A Post Occupancy Evaluation of the

Education Spaces at the Ngeruka Health Center in Rwanda:

Can the Design of the Built Environment Effect Healing?

by

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ABSTRACT

A post occupancy evaluation (POE) was conducted at the Ngeruka Health Center (NHC) in the Bugesera District of Rwanda. The POE was limited to the education spaces within the health center, its participants and staff. A POE is a combination of methods both quantitative and qualitative to determine user satisfaction and whether the design intent of the built environment was met. In rural Rwanda where healthcare facilities are scarce and people become seriously ill from preventable diseases help is needed. The smallest injuries become life threatening. Healthcare facilities and providers must develop approaches that stop these minor illnesses and diseases from costing further problems. The healthcare facility is a healing environment. Healing environments nurture health and provide a sense of safety and security. The Ngeruka facility has incorporated education spaces within their facility to teach the community ways to prevent minor health problems from becoming major ones. The research that was conducted at this healthcare facility sought to answer the main questions: Does the built environment of the NHC contribute to healing by engaging education program attendees to learn about preventing illness and disease and other health promotion strategies? In addition, can you measure healing effects of the built environment? The research took measurements of the built environment and combined them with user satisfaction questionnaires. Site observations and a participant engagement questionnaire were used to determine the amount of engagement the participants put forth into the education programs within the designated design space. Measuring engagement is a tool schools use to find out if their facilities are producing their intended results. This same thought process was incorporated into this research. The participants did prove to be engaged but it is not definitive that the built environment was responsible. It was a combination of many factors.
DEDICATION

I would like to dedicate this project to the memory of my mother and father who always encouraged me to want more.

To Renée, my family, and friends whom I love dearly and managed to alienate over the last couple of years, I hope to see them once again now that this is all over.

Most importantly, I would also like to dedicate this project to the more than 11 million people of Rwanda who have endured much and still have managed to come out strong. They have touched my life and I hope in some way this research will positively touch theirs.
ACKNOWLEDGMENTS

I would like to acknowledge Janvier Hakizimana, Titulaire (person-in-charge) of the Ngeruka Health Center in Rwanda as my co-investigator while on-site at the facility. He was instrumental in introducing me to the staff and participants at the center. Without his cooperation, introductions and added input this research would not have been possible. I would like to extend my thanks to the entire staff of the Ngeruka Health Center for letting me meet and observe them in the course of their activities.

I would like to thank the Honor Society of Phi Kappa Phi for their financial support in the continuation and advancement of learning or as their adopted motto states: Philosophia Krateito Photôn, "Let the love of learning rule humanity."

Thanks to all my new friends in Rwanda... Aimée Utuza her husband Louis and her family for being such gracious hosts and a great source of support while in Rwanda. Freddy Nzeyimana for being able to stand in at the last minute as my interpreter, translator, and friend. Hawa Usabimana a good friend that spent time with me when I needed it. Emmanuel Hakamineza my aide and tour guide, friend and almost translator. In addition, Prof. Jean Baptiste Kakoma, Dr. Aline Umubyey, Benoite Umubyeyi, Remy Twiringiyimana, Dr. Leon Mutesa, Dr. Vincent Mutabazi and everyone else who helped me along the way “I apologize for not knowing everyone’s name.”

Finally, I would like to thank family and friends for their individual contributions and words of encouragement throughout this journey.
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NOMENCLATURE

Baseline Data: Is the initial information that is obtained through research to use as a starting point to indicate and compare any changes that have occurred since the information was obtained and recorded.

Built Environment: Is a physical space designed by man or woman for human activity, use, and/or interaction. This is to include the Architectural features of the building as described as the “permanent aspects” of the building “such as the plan or layout”, ventilation, lighting, “the size or shape of the rooms, and the placement of the windows” (Harris, et al 2002, p. 1278) but it also includes the “furnishings... colors, finishes, artwork and the layout” in the rooms (Harris, et al 2002, p. 1279).

Design Intent: During the original conceptualization of the building design, a specific outcome of the space was desired by the Owner / Administrator and Architect to put that concept into a plan and the project was built. In some situations such as the project evaluated herein the Non-government Organization (NGO), the architect and a review by the Rwanda Ministry of Health (MOH) constituted the design team.

Healing: “The act or process of curing or of restoring to health” and “The process of getting well” as stated in the Merriam-Webster online dictionary are quite accurate in its definition but it should mention there is both a physical and mental aspect of healing. Healing can also include a process that is extended into the family as and the community as well (http://www.merriam-webster.com/medical/healing).

Health: “A state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity” (World Health Organization, 2006, p. 1).

Healthcare: “The maintaining and restoration of health by the treatment and prevention of disease especially by trained and licensed professionals “(http://www.merriam-webster.com/medical/health%20care) or as stated in a conversation by a very
matter-of-fact thinking CEO in 2012: “The application of resources to the process of taking care of people” (Kaylor E. Shemberger 2012, Chief Executive Officer, Gila River Healthcare, Arizona).

