques like those found in home yards that grow a number of different vegetables together. For example, corn, beans and squash (i.e., the three sister vegetables) can be grown together successfully in small 15 foot by 15 foot gardens (Hyman 2010). These combination gardening techniques are very important and this space is ideal as a teaching area, especially for the younger children who now do not need to walk far or cross the road.

2. Hedges are also used to add color to the site while acting as a living fence to border off the school space from the road and parking areas. For this task, a Bauhinia tomentosa, or Camel’s Foot, is recommended. It has very attractive yellow flowers that would promote the school colors, forms a dense hedge row, and while not yet recorded as growing in Uganda, is indigenous to the region and prolific in Kenya and Tanzania (Dahrani 2011).

3. There are a considerable number of trees that will be added to the site perimeter both around the teacher housing and around the school site in general. These trees will be primarily flowering native trees that will support the bees and honey production, as well as fruit trees like Jack Fruit, or Artocarpus heterophyllus, that are eaten and enjoyed by the community and prevalent in the area. While the Jack Fruit tree is
exotic, it is a very fast growing tree that will grow from a cutting and produce a large amount of sweet fruit that children enjoy eating. Trees will also be added to the border along the south branch road in the southern half of the site. These trees will be designed to shade the area for teachers when walking home after work and to help keep vehicle speed low in case students are working in the field that straddles this road. Trees are added to the play and central lunch area on the northern half of the school site to provide shade, and these will be in addition to the existing trees in this area. In particular will be the addition of a Nandi flame tree, or Spathodea campanulata, which is a very large tree with very bright red or yellow flowers. This tree can grow to a height of 80 to 90 feet and with its vibrant red or yellow flower, will make an excellent landmark for the site and the school. A smaller Cassia tree, or Senna spectabilis, has been placed at the rear of the school to add shade and vegetation color to the playground area located there. Indigenous wild magnolia, or Tabernaemontana stapfiana, trees have been used to line the entranceway to the school. The entrance itself has been moved to the east and the Magnolias are planted about 15 feet off the entrance pathway to ensure the school, courtyard garden, school flagpole, and the Ugandan flag can be clearly seen. Finally, hedges will be used to border the north side of the road and parking area from the school space, and berry vines will be used along the borders to define the school site boundaries in the agricultural areas. These vines will act as a deterrent for grazing animals entering the property while also providing another source of food for the school staff and students.
Goal 4: Provide an appropriate septic human waste disposal system for teachers and students at the school.

This goal addresses two objectives. These objectives include the relocation of toilets near key student, teacher and community member usage areas, and the location of a septic tank system that can easily be accessed by government sanitation trucks if necessary. These objectives were addressed through design features like:

1. The building of new toilets and change rooms between the lunch area shelter and the sport field on the west side of the school building. This location allows for access to the soccer field and amenities by community members along the west boundary of the site and from the north branch road, should it be developed by the government in the future. It is also close to the lunch seating areas, all three play and activity areas for the children, and the school building as well. It will served by its own water and the two 5000 liter water tanks should hold enough water to support both the sanitation system and hygiene practices like the washing of hands after going to the toilet.

2. The toilets themselves have been located in this area so that the septic tanks can be located under the soccer field in the west corner. This would allow for easy access to the septic tanks if they needed maintenance or emptying from the easement area.

Goal 5: Expand and develop the agricultural potential of the landscape

This goal addresses objectives targeting issues related to soil erosion and flooding around the school building, the addition of livestock to the school’s agricultural program, the provision of on-site teacher housing, and the provision of gardens and livestock areas for the teacher housing. These design features include:
1. The provision of garden areas both in the school center courtyard and on the west side of the school building where the drainage of water has already been determined as being a problem. The growing of flowers in these areas not only improves the aesthetic of the school but slows the rate of runoff from the site, increases the aquifer recharge, holds water that may accumulate due to poor drainage, while enhancing the school science biology curriculum if the plants are varieties that are not seen in the area any more.

2. The addition of livestock is encouraged, and livestock shelters have been provided between the south crop field and the teacher housing areas on the site. This area includes covered and open pen areas for goats, chickens and rabbits, with an apiary for bees. Food from the animals can be used to support teacher food supplies, or school lunches. In addition, the presence of teachers at the school year round through onsite housing enhances the security and care of the animals, especially during holiday periods.

3. The apiary and beehives are an excellent source of food in the form of honey for school use, teacher use, or for sale to the community. A small microenterprise could be located in the livestock covered areas that would allow for treatment and the packaging of honey for distribution to the local community.

4. Each teacher, housing unit is self-contained and has its own water, solar power, solar water heating system, and garden area for growing vegetables and keeping animals if desired. Trees have been added to this area as well to provide recognizable boundaries to the school site. These trees are both flowering trees to support the apiary and fruit bearing trees to supplement the food supply for the teachers. Borders
are also lined with berried vines so supplement food supply. Discussion of livestock choices with the School Management Committee and community members indicated that goats and chickens are readily acceptable, but that rabbits are not. Rabbits however are an excellent livestock choice as they are prolific breeders, easy to raise, eat local vegetation, and their meat is a good source of protein (Personal communication, Najma Dahrani, 5 March 2013). So, in this light, community members would be strongly encouraged to look at rabbits as another viable food source option as well.