**Health Education:** Teaching participants how to become aware of factors in their daily lives that they can personally control with minimal assistance to lessen the likelihood that they may acquire a preventable disease or illness within their environment. The education courses currently taught at the Ngeruka Health Center include: Immunizations and the need for Vaccines, Opportunistic Infections, Voluntary Counseling and Testing, Anti/Pre-Natal Health, Post Nataal Health, and Family Planning.

**Health Promotion:** Access to healthcare information by the surrounding community from the health center so they can become active and knowledgeable in their own health concerns, take charge of their own health, and make informed decisions on when to seek treatment and when treatment can be accomplished safely at home. Some of the health promotion offered at the Ngeruka Health Center include: Health Education, HIV, Nutrition, Hygiene, and Sanitation. A Food Preparation class is also taught one to two times a month.

**Post Occupancy Evaluation (POE):** “Post-occupancy evaluation is the process of evaluating buildings in a systematic and rigorous manner after they have been built for some time. POEs focus on building occupants and their needs, and thus they provide insights into the consequences of past design decisions and the resulting building performance” (Preiser, Rabinowitz, & White, 1988, p. 3). Like a report card, elements of the built environment are evaluated to determine if the design intent was met and the successes and failures of the existing design are recorded for future design improvements and considerations.
Pre-Occupancy Evaluation (PrOE): It is desirable, after working with the design team consisting of but not limited to the architect, consultants, owners, users and people who will interact with the built environment of a space, a project is laid out in a set of plans and subsequently constructed fully incorporating the desires and intents of the design team. If you are planning to build a new facility, you want to incorporate the working attributes of an existing facility and eliminate the elements that do not work or need modification. Evaluating your existing facility would enable you to make these determinations. This data would then be used as a baseline from which to inform your new design.

Stakeholder: A group or person having an interest in the project. The owner, government, contributor, NGO, architect, designer, engineer, contractor, community, staff, vendor, or appointed representative.

Wicked Problem: According to an article by Horst Rittel and Melvin Webber there are at least ten “planning-type” social related challenges that are incorporated to describe this problem. (1) It is a problem that cannot be wholly defined. (2) It has no definitive end. (3) The solutions “are not true or false,” they are “good or bad” depending on the reviewing parties. (4) The end solution comes with “consequence” and “repercussions.” (5) Once the solution is implemented, it cannot be reversed or “undone.” (6) The answer may never be solved or solved correctly. (7) Every problem is “essentially unique.” (8) “Every “problem is a symptom of another problem and you should not try to cure a symptom.” (9) “The analyst’s “world view” is the strongest determining factor in explaining a discrepancy and therefore, in resolving a wicked problem.” (10) The planner has to be right and will be held responsible for all actions taken (Rittel, and Webber, 1973, p. 160-167).
PREFACE

My father once told me; “I don’t care if you are a ditch digger, as long as you are the best damn ditch digger there is.” I have made that quote my raison d’être or at the very least my reason to succeed or just try harder. I tend to be an overachiever and thoroughness always seems to be the axiom for all my efforts. Any criticisms I may offer in this research is not meant to condemn or vilify anything that has been done in the form of bringing healthcare to Rwanda but to provide possible solutions for future advancements in the field of the built environment and the informed design processes. A Post Occupancy Evaluation (POE) is used to apprise future designers of what has been done and how or if it worked. Informing on both the successes and the areas where there is room for improvement is of utmost importance. The information obtained is to be recorded and used to feed forward future design decisions. It was my intent to incorporate only those aspects that pertain to this specific research effort but that being said it is far reaching and has many more implications that can be assumed and need further assessment.

I would like to state that any well-designed, well-equipped and well-staffed healthcare facilities built in Rwanda’s rural communities are a much-needed improvement from what they had or for that matter didn’t have in the past. I can see many strides being undertaken to improve conditions throughout the country both by the Rwandan government and by non-government organizations. The Ngeruka Health Center is the topic of this research and is one of those many improvements, it should be commended for the advancements to better healthcare in the community for which it serves.
Chapter One

INTRODUCTION

1.1 Statement of the Problem

The Director General of the World Health Organization (WHO), Dr. Margaret Chan stated; "The world needs a global health guardian, a custodian of values, a protector and defender of health, including the right to health." In clarifying several key points along with her statement she was quoted from, “access to health-related education and information” was included along with several other important elements (World Health Organization, 2013).

Adequate healthcare for many countries is sometimes what seems to be an impossible challenge and for rural communities in Rwanda it is a serious problem; “85% of the population” (Human Resources for Health Country Profile Rwanda, 2009, p. 11) lives in rural agricultural communities and the distance to healthcare could vary greatly depending on the terrain and lack of infrastructure. When interviewing patients at a remote hospital in Munini, Rwanda in September of 2011 some patients stated they walked between two and four hours to seek medical care. In many cases, care was not sought until the injury or illness became life threatening and walking was no longer an option. A mother had brought her ten-year-old child in for treatment of a wound only after it had become septic. The injury was a small laceration on the child’s ankle that he had received during a football match with his friends. This resulted in a twelve-day stay in the hospital. Ordinarily proper cleaning and a sterile wrap could have solved the problem. The mother did not have the education to understand the condition nor the resources to obtain proper handling of such a situation.

The healthcare facilities located in these rural areas, called the “periphery” by the Rwanda Ministry of Health in the Rwanda Service Provision Assessment Survey of 2001
(printed in 2003), is primarily understaffed and under equipped to handle their surrounding regions (Ministry of Health, 2003, p. 10). To add to the further burden of the mother mentioned above, the hospital does not provide food or water for the patients so in her case she was required to bring her own provisions for herself and her son. The mother had to leave her other children at home, which was some distance away, in the care of her mother so that she could live at the hospital and care for her son during his entire hospitalization. She brought food and cooked for him, provided his water and hand laundered his clothes. This was typical for all the patients at this hospital.

This story is true of many outcomes where education could have prevented minor health issues from escalating. Access to education in hygiene to clean wounds, washing hands, pre and post-natal care to reduce infant and mother mortality rates, family planning, nutrition, HIV/AIDS prevention, and preventing the spread of Tuberculosis (TB) is greatly needed. Other education programs that offer information on proper sanitation and water treatment to prevent the spread of water borne illnesses, curbing helminthes warning signs, and the use of mosquito netting to prevent malaria is grossly lacking in these population areas. These diseases and illnesses can be prevented if treated within a specified amount of time if only the people knew what to do and had the proper training and education to do it.

1.2 Purpose of the Study

The purpose of this study was to conduct a POE of the education spaces at the Ngeruka Health Center (NHC) in Rwanda. Permission, granted by Rwanda Works, a non-governmental organization to conduct research at this site is found in Appendix N. The center, completed in June of 2010, is located in the remote Bugesera District – one of Rwanda’s poorest districts and most affected by the 1994 Genocide. See Figure 1, a Map of Rwanda for reference. The information obtained to create Figure 1 came from the
National Institute of Statistics of Rwanda (2012) and Google Maps. The village of Ngeruka is shown at the approximate location for reference.

Figure 1: Map of Rwanda

Rwanda Works, worked with the Rwandan Ministry of Health (MOH) to locate and design the much needed health facilities for this area (there were five in all). The Executive Director of Rwanda Works had done extensive research and travels through Rwanda. While in Bugesera he found the existing, “health centers were essentially abandoned. People were starving to death and too exhausted to do much about it. The land was essentially a red dust desert. The water supply was intermittent – it would drip for weeks and then shut off altogether for four or five months. Children were dying every day” (Ruxin, 2013, p. 85) it was an unacceptable and something had to change. Ruxin
said, “The government tried several approaches...but every attempt was swallowed up by dust and despair” (Ruxin, 2013, p. 85).

Aside from the much-needed healthcare the new facility had to offer, it provided healthcare education something sorely lacking in the rural communities. Education teaching the prevention and promotion of health-related illnesses and diseases, nutrition, pre-natal care, sanitation, hygiene and various other personally manageable programs with big outcomes that could keep people from contracting some of the more serious illnesses or complications that previously sent them to the hospital for treatment. These education spaces are the focus of this research. The ability to provide spaces for education purposes within a rural health setting is of paramount importance in the fight against curable and preventable illness and disease.

The intended outcome of this research is to contribute to the understanding of how the built environment of a healthcare center's education space in Sub-Saharan Africa can contribute to education and participant engagement for the prevention, promotion and early treatment of many diseases and ailments that can be accomplished at the community and home level which will not require hospitalization. This could be a great relief to the hospitals and health centers by relieving the burden from unnecessary visits to understaffed and under equipped hospitals and facilities in remote areas.

The 2012 annual Legatum Prosperity Index ranked Rwanda 111 among 142 countries totaling 96% of the world's population. Eight sub-indices are used for ranking each country of which is averaged. Two of the sub-indices used that make up the index put the education ranking at 108 and health at 115. It is obvious Rwanda has great room for improvement and the percentages indicated here demonstrate just how far that improvement needs to go. Health is the number one priority without it everything else seems futile. It is very likely the patients and staff of the NHC were more concerned with
fulfilling their basic needs and not so much considering the space in which they were occupying at the health center or the fact it is understaffed and under equipped.

Quite a few North Americans might find it is hard to relate to the Rwandan quality of life. If you would compare the majority of the Ngeruka, Rwanda populace up against Maslow’s hierarchy of needs you would see that many of them have not even surpassed the most basic needs. The foundation of this hierarchy is physiological which includes homeostasis or the ability to maintain a healthy life with proper nutrients, a sustainable healthy food source, and ability to obtain safe drinking water. According to Maslow, people are unable to advance to the next level until these most fundamental needs are met (Maslow, 1943, p. 372). Rwanda has food or the capacity to grow the right crops but proper farming, eating the right foods, and making the right choices needs to be taught. Once nutrition education is learned and the right crops are being produced, purchased and consumed people will start getting healthier. Satisfying all the basic needs according to Maslow are what motivates us to achieve and advance and if we are stuck in any attempt to achieve any of our basic needs we are “envisaged as a sick man” (Maslow, 1943, p. 394) we need to learn to grow to full capacity. Further proof according to the Republic of Rwanda, Millennium Development Goals 23.5% of children under the age of five living in rural communities are underweight and until people are no longer starving their higher needs will not emerge (Maslow, 1943, p. 375).