Goal 5: Provide a renewable energy source and energy storage system for the school.

This goal has objectives that address the need for an independent power source that can create electrical energy to power school lighting and technology for 4 hours at least one night a week, power the electrical water pumps needed to move the water through the solar hot water system, and provide lighting and power in other buildings like teacher housing and the school kitchen. Features addressing these issues in the design include:

1. The inclusion of solar panels on all buildings that collect and use water with the exception of the livestock shelter area that simply collects rainwater for the animals without treating it. This energy is first used to provide power to the electrical water pumps used to circulate the water through the solar hot water systems, and then for lighting.

2. For the school building, solar energy is collected and stored through a series of rechargeable battery cells that are then used to provide power for:

   a. Four hours of lighting after school for community and teacher on-going education programs, and
b. Ten computers and a projection unit to be powered for 4 hours to allow for on-going education programs to be delivered.

3. The solar energy and water collected from the new school lunch shelter roof can be used by either the school toilets or for the school kitchen as needed. The water from shelter roof could also be treated by the solar hot water system and used as a source for drinking water during lunch by the students.

Overall, the site design proposed for this site comprehensively addresses the site program goals and objectives and the needs of the teachers, students and community members. Indeed, the strategies utilized in this design often serve more than one objective or goal, and in many cases, multiple strategies are used in concert to address one specific goal or objective. For a summary of the benefits provided by each of the key design features, and the impact these features have on other features, refer to Figures 15 and 16.

Summary and Conclusions

As education takes on a higher priority in African nations like Uganda, more schools and teachers are needed in underserved rural areas. Unfortunately, these rural areas receive the least amount of public and government financial support resulting in low teacher retention, low student attendance, and ultimately, a lower overall quality of education. For many students in rural areas, primary school may be the only educational opportunity they receive. As such, a significant effort needs to be made to improve educational opportunities in rural schools so that students have some vocational preparedness upon leaving primary school.

While the addition of classrooms are an important part of this educational process, a considerable portion of the newly revised primary school curriculum can be, and indeed
should be, taught in outside learning environments. This is especially relevant in rural areas of Africa where agriculture is predominant both as a form of income and as a subsistence living, survival skill. Effective design of the outdoor areas around the school may provide additional learning opportunities and enhance the quality of education provided.

The purpose of this project was to utilize a coproduction approach to the redesigning of the landscape around the Lutiiisi Academy Primary School. This coproduction approach involves determining the needs and interests teachers, students, and community members have for this space as an educational area, and how they would like to see the space used and developed in the future. This approach involved gathering information from teachers, the School Management Committee, and members of the community using group interview methods and from children using art activities and analysis of the verbal descriptions they gave of their artwork. This information was combined with information established through an analysis of the physical site around the school, and observational information gathered on the use of the school site by teachers, students, and community members to determine the key issues affecting the site and its use as an educational setting. A site program containing goals and objectives was developed to address these issues, and this site program guided the design process.

The design that evolved from this process addresses a variety of issues across a number of different areas and uses a complex systems approach to resolving these issues in the reshaping of the landscape. For example, the addition of teacher housing not only addresses the concern of livestock care during periods when students are not attending school, but it also addresses issues like the security of the school site and provides benefits like accommodation and access to food that are not available in other schools and teaching
positions. This in turn improves the desirability of the school as a place of employment, which improves teacher recruitment, retention, and instruction at the school. This allows one design change to have considerable influence and impact in a number of different areas related to education at the school. It also allows for a feedback loop to be established (i.e., the provision of teacher housing allows for the addition of livestock at the school, which in turn provides food that the teachers can use reinforcing the teachers desire to remain at the school) that supports itself and helps sustain the change (Sterman 1994).

The final design offers a series of solutions to physical, social, environmental, and educational issues for teachers, students, and community members. The design also addresses these issues in ways that both meet the needs of users and can be understood and appreciated by the user. It is important to remember, however, that these design features are simply a starting point for the conversation on how the Lutiisi Academy Primary School might address these needs in the landscape. On-going input from students, teachers, and community members will be essential if these enhanced educational opportunities are to emerge.
REFERENCES


APPENDICES
Appendix A: Teacher Interview Guide and Responses to Guide Questions
Teacher Interview Questionnaire Guide:

1. Can you describe your school please in terms of numbers of teachers, classes.
   - 7 Government teachers and 3 teachers that are paid School Management committee made up of parents.
   - Extra teachers are for nursery – you have to have nursery to have pre 1 – paid for by committee. 4 to 6 years of age.
   - Also looking to have a playgroup at some time to have 2 to 3 years old for the school in the future.
   - Government support = $1000 per term per child

2. When you think about primary education at Lutisi, can you describe is role and the role of the curriculum for me? What do you see as the role of primary education and the primary education curriculum for the children here at Lutisi?
   - It is the first stage of literacy development. By the time the child reaches P7, they should have the foundational skills in reading, writing and mathematics.
   - These skills form the foundation for higher education, as well as trade and vocational training, and agricultural and farming. Schooling at this primary school includes basic agriculture and farming.
   - Not all children from Lutisi who pass go on to secondary education, and the pass rate for the P7 group at Lutisi is about 70%. In last years group, all of the children went on to secondary education at St. John’s High School through the scholarship support provided by Building Tomorrow. Even though there is USE, not all high schools are government schools and free. There are even less options for those in rural areas. So for many who pass, secondary school is just not attempted for a number of reasons. These include:
     - Distance is too far to the school
     - Cost
     - Marriage
     - Work to support family
   - Those who do leave get unskilled work or for the girls, many get married and become stay at home mothers. To learn a trade, you must pay so even this option is only available to a few.