A report generated by the CIA-World Factbook in 2009 reported the average education level attained is up to eleven years however only 27% of the population attends secondary schools and only 5% advance beyond that into university level programs (Helman, 2011, p. 265). Rwanda has taken many strides forward to put the tragedy of the Genocide in 1994 behind them. In this attempt, they have been striving to reach the Millennium Development Goals (MDG) as published by the United Nations (9/2000).
The Millennium Development Goals — Eight Goals for 2015:

1. Eradicate extreme poverty and hunger
2. Achieve universal primary education
3. Promote gender equality and empower women
4. Reduce child mortality
5. Improve maternal health
6. Combat HIV/AIDS, malaria and other diseases
7. Ensure environmental sustainability
8. Develop a global partnership for development

(http://www.undp.org/content/undp/en/home/mdgoverview.html)

In order to reach these goals one of the things they have to do is to educate their population from the top down and the bottom up. Re-educating the elected officials and educators and then educating the entire population.

With over 11,689,696 (July 2012 est.) people occupying 10,169 square miles “Rwanda is the most densely populated country in Africa” according to the Central Intelligence Agency – World Factbook. That is roughly the size of the U. S. state of Maryland. For the record, Maryland’s population is reported as 5,773,552 according to the 2010 US Census.

Another way to look at Rwanda comparatively is Table 1 which is a compiled statistical perspective comparing Rwanda with the United States. This is not to say that the two countries have a lot in common the statistics were done by percentages it is a way to get a westerner’s viewpoint on some of the data offered. This table shows, statistically, the dramatic differences between the two countries with Rwanda having higher incidences in birth rates, population growth, population density, infant and maternal mortality rates, while having lower life expectancies, fewer physicians, fewer hospitals and almost fifty percent of the population is below the poverty line. One area where Rwanda and the US seem to be close statistically is in their expenditure on education. Education is of prime importance in reversing extreme poverty and health concerns of the country.
Table 1: Rwanda and United States Statistical Perspective

Putting things into perspective and to better visualize the disparities within Rwanda the United States was used as a comparator because it is believed to be a more familiar country when it comes to realizing the listed statistical data.

<table>
<thead>
<tr>
<th>CATAGORIES</th>
<th>RWANDA</th>
<th>USA</th>
<th>(Δ*) IMPLICATIONS</th>
</tr>
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<tbody>
<tr>
<td>Total area</td>
<td>10,169.16\text{sq. mi.}</td>
<td>3,794,100 square miles (sq. mi.)</td>
<td>.3% of US</td>
</tr>
<tr>
<td>Population</td>
<td>11,689,696 (2012 est.)</td>
<td>313,847,465 (2012 est.)</td>
<td>3.7% of US</td>
</tr>
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<td>Population density(^2)</td>
<td>0.00087 sq. mi. / person</td>
<td>0.01209 sq. mi. / person</td>
<td>.07 x's &lt; US</td>
</tr>
<tr>
<td>Population growth rate</td>
<td>2.751% (2012 est.)</td>
<td>0.99 (2012 est.)</td>
<td>3.1 x's &gt; US</td>
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<td>Birth rate</td>
<td>36.14 births/1,000 population (2012 est.)</td>
<td>13.7 births/1,000 population (2012 est.)</td>
<td>2.6 x's &gt; US</td>
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<tr>
<td>Total fertility rate</td>
<td>4.81 children born/woman (2012 est.)</td>
<td>2.06 children born/woman (2012 est.)</td>
<td>2.3 x's &gt; US</td>
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<tr>
<td>Maternal mortality rate</td>
<td>340 deaths/100,000 live births</td>
<td>21 deaths/100,000 live births</td>
<td>16.2 x's &gt; US</td>
</tr>
<tr>
<td>Infant mortality rate</td>
<td>62.51 deaths/1,000 live births</td>
<td>6 deaths/1,000 live births</td>
<td>10.4 x's &gt; US</td>
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<td>Life expectancy at birth</td>
<td>58.44 years</td>
<td>78.49 years</td>
<td>20.1 Years &lt; US</td>
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<tr>
<td>HIV/AIDS adult prevalence rate</td>
<td>2.9% (2009 est.)</td>
<td>0.6% (2009 est.)</td>
<td>4.8 x's &gt; US</td>
</tr>
<tr>
<td>Physicians density</td>
<td>0.024 physicians /1,000 population (2005)</td>
<td>2.672 physicians /1,000 population (2004)</td>
<td>99.9% &lt; US</td>
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<tr>
<td>Hospital bed density</td>
<td>1.6 beds/1,000 population (2007)</td>
<td>3.1 beds/1,000 population (2008)</td>
<td>48.4% &lt; US</td>
</tr>
<tr>
<td>Health expenditures</td>
<td>9% of GDP (2009)</td>
<td>16.2% of GDP (2009)</td>
<td>44.4% &lt; US</td>
</tr>
<tr>
<td>Education expenditures</td>
<td>4.1% of GDP (2008)</td>
<td>5.5% of GDP (2007)</td>
<td>25.5% &lt; US</td>
</tr>
<tr>
<td>Population below poverty line</td>
<td>44.9% (2008 est.)</td>
<td>15.1% (2010 est.)</td>
<td>3.0 x's &gt; US</td>
</tr>
</tbody>
</table>

1. Slightly smaller than the state of Maryland.
2. Calculated by dividing square miles/person (not part of CIA statistics).
3. Δ (delta) signifies difference or change.

1.3 Significance of the Study

“Medical care cannot be separated from the buildings in which it is delivered. The quality of space in such buildings affects the outcome of medical care, and architectural design is thus an important part of the healing process” (Horsburgh, 1995, p. 735).

A POE can identify opportunities for improving the built environment by taking what has worked in the past, incorporating that into the next design and taking the lessons learned from what did not work and making improvements. Evidence-based design feeds forward the information learned to future projects and shares the information with other architects, design engineers, and facility owners so that mistakes can be a one-time occurrence.

A healthcare facility is a healing environment (see Chapter Two, Section 2.6). When it incorporates education space, the built environment offers a place of security that is conducive to learning through its availability of space where the attendees find an atmosphere that is supportive and inviting (McCullough, 2009, p. 47). It is a space dedicated through the efforts of the staff to the health and wellbeing of the participants by teaching them how to care for themselves and their children. These efforts will reduce the need to admit patients into the healthcare system for preventable illnesses and diseases that will be resolved in the comforts of people’s homes thus reducing the burden on understaffed and under equipped facilities.

In the future, healthcare facilities will become wellness facilities that promote health and healing instead of treating preventable diseases they will prevent them from occurring by eliminating or at least limiting the occurrences of preventable health problems through education of the communities they serve.
Chapter Two

REVIEW OF LITERATURE

2.1 Introduction

“Perhaps the most important benefit of POEs is their positive influence on the creation of humane and appropriate environments for people” (Preiser, Rabinowitz, & White, 1988, p. 29) and the ability to provide a source of reference for future projects of similar design and scope.

The body of this inquiry investigates the interconnections between the built environment of a healthcare facility and its designated education space located within. It links the ability of the built environment to affect healing through the engagement of participants in the facilities education programs that encourage learning. In addition, this learning is a healing process for the individuals, their families and their communities. The programs teach nutrition, anti-natal care, family planning, hygiene, and sanitation. The built environment invites the participants in and encourages them to engage in these activities and by doing so helps to end preventable illness and disease. Rural facilities are rare in Rwanda, they are understaffed and under equipped and if eliminating a few of these preventable cases can relieve some of the burden, then the process is well worth the effort and can be a cost savings for the family and the healthcare facility.

2.1.1 Conceptual Framework

The conceptual framework (Figure 2) shows the interconnectedness of the Ngeruka Community, the health center and the people. The staff at the health center are from the community it serves, the patients and participants come from the over 27,500 members of the surrounding area. The model is taken from Rutherford’s 1911 Atomic Model visualizing constant motion orbiting around the healing nucleus emanating from inside the health center. The overlapping pathways created connectivity between all elements
within the community. Healing occurs outside of the built environment because of the education taught at the health center demonstrating its far-reaching values.

![Conceptual Framework (Adapted from Rutherford’s 1911 Atomic Model)](image)

Figure 2: Conceptual Framework (Adapted from Rutherford’s 1911 Atomic Model)

### 2.2 Pre-Occupancy Evaluation (PrOE)

Eleanor Roosevelt once said, “Learn from the mistakes of others. You can’t live long enough to make them all yourself.” A pre-occupancy evaluation (PrOE) can help in that regard although not all of PrOE intentions are to reveal mistakes they also point out things that were done right and are worth repeating.

According to interviews for this research study, a PrOE was not conducted prior to the construction of the NHC. The value of such an evaluation was considered
important enough to include in this literature review for inclusion into future projects. The need to acquire baseline data from PrOEs for designing new buildings and new spaces can be invaluable. Had Rwanda Works and the architect of the NHC used baseline data from its previous buildings some of the items that were observed as “needs improvement” could have been corrected in plan before recreating them in this and future projects.

When occupying an existing building “you need to determine how the end user likes the old versus the new” (Shepley, 2011, p. 6). The owner can verbalize what works in the existing facility and what did not and it “provides an opportunity for the designer to measure the effectiveness of the new building against a baseline” (Shepley, 2011, p. 6). Shepley (2011) states it is not coincidental the PrOE is conducted the same as the POE so that correlations can be made between the two studies after the new building is built and occupied. “For public agencies or other organizations that repeatedly construct the same building type, linking POE with pre-design programming can save money and time” (Vischer, 2001, p. 29) by learning from previous experience and by carefully reviewing through the evaluation process what to keep and what to disregard in future planning.