3. What subjects are taught in the primary curriculum at Lutisi?
   Thematic Curriculum:
   - P1 – P3 : math, English, local language (which for Lutisi is Bugunda – Note there are over 50 languages spoken in Uganda so English is the common/central language and local languages are then used in selected areas and environments like schools), literacy 1 and 2. Drawing, Music. Rotates around the curriculum themes. Themes like Our school, our town, etc. Also PE
   - In P4 – transition – Buganda is spoken here at school as we are in the Buganda language region. This language is now taught and English is taught as a subject. Language of instruction by teachers is English, although many times, the local language will be used to try and get a teaching point across to the student.

4. Can you describe a regular day? What does a regular day at school look like for you and the children?
7:30am – All kids come to school
8:00 am – Assembly – Teaches get assigned tasks and reports to do for the week at first assembly. Different teachers control the assembly and talk about discipline/aids, and any important information for the week. Children assemble outside the school on the grass area.
8:15 to 8:30 am – 3 lessons are taught by teachers to their classes.
10:30 am – 30-minute morning break where the children go outside and run around and play.
11:00 am – Children return to class and take 2 lessons and study to 1:00pm.
1:00 pm – 2:00pm – P1 and P2 will go home unless the teacher feels the children need to stay do some remedial work in an area they behind in. These children can then stay up to 3:00pm. Does not happen often but it is available for teachers if they need it. For all other grades – 1 hour for lunch until 2. Children stay at school and eat a porridge made at the school by the community support group who work at the school each day. The teachers are also given a meal ... on the day I was there, they ate a stew of beans and meat with bread. The children often come from home with nothing so it is up to the school to feed them while there.
2:00 pm - Study until 3:30pm.
3:30 pm - Play games. On Friday the children are responsible for cleaning up the school. They clean up the classrooms, fetch water, mop, clean latrines, and do gardening too.
4:30 pm – Children go home except for the P7 class who now spend an extra hour preparing for their primary school leaving test. They were just completing this when I was there. It is given over a number of days and is quite comprehensive.
5:30 pm – The P7 class now goes home and the school will close. Some will walk 5 km (approximately 3 miles).

5. How do you use the outdoor spaces when you teach? Which parts of your curriculum if any do you teach outside? How might you use the outdoor spaces?
   - Most of the space is used for agriculture. The school has large crop gardens and is looking to expand this as well.
   - Behind/below the school there is 2.5 acres where they plant maize/corn, beans, and bananas (plantanes)
   - The Upper section of the school land above the road has 4 acres. Here they grow potatoes, beans, and corn. They also have a teachers garden that the teachers can use to grow their own vegetables. If there is enough to go around, the food from school gets eaten by the children at school as a supplement to their porridge at lunch. Usually though, there is not enough so it is mixed in with foods or dried and saved for later.
   - Girls and boys have different play spaces but these are not sport based.
   - They don’t have a lot of equipment or play things like swings or climbing apparatus. They do have some sporting equipment to play formal games and they play these games in a small grassed area alongside the school. When they play sports formally, they have to go to another place that has a full size soccer field or sport space.
   - They have interschool sports and house sports (George House, Joseph House, etc.) and play soccer, netball, athletics/track and field, and music/singing/dance competitions – usually involving traditional Ugandan music or poetry in nature.
• Teachers also use the outdoor space when teaching core classes (how many plants did we plant yesterday ... let’s count them) but this is mostly up to the teacher and their lesson planning.

6. What kinds of health information do you teach the children?
• Health information – Issues related to sex, AIDS, pregnancy, and female hygiene are very important. How to use Sanitary Pads for the girls. These are available from the school principal. The older boys and girls are separated and talked to individually about health and puberty. They teach about sex in the PIASCY curriculum (President’s Initiative on AIDS Strategy and Communication). Girls can also submit health topics that are important to them or that they do not know about anonymously and they are talked about.

7. What kinds of agricultural skills do you teach the children?
• Agriculture: Everything from basic planting of plants, watering, making a garden, compost, mulching, herbicides and spraying for disease, etc. fertilizer. (Think about organizing the garden so that they have food to eat and surplus to sell). They don’t do anything about cyclic economy, nor do they have any livestock education for goats, pigs, chickens, or rabbits. The concern would be that if you have animals you need someone to watch for them during the holidays or at times when school is not in session.

8. What kinds of environmental skills do you teach the children (i.e., conservation, recycling, etc.)?
• Environmental Education: Very little Environmental Ed. taught – but there is the belief that more emphasis could be placed on it. Ask about the recycling of plastic bottles – at the moment they burn the bottles and that really is not good.

9. Do the children get any physical education instruction – what do they do and learn?
• Children get PE but it is not well organized, and it will take a back seat to classroom academics if needed as teachers are just not PE trained. There is some sport at P7.
• Games they play in there break time include jump rope, dodge, stack stone race, tag, etc. They also play their soccer and netball games even though there is no space. Even girls are encouraged to play soccer. There is even a school sports competition in soccer for both boys and girls.