An option, to include with a PrOE is conducting site tours of existing facilities that are similar and desirable to what the client is looking to build. Arranging for on-site tours with existing facility owners is usually not difficult and they are usually quite proud of their facilities. This option may be preferred when the client is looking for new ideas. Sometimes expressing exactly what is desired is easier to do by example then by words. Researching facilities with similar on-site programs and then arranging for the tour with building Facility Managers and CEOs is recommended to obtain first-hand knowledge of how their facility has worked and gleaning what hasn’t worked.
2.3 Post Occupancy Evaluation (POE)

Some of the most referenced reasons for conducting POEs found in the literature review included, “user satisfaction” (Preiser, Rabinowitz, & White, 1988, p. 17), “the overarching notion of the purpose of POE is to facilitate the accumulation of information” (Hadjri & Crozier, 2009, p. 27), to “inform building decision-making” (Vischer, 2001, p. 26), it is a “a feedback mechanism” (Preiser, 2003, p. 42), “the accountability of design professions” (Preiser, Rabinowitz, & White, 1988, p. xii), and “improving the all-round performance of our buildings” (Bordass & Leaman, 2005b, p. 375). This is not nearly an exhaustive list but might be well worth a study of its own.

A POE conducted properly is a rigorous approach aimed at evaluating the built environment, its influences on people and ways to make it better. The definition as stated in the nomenclature section of this paper is a generality of what a POE is meant to accomplish. What is included in the POE depends on what the agreement or contract between the owner(s) or person(s) in charge of the facility and the researcher determine. This is the definition used to conduct the POE at the NHC.

The purpose of a POE is probably as infinite as the procedures being devised to conduct them. “There are numerous methods and approaches to a POE, depending on” what type of building it is or what type of activity it houses as well as what results the POE is looking to achieve (Hadjri & Crozier, 2009, p. 28).

A POE is a valuable tool if used correctly. It must be conducted with a goal in mind and the goal or goals need to be established during the planning stages of the POE. This will help guide the process and determine what will be needed to complete the POE.

A review of the project and plans with the stakeholders can aid in understanding the expectations and limitations of the site. “The best place to begin on a project is to understand an institution’s long-range goals” (Cama, 2009, p. 47) by speaking with the
person(s) who knows and is responsible for the end product. Finding out the names of the contacts at the facility, conducting a thorough walk-through with someone knowledgeable of the project and the desired goals is extremely important. Asking questions about who wants the POE, for what purpose and how the information will be used and disseminated beforehand is of key importance (Vischer, 2001, p. 32). Knowing who will be the end users of the space and their availability throughout the evaluation process will also need to be addressed for participation in the POE once the data collection criteria are determined.

Several contractual responsibilities and understandings have to be made clear of what the deliverable product will be. What are the client’s expectations? Resource materials, personnel, budgets, schedules, access to the facility all need to be worked out beforehand. Reviewing the process, the level of effort, developing a research plan and then getting a signoff by way of a contract before proceeding will also be in order.

The next step is to start conducting the POE and collecting the data. A POE should not commence sooner than six months from the occupant move in date but according to Shepley (2011) a twelve month “honeymoon period” should be observed to allow time for the occupants to adjust to the new space and time to acquire “significant data” (Shepley, 2011, P. 130). It is important to monitor the process to maintain reliability of the data. Once the data is collected, it can be analyzed through interpretation, software, or whichever method selected or appropriate and the findings recorded and reported.

From this report, conclusions and recommendations are made. An official report is presented to the client that is prepared per his or her expectations as stipulated in the preliminary planning (see Appendix “CC”). A formal presentation may also be required.
The report will be published for feeding forward the findings and conclusions of the POE process for future projects (Preiser, Rabinowitz, & White, 1988, pp. 58-65).

During the preliminary fact, finding phase it is essential to learn “what was the design intent” of the architect/designer and the owner. Then at the conclusion of the POE, the question of whether the intent was met can be answered. A POE “is reviewed proving insight on how a building in use may be assessed according to the upfront planning decisions, design attributes and measurable outcomes” (Battista & Franqui, 2013, p. 361) and “allows professionals to make informed decisions about the design of the built environment” (Preiser, Rabinowitz, & White, 1988, p. 29).

Preiser, Rabinowitz, & White (1988) proposed that there are three levels of effort for conducting a POE and each one has an increasing level of effort associated with them but the same operational variables and the same three phases as shown in Table 2, which apply to all levels.