10. Is sport an important part of education here at Lutisi? Why?
• Sport is important at P6 and P7 and the school plays in a school system that competes against one another. For this, they have to go to another field away from the school, as there are no sporting or playing field facilities at the school itself.

11. What kinds of sports and activities do the students participate in? Is it different for boys and girls?
• Most sports are mixed although the girls primarily play netball as it is a ‘girls’ game and boys play soccer. They do have a lot of girls that play soccer too though.

12. Do the children get break times at school that allow them to go outside and play?
• Yes, they get 30 minutes for morning break and 1 hour for lunch and lunchtime break.
• During this time, they play around the school in the open spaces. Some play team sports like soccer on the lower area of the school, and netball at the top. Others play dodgeball, and some just sit and talk. Groupings are all sizes from just pairs to large mass team games. They play well together and even referee their own games.
13. Where do the children eat meals when they are at school? Is there a specific place where they do this? What is this area like (i.e., Are there any seats or tables there? Is it shaded? Etc.)?

- Children eat porridge for lunch. This is supplemented with other vegetables they get from the gardens there is there is enough to go around. Children eat the porridge sitting on the grass areas around the school. There are no tables or seating for this. There are a couple of trees but really very little shade over all. More trees needed.

14. Do you have any children here with disabilities? Would making the school more accessible increase the chances of children with disabilities in the area attending school?

- Yes. There is one deaf child (they think and I did not have access to any other information like medical testing so I will take their word for it). They are trying to teach him sign language but he is already 10 and it is hard. No one else uses it so he doesn’t see the value. The teacher is not trained but she is trying and that is really amazing given the amount of support she is getting (i.e., none). There are others in the community with disabilities but there is a kind of ‘shame’ to having a child with a disability and these children are often hidden away and do not go to school.

15. Thinking about the children when they first enroll in your school, what kinds of skills would you like them to already have so that they can be successful from the start of their first day? What are the most common “missing” skills in the children who come to your school in the first grades?

- Skills sought for the P1 class are some reading and fine motor skills for holding a pencil so they can write. Children in the pre-school classes are given the chance to use the chalk and draw so that they develop the fine motor, manipulative skills needed to successfully print and write.

16. What are some of the skills you would like to have help with teaching the students? Are there skills or activities that you would like to see the children receive more instruction and/or practice in?

- All the subjects are taught well and teachers are resourceful and creative. Teachers need encouragement but have some attitude problems. They may need motivation and positive encouragement. Do they have opportunities to continue study and learning – they have workshops for subject areas. Would teachers be interested in on-going education – how about an advanced degree.

17. Do you have any agricultural or garden projects here at school? Do these garden projects have any products? What do you do with the products you get from your projects? How do you use them?

- There is a lot of gardening and farming done at the school. The teachers support this program very strongly and even have a section of the land that is dedicated to their vegetable gardens. The food is used at school to feed teachers, the children if there is enough to go around, or it is stored for use when the crops are not producing. There is an interest in growing food so that they can do a better job feeding children and teachers, and also having some left over for sale.

18. Do you have any environmental projects here at school? What do these projects do or show to the students? Are there any products that come from these projects that you can use?

- Although they don’t think of it as being an environmental project, they do collect rainwater in a tank for drinking and they also compost vegetation and scraps for recycling and use on crops. They treat their own water by boiling it on sheets of shiny
corrugated iron for 12 hours in plastic bottles. Interesting process but when the water tank (2000 L) tank is empty, they take the water from the bore/well.

- Rainwater is used for drinking and the gardens. Manure and compost is for the crops and garden.

19. Where does the water you use at school to drink, wash hands, etc. come from? If it is from a well, how deep is the well?

- The latrines are ‘dry’ latrines (i.e., holes in the ground that will require the moving of the latrine in time). They are lucky though in that holidays and times when they are not at school allows the waste to recede extending the life of the latrine they have. They would like to move to a deep sewer as there is government service that will come and empty it and they would like a larger set of restrooms for both boys and girls and for them to be separate rather than joined by a common wall.
- When the water tank is dry, the water they drink comes from the well. It is a deep well and the water is not very tasty or clean. It undergoes the same process of boiling to make it fit to drink.

20. Do you and the children have enough clean drinking water each day?

- There is enough water at the moment (between both tank and bore) but they would like to use more rain tank water and would like a larger (5,000 or 10,000L) tank. They have plenty of runoff but cannot store it all so there is overflow into the garden many times during the wet season.

21. What do you do with your waste-water?

- There is no black water from the latrine although I would like to know if it floods ... that would be a problem. The grey water from hand washing, or washing up after the food is cooked and when dishes are cleaned is just drained out onto open ground and left to absorb there.

22. What kind of lighting do you have and use in the school?

- There is no power or lighting at the school so everyone must leave before it is dark and you cannot see your way. Power would be huge bonus for this school and it is ideally suited to solar power – even to the point of having banks of panels at the side or on the roof.
- I would also recommend the installation of LED lighting at sites around the school building and for one of the classrooms. There is interest in community classes for adults in the evening and this would ensure that they could teach a little later in the day.

23. Where are the main “standing water” issues when it rains? How well does the land around the school drain? Where does the water naturally want to go?

- There is standing water in the NW corner of the center quad when it rains hard. This is because all water is now directed by the gutter around to the water tank and by the time it gets to this corner in a hard rain, it is full. Also the gutter feeding the roof join here is higher than the gutter itself so the water tends to shoot over the gutter and straight into the yard. Flooding can back up to the school wall and classroom door and is actually eroding the brick work and concrete in this area.
- The water comes down the hill and has to be directed around the school by a drain dug in the ground. This can be better done. Also, they have put in a nice little garden area on the inside of the walkway in the center quad and this has helped with water overflow from the gutter on really rainy days.
• The school U shape faces up hill which in hindsight might not have been the best direction. Drainage out of the U is hard and the ground the school is on naturally slopes from hi to low in a NW direction.

24. What would you like to see done with the landscape around your school? What kinds of gathering, sport, recreational and learning spaces would you like to see included with the school? Why?
• It would be nice to have …
• Newer larger children’s and staff bathrooms
• Housing for staff onsite
• Playing fields
• Playgrounds
• More trees and shade
• Bigger water tank
• Power and lighting

25. Would you support the use of the school and its facilities for use by the community for instructional or recreational programs? If you were able, would you consider teaching a class to people from the community in an area that you felt comfortable to teach in?
• There is a very positive attitude toward teaching the community and teachers would be happy to do this say for one night a week if there were the right resources available.
• On a scale of 1 thru 10, where 1 means you completely disagree with the statement, and 10 means you completely agree with the statement, how would you rate the following statement: “I would be happy teaching a class to adults from the community one day a week.” Everyone indicated Kumi (Swahili for 10!)
Appendix B: School Management Committee and Community Interview Guide and Responses to the Guide Questions
Community Interview Questionnaire Guide:

Due to the lack of English speaking members in the community, the questions were read by me aloud to the community group and then they were interpreted and announced to the group directly after. The interpretation was conducted by both the school principal Jennifer B. and by the Building Tomorrow Education Director, William. The community group then discussed the questions openly and aloud giving their opinions and the answers were then interpreted and spoken to me so that I could record the response. I would then thank them for the response or use a follow up prompt to see if more information could be given, where the process would then be repeated.

1. What do you see as the role of primary education and the primary education curriculum for the children here at Lutisi? What kinds of things do you hope the children here at the school will learn? Are you expectations the same for both boys and girls at the school?
   - They want their children to pass these basic educational skills so that they can have a use/skills for the future like being a teacher, or a radio presenter, etc.
   - They want their children to be able to hear and speak for themselves, rather than having to be told through others (this means that they would like the children to learn English so that they can hear important information first hand and make decisions based on that, rather than having someone interpret for them and tell them what it is they need to do).
   - They want their children to be worldly and to have knowledge that is greater than just the small world that is their community.
   - They want their children to have a good foundation for further/higher education.
   - They would like their children to learn about computers and how to use them.
   - They would like to see their children also have the chance to learn vocational skills like carpentry for boys or knitting for girls. They do see a difference in some areas of life based on gender and this is mainly at the lower education level where men do physical work and women do more feminine/house work tasks. Not that they think boys cannot knit, but it is just not as useful for a boy in terms of work opportunities. Modern and higher education level jobs appear to gender indifferent and both boys and girls are encouraged to try for them.
   - Best comment of the night … the education of the children is more about finding each child’s strengths and talents, rather than them being a boy or a girl. Beautifully put!
   - They want their children to have regular, stable, and steady work. Not day-to-day, job-to-job type employment where they have to continually seek work for themselves to keep going.
   - They would like their children to also experience vocational skills of an artistic nature like pottery, cooking and catering skills, and photography.

2. Can you describe a regular day for you and your children? What does a regular day going to school look like to you and your children?
   - 6:00 am: Wake, sweep, fetch water, take food or tea, wash dishes, and do general house preparation for the day work.
   - 7:00 am: Leave for school. Most children walk to school with some walking up to 5km (3 miles) so on average, it takes a child about 30 minutes to walk to school.
   - 4:00 pm: Leave school to walk home. Again, a second walk of approximately 30 minutes.
• 4:30 – 5:00 pm: Arrive home, eat some food (snack), fetch water, find food, tend to livestock.
• 7:00 pm: Reading and homework by oil or candle light for 1 to 2 hours.
• 9:00 pm: Dinner and in bed by 10:00 pm.

3. I would like you to think about the health of the children. How do you see learning about health and practicing healthy behaviors fitting into the school day? Do you think health information is important for these children to learn about? Can you describe some of the skills and information you would like the children to learn? What kinds of health skills and information would you like to see the children learn? Is it different for boys and girls?
• Health is considered important and is taught as a subject both in science and by topic as in the case of the PIASCY AIDS awareness program.
• Parents would like their children to learn about feelings and emotions, reproductive health, HIV and AIDS, the dangers of early pregnancy, and have knowledge of important diseases like e-boli or malaria and know how to avoid getting it or spreading it.
• Boys and girls are taught differently when they are older and this is good information as many girls fall pregnant at too young an age.