<table>
<thead>
<tr>
<th>Poe Levels Of Effort</th>
<th>Operational Variables</th>
<th>Three Phases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1: Indicative</td>
<td>Time</td>
<td>Planning</td>
</tr>
<tr>
<td>Level 2: Investigative</td>
<td>Resources</td>
<td>Conducting</td>
</tr>
<tr>
<td>Level 3: Diagnostic</td>
<td>People</td>
<td>Applying</td>
</tr>
<tr>
<td></td>
<td>Depth</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Breadth</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cost</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: POE Levels of Effort. Preiser, Rabinowitz, & White (1988)

An Indicative POE looks at the positive and negative attributes that are apparent and reports the building’s performance. This can take from two hours to two days and is carried out by an expert in that particular building type. The method employed consists of a generic questionnaire with open-ended questions given to the owner beforehand and a review of existing archival documents and as-built drawings. A building walk-through noting items discussed from the questionnaire and taking photographs as required. A summary is written of this process and is then provided to the owner.
An Investigative POE is used when during the course of the Indicative POE a more serious issue has been identified that requires more investigation. This type of investigating can take between 160 – 240 hours or more to complete. The steps are the same as the Indicative POE but with a higher degree of effort. Emphasis on the evaluation criteria is “explicitly stated before the building is evaluated”. A rigorous literature review of successful and similar building types is made to ascertain the research criteria for the current building.

The Diagnostic POE is the most rigorous evaluation and can take up to a year to complete and uses a mixed method approach consisting of questionnaires, surveys, measurements, literature reviews, evaluations of the building itself and similar buildings of the same building type attempting to show connections between variables. The recommendations are long term and aim to improve the existing buildings and future buildings. The research and data analysis is generally much more sophisticated than that of Indicative or Investigative. A complete and comprehensive diagnostic report is provided to the owner.

For the purpose of this research, a combination of an Indicative POE and an Investigative POE was used to obtain baseline data that was not currently available from the existing project. These combinations will not only “assess the quality of the physical environment” (Battisto & Franqui, 2013, p. 364) but also “provide feedback on occupant satisfaction” (Vischer, 2001, p. 23).

POEs were “developed as a result of research by social scientists, designers, and planners interested in understanding the users’ experiences within the buildings” (Robert Gifford, 2002) (Kopec, 2012, p. 18) and linking it to the buildings themselves. The actual size, shape, and appearance of the building can affect the work and capabilities of its occupants (Preiser, Rabinowitz, & White, 1988, p. 27).
Whereas Preiser, Rabinowitz, & White (1988) were interested in, the “Levels” of POEs that dealt with the extent of effort the researchers put into the evaluations Zimring & Reizenstein (1980) were concerned with the “Dimensions” of POE Goals.

Table 3 addresses the scope or shape the evaluations take on. Each project has these same three-dimensional questions or goals addressed and answered at the onset before moving on.

<table>
<thead>
<tr>
<th>Dimensions of POE Goals</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generality</td>
<td>The expected or planned outcome of the research</td>
</tr>
<tr>
<td>Breadth of Focus</td>
<td>How broad or how focused you want your research to be as opposed to all encompassing</td>
</tr>
<tr>
<td>Applicability</td>
<td>The time to apply the application of the research findings: Immediately or to provide advice for future projects</td>
</tr>
</tbody>
</table>

Table 3: Dimensions of POE Goals (Zimring & Reizenstein, 1980)

POE researchers are goal oriented and can be looking at the big picture or little picture depending on the intended outcome and the desired results. Looking for specifics or generalities (Zimring & Reizenstein, 1980, p. 431) depends on the decisions made with the building owners and occupants. In the case of the NHC research, it is focused on the built environment of the education spaces and how it contributes to healing.

Some of the Cons seen for not wanting to conduct a POE might be the argument of “who pays for it?” A lot of the time the money budgeted for it is spent on something that was deemed more important such as construction Change Orders, Additional Services, Unforeseen Circumstances or something just as significant. A lot of the time most of the feedback mentioned is on the failures and not on” what worked” (Vischer, 2001, p. 32). If a “special interest” (Zimring & Reizenstein, 1980) is backing the POE, it may be thought to be biased. Architects are still apprehensive that we live in a litigious society and they may be sued (Preiser, Rabinowitz, & White, 1988, p. 23), and it may happen. A POE can be self-serving to look favorable toward the one conducting it.
So what are the Pros for conducting POEs? They can and are a quality control device (Preiser, Rabinowitz, & White, 1988, p. 26). Employee satisfaction is growing among building users. Employees are taking ownership of their buildings and the decision processes (Vischer, 2001, p. 28). The outcome is better buildings that are more efficient. Adding “to the general Knowledge base” (Vischer, 2001, p. 24). Large real estate companies making more strategic real-estate decisions. To “support the goal of continuous improvement” (Zimmerman & Martin, 2001, p. 169)” (Hadjri & Crozier, 2009, p. 23). POEs inform the owners that their buildings are performing at a specified level of operation and can save on maintenance costs and warranties if they are not.

The biggest success is when the “lessons learned from the failures and successes of building performance” (Preiser, Rabinowitz, & White, 1988, p. 7) of the past are used and utilized in the future. And that there is a method of obtaining information of past success through literature review and being able to repeat or take from them without repeating the failures that went wrong with them.