4. Now let’s shift our focus to food and farming. Do you think agricultural information is important for these children to learn about? What kinds of agricultural skills and information would you like to see the children learn?
• Learning about agriculture and farming is very important. As one member of the group noted: “If I die and left my child 10 acres of land, and they could not farm it, then they would just sell it and take the money. This money would just last a short time. But, if they had farming knowledge, they could then farm the land and grow things. The land now has personal as well as family value to the new family owner and now has on-going value and worth to them.
• They would like their children to learn about the agriculture of their community and the heritage-based, traditional methods that the community uses (in many cases, these are permaculture strategies that include mulching and composting, crop rotation through land areas, etc.)
• They would be open to new ideas if their children brought these ideas home after learning them at school as long as it increased yield or productivity.
• They would also like to have livestock added to the training program so that the children can learn about the animals (i.e., goats, cattle, chickens, etc.) that are also producers of food and products for human consumption. This is a great idea but one that may have to be tempered with the understanding that the school has holiday periods when no one is there, so care and maintenance of these animals may be in issue during these periods.

5. The next topic I would like to talk with you about is the environment. Do you think environmental information is important for these children to learn about? What kinds of environmental education skills and information would you like to see the children learn (i.e., water collection, circular economies, conservation, recycling, etc.)?
• They believe that issues related to the environment are very important although some issues are not as relevant as others. For example, they realize plastic bottles are a problem and not good for the environment, but this is really not as important a concern as some others like the use of herbicides or deforestation.
• They would like their children to learn about:
6. Let’s shift our discussion to active living and physical education. Do you think physical education and sport is important for these children to learn in school? What kinds of recreation, games and activities would you like to see the children take part in and learn? Is sport an important here at Lutisi? Why? What kinds of sports and activities would you like to see the children at Lutisi participate in?
   • This is difficult as they don’t really know all the options available to them.
   • Overall though, they believe sport to be very important for all children both for physical development and school pride.
   • Would also like to see more music, dance and drama included in the movement instruction at the school. All are a good way to learn about other places and cultures.
   • Sports that they would like to see at the school include Netball, Soccer, Track and Field Athletics, Boxing, Volleyball, Basketball, Swimming, etc. The community appears to be open and embracing of all sporting opportunities should they be made available at the school.
   • They would also like to see more playgrounds and play equipment like swings, climbing apparatus, and slides for the children.

7. Thinking about the teaching at the school, what are some key strengths your have seen? What subjects does the primary school do a good job of teaching?
   • The school appears to be doing a good job in the areas of Science, Math, English, and Social Studies (which encompasses Civics, Geography, and History).

8. What else would you like to also see included or strengthened? What kinds of subjects would you like to see the school teach or teach more of?
   • Even though the school is doing a good job teaching math and science, the parents wish that more time could be spent in these subject areas.
   • The parents also note that Social Studies in general is taught very well, but that the textbook is inadequate and this may be true for texts in other subject areas as well.

9. Are there any children here with special needs or disabilities in the community that do not yet go to school? How might the school be more accessible and inviting so as to increase the chances of children with disabilities in the area attending school?
• In this area, they are really not sure. They do know that there are other children who do not come to school because they have disability.
• There is also the concern that the teacher will not be able to work with the child and that the teachers are not prepared. These children should go to a special school perhaps to get the skills they need.
• There is one boy in the school that does not speak and they have been working on sign language with him, but will little success. Age and lack of others with signing skills are making it difficult for him to proceed and see himself as successful. The parents need to be in on the instruction as well so he can practice at home.

10. What would you like to see done with the landscape around this school? What kinds of recreational and learning spaces would you like to see included with the school? Why?
• The community has a large list of things they would like to see added to the school so that it could be better. These include:
  o Playgrounds and sport facilities
  o Staff and Teacher Quarters so that teachers live on-site rather than having to travel to school each day themselves.
  o More plants being grown for food production.
  o More flowers, and food producing plants, but most of all they really need a new deep bore/well for water
  o The addition of livestock to the agricultural program
  o Flowers so that rare flowers that are no longer commonly available in the region can still be grown and kept.
  o Power and electricity for lighting, etc.
  o A Vocational Extension to the school so that children seeking to continue their education in skilled trade areas can do so.
  o Potential boarding accommodation as children traveling in some areas have to deal with danger/safety issues (e.g., traffic, assault, etc.).

11. When you think about using the school and its facilities, especially the outdoor spaces, for community instruction, how does that make you feel? Would you support the use of the school and its facilities for community instructional programs? Would you support the use of the school and its facilities for community recreational programs?
• The community appears to be unanimous and very much in favor of allowing the community to use the school for instructional purposes. They would like to take classes in a range of academic (e.g., agriculture) and general topic (e.g., health and the environment) areas and would support the use of the school in that way.
• The community was also very excited about the idea of being able to use any recreational and sporting facilities that might be added to the school. There are few facilities anywhere in the region and the provision of facilities would be a great boost to the community as a whole.
• On a scale of 1 through 10, everyone voted a 10 in terms of attending a class at the school if it were offered to members of the community; and,
• On a scale of 1 through 10, everyone voted a 10 in terms of using the recreational facilities at the school if it were offered to members of the community.
Appendix C: Student Art Activity Guide and Examples of Student Artwork
Children’s Art Activity Guide:

1. Introduce myself to the P7 class and talk to them about what I am doing overall, as well as for this activity.
2. Have the children help me tape up the pictures of playgrounds and recreational areas that I have brought with me to the walls of the classroom?
3. Give the children 5 – 10 minutes now to walk around and look at all the pictures and think about them? Then have them sit down again. Talk to them about the pictures, what they see in them, and what they would like to have at their school in their play spaces outside.
4. Give the students their instructions: You are to draw a picture of what you would like to have in the space around the school. Remember ...
   a. Everyone can be an artist no matter how well you THINK you can draw?
   b. Do the best you can ... the idea is to have the picture tell me your idea and what you want?
   c. The picture can be of many different things, or of just one thing you would like with lots of details about what it would have (e.g., color, size, shape, what it is made of, etc.).
   d. At the end, I am going to ask you if you would stand and please tell me about your picture so think about what you are drawing and don’t worry about what it looks like so much as just getting your idea across to me. That is the mark of a good design!
5. On the back of your paper, write down three words that best explain how you would feel if you were able to play in the space you had just drawn.
6. Have the teacher and students help me distribute the paper and crayons.
7. Begin ... Allow at least 1 hour for the children to draw as much as they can.
8. Video each child holding their picture and telling me what they have drawn. This is good practice for them using their English and will also help me to understand what they think is important and in their picture.
9. Make sure names are on all the pictures.
10. Collect the pictures and give each child a Koala as a thank you for giving their pictures to me.
11. Collate the images and transcribe the student descriptions of their artwork.
Appendix D: Student Video Transcripts and "Wordle" Identification of Student Themes
Transcripts from Videos Showing Students Describing their Pictures and What they Have Drawn:

There were 36 students who completed this task, and 35 were available for video recording. Only one has a picture and did not get videoed or offer a description of the picture they had done.

- Katott: I want football. I want Uganda flag. (I cannot understand the rest or the pictures here). I want stokes? I want food to grow.
- Albert Bwire: I have drawn a church, a house, a flower, a tree. Favorite color is red and yellow.
- Nyombi Juma: I have drawn my playing football, have drawn a mosque, have drawn a Uganda flag, have drawn a flower.
- Kiboneka: I’m a draw a picture. I’m a draw a football. I am playing football – what else – I am playing volleyball, I am running.
- Ssemakula Joseph: The picture is of playing football. This is the goal keeper, this is the swing, this is the flag. The swing as at the top and at the bottom is a bulb – electricity, it is a light bulb.
- Nakimuli Brenda: I like to play netball, I like to jumping, I want the flowers in our compound, and that’s it.
- Nakabiri Immaculate: I want a swing and flowers.
- Nsubuga: I am playing football.
- Nankya Anna: I draw a swing, a netball, and a ____ (I cannot understand the name she gives but she is referring to the image of the dodgeball game at the bottom).
- Kigozi Derick: My want ball, this is the keeper, this is Peter Czech, this is (player name), this is (another player name). This is your football team? Yes.
- Fiona Nabwire: I have drawn a flower, church, and ramp and swing.
- Tonny N.: I draw a swing, a flower, and a shed for drinking porridge to have for lunch.
- Madamuannet: I have drawn the volleyball (not sure if she is referring to the netball game she has now and thinking it is called volleyball), flowers, and dodging (dodgeball).
- Patience Nansubuga: I have drawn a swing and fruit, a girl playing and a Uganda flag.
- Malinde Dagaualas: I want a goalkeeper, I want a shoes, I want a shed and flower.
- Nusifah: I playing netball, flower, tree.
• Kayanja Peter: I like to play football. That is goal keeper Garcias, that is (player name), that is (player name). I like it that passing, (lucky?) people.
• Nakitende Sharon: I have drawn a shed, football, boat, netball and flower.
• Bukiriwa Martha: I have drawn a flower, I like to teaching poetry, and to playing netball, swimming pool, and swing. The animal the children are sitting on is a crocodile.
• Kizito Ronald: This is football, a shed and kickboxing – when will you use the shed – for lunch.
• Ssebale Jamilu: I am drawing a swimming pool, I am drawing a shed, and I am drawing a man for kick the football. Why would you like a shelter – eating.
• Segane Christopher: I have drawn the shed, I have drawn the swing, I have drawn (cannot understand the word but it is for the climbing wall). Why do you want a shelter? Eating porridge.
• Simon Peter: I draw a goalkeeper. I want to play football. I want a poetry? What is this animal? A crocodile.
• Ssenyonjo Joseph: I want the teachers to take them from their homes, I draw the peoples when they are playing volleyball, I draw the school bus, I draw a bottle of drinking water – finishes with a comment I cannot make out – did you draw a bus or an ambulance – this is a school bus to take you to and from school? - yes.
• Shafick: I have drawn that picture for volleyball. I have drawn that flower. I have drawn that swing. I have drawn the man who plays the football.
• Simon Bakisula: I draw a flower, I like a play a football.
• Kagiri Martin: I have drawn pictures of playing football, I have drawn a swings, I have drawn a people who are here (he gestures to the children walking on a log).
• Serugo Paul: I am drawing the car, these people is playing football – what does your truck do? – to take him to school.
• Mukwaya Evans: I am for play football, I want to build a stadium for playing football.
• Kaiyango:
• Ssegawa Erick: I like to playing football, I like a swing.
• Muzeyi Cloud: I am drawed the swing, I am drawed the tree, I am drawed the man who swing the swinging, I am drawed the tree.
• Musisi: My name is Musisi and I want flowers for our compound. I want to see them. I want the flowers to be a border for the compound.
The “Wordle” (a graphical depiction of words used in narratives with words that are repeated the most being represented in the largest font size) Developed from Video Transcripts of Student Artwork Descriptions

The wordle shown below is a graphical representation of the top 30 words used by the children in the description of their artwork, with the size of the word in the image indicating how many times the word was used in the descriptions.

*Note:
- Some words are used together like Uganda Flag, or Goal Keeper as in the soccer player position.
- Some words are duplicated but the Wordle does the image directly from transcripts and does not differentiate or combine (e.g., Flower and Flowers)
Appendix E: Average Annual Climate Statistics for Entebbe Airport in Uganda
Appendix F: Architectural Plans for the Lutiisi Academy Primary School Buildings
Appendix G: SWOT Analysis Summary of the Lutiisi Academy Primary School Site
### SWOT Analysis of the Lutiisi Academy and Site

<table>
<thead>
<tr>
<th>Strengths</th>
<th>1. Solid school building with water collection process already implemented on the roof.</th>
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<tr>
<td></td>
<td>2. A lot of initiative and improvement work already undertaken and done for the school by the school staff, community and children themselves.</td>
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<td>3. 12 Hours of steady sunlight most days of the year.</td>
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<td>4. Solar energy currently being used for water purification.</td>
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<td>5. Two rain seasons for water collection (one season not as reliable though).</td>
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<td></td>
<td>6. The potential to grow almost anything year round.</td>
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<td></td>
<td>7. Many native “food” bearing plants already on site.</td>
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<td></td>
<td>8. School commitment to agriculture as part of education curriculum.</td>
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<td></td>
<td>9. Positive student environment – very creative student body</td>
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<td>10. Strong student, teacher and community desire to improve and develop the school.</td>
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<td></td>
<td>11. Strong community support and school management committee.</td>
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<td></td>
<td>12. Strong desire to get more out of the school and to extend the schools reach beyond the existing curriculum for students, teachers, and the community.</td>
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<tr>
<th>Weaknesses</th>
<th>1. No electrical power to the site at all – no lighting so the school is limited in use to daylight hours.</th>
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<tr>
<td></td>
<td>2. Limited water availability – water must be collected each day either from the water tank, or the well.</td>
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<td>3. Existing roof water collection loses water during heavy rains due to design.</td>
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<td>4. Water needs purification</td>
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<td>5. Lack of permanent and adequate toileting facilities.</td>
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<td>6. Lack of separated toileting facilities for boys and girls.</td>
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<td></td>
<td>7. Dependent on school gardens for a large portion of their food.</td>
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<td>8. Crop yields are lower than potential.</td>
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<td></td>
<td>9. Teacher absenteeism.</td>
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<td></td>
<td>10. Student absenteeism.</td>
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<td>11. Long distances for some children to come to school.</td>
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<td></td>
<td>12. Lack of permanent play areas for younger children, play equipment and recreational spaces.</td>
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<td>13. Lack of trees and flowers as vegetation.</td>
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<td></td>
<td>14. Lack of a formal lunch seating and shelter area.</td>
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<tr>
<td>Weaknesses (Continued)</td>
<td>15. Limited kitchen facilities for preparing student and teacher lunches.</td>
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<td></td>
<td>16. The presence of a road through the middle of the site (not traveled much but it is still there).</td>
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<td>17. The presence of 25’ utility easements on both sides of the road that cannot be built on, as well as an easement for a proposed road along the northwest boundary of the site.</td>
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<td></td>
<td>18. Location – almost a mile to the nearest main road.</td>
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<td>19. Positioning of the school building and the potential for it to flood in areas.</td>
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<td></td>
<td>20. Poor and improvised drainage solutions in and around the school building.</td>
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<tr>
<th>Opportunities</th>
<th>1. The school is a “clean slate” so there is a great deal of underlying potential for design and development here.</th>
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<tr>
<td></td>
<td>2. The school site is large and more than able to accommodate needed additions to the school like play spaces, sheltered lunch eating areas, teacher housing, sporting fields, etc.</td>
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<td></td>
<td>3. Plenty of space and potential for harvesting rainwater.</td>
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<td>4. Highly suitable as a location for solar energy.</td>
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<td>5. Potential for the use of solar-based electrical energy to support LED lighting and some limited computer technologies.</td>
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<thead>
<tr>
<th>Threats</th>
<th>1. The issue of security and safety (encroachment on the land by other farmers, safety issues for students walking to and from school, etc.).</th>
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<td></td>
<td>2. Politics, time and administrative difficulties associated with initiating change.</td>
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<td>3. Difficulty in getting things built, finding skilled personnel, materials, etc. when located in a rural area.</td>
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<td>4. Obtaining the necessary materials and technology needed for development locally.</td>
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<td>5. Degree of slope on the site promotes erosion.</td>
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<td></td>
<td>6. The continued burning of waste that cannot be recycled or removed.</td>
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