2.3.1 POE Standardization

In conducting a literature review on the subject of POEs it has become obvious there are many types and may forms that POEs can take. Even the definitions vary depending on what outcomes you want to convey. As stated previously “it is evident that there is no definitive understanding or industry standard as to what POE actually is” (Hadjri & Crozier, 2009, p. 23). From the definition and the literature, “it is clear that POE is a process that involves a rigorous approach to the assessment of both the technological and anthropological elements of a building in use. It is a systematic process guided by research covering human needs, building performance and facility management” (Hadjri & Crozier, 2009, p. 23) after a building has been occupied.
While the definition has similar but varying aspects, one common element keeps coming up in the literature... it is the desire to standardize POEs. This too is a very delicate problem because there are so many people designers, researchers, academicians with their own opinions on what standardization should mean and how it should be conducted. It is hard to standardize something when there are so many different standards being presented and all of them individually showing opportunities along with challenges for success.

In her effort to standardize, the research process Jacqueline Vischer (Vischer, 2001, p. 25) classified four types of POEs. In her study, she explains that although this is not an exhaustive list it is a quite useful example of how the system works. According to Vischer (2001, p. 33) “it is necessary to clarify who are to be the consumers of the POE” and the relevance of the results. “Clear objectives” must be “identified” and at the outset, it is important to clarify the value that the POE will have for the person or agency carrying it out” (Vischer, 2001, p. 32). Table 4 reveals the types and their purposes.

<table>
<thead>
<tr>
<th>Four types of POEs</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building-behavior research, or the accumulation of knowledge</td>
<td>“Building a broader and more reliable base of knowledge of human behavior in relation to the built environment”</td>
</tr>
<tr>
<td>Feeding into pre-design programming</td>
<td>“To be able to inform building decision-making in the early stages of a new project”</td>
</tr>
<tr>
<td>Strategic space planning</td>
<td>“Organization seeks to improve, innovate, or otherwise initiate workspace change to bring space use more in line with strategic business goals” and “to provide functionally supportive workspace to their employees and simultaneously to reduce occupancy costs”</td>
</tr>
<tr>
<td>Capital asset management</td>
<td>Using POE as a tool for managing building assets</td>
</tr>
</tbody>
</table>

Table 4: Four types of POEs (Vischer, 2001, pp. 25-29)

The information in Table 4 is useful in the planning stage of the POE to determine what type of POE to conduct and for what purpose. The research could be for one or more of these typologies.
“Vischer (2001, p. 33) focuses attention on the rigorous standardization of collecting feedback, suggesting that such information should be focused on “a few, carefully selected and identified indicators of environmental quality” (Hadjri & Crozier, 2009, pp. 28-29). Deciding which factors to include in the study will depend on what the client wants to learn about his or her building. “These recommendations again reiterate the need for standardized data gathering” (Hadjri & Crozier, 2009, pp. 28-29) but only at the clients direction. This may or may not be that standardized unless in the POE typologies there are only limited offerings.

Vischer thought that POEs were not being utilized and speculated that if POEs were simple and reliable more people would be using them and people would be building them into their planning budgets (Vischer, 2001, p. 30) but if they were too simple how valuable would they actually be?

In an effort to learn from their completed projects designers, builders, and even clients tested a new standardized POE (Bordass & Leaman, 2005b, pp. 361-362). “Attempts to produce a single standard POE method have been unsuccessful (e.g. Federal Facilities Council, 2001) and a portfolio approach was therefore suggested (Bordass & Leaman, 2005)” (Bordass & Leaman, 2005b, p. 362). Bill Bordass & Adrian Leaman (2005) recommend the establishment of a “portfolio” of techniques in the United Kingdom that can be assessed and utilized where appropriate. It was an effort to standardize the process where the portfolio was “all-encompassing” and depending on the project the researcher could select from one of the five categories within the portfolio to conduct the research” (Hadjri & Crozier 2009 p. 28). Currently the five categories or “Sectors” as Bordass and Leaman refer include Commercial, Cultural, Government, Higher Education, and Schools. The portfolio system is an online system and the users
can select the “Life Cycle Stage” the project is in from the following choices: Prepare, Design, Implement, Finish, Use, and Refurbish.

Bordass & Leaman are convinced that short of standardization the portfolio system demonstration in the case studies used demonstrates success. The portfolio albeit small in their paper has other suggested additions that are to be added to make it even more useful. “The case studies demonstrate the value of feedback, the utility of the “pick-and-mix” portfolio approach and the potential for adding value to current projects, future projects, and to client and industry activities in general” (Bordass & Leaman, 2005b, p. 372). The key problems they mention have to do with changing attitudes toward POEs and the value of feedback, developing benchmarks, finding the money to pay for them, and using the knowledge gained from the information gained.

“POE methods have developed, more-standardized and -specialized evaluation approaches have been developed for specific building types” (Zimring, 2002, p. 309). It is important to treat building types differently. Buildings serve different purposes and house people for different reasons. This next standardization for healthcare design is very user specific.

Taylor, Quan, Nanda, & Joseph, (2012) wrote an article in Healthcare Design that echoed a sentiment in many researchers’ findings. POEs are in a state of flux, everyone (Zimring & Reizenstein, 1980) (Vischer, 2001) (Bordass & Leaman, 2005b) (Hadjri & Crozier, 2009) (Preiser, 2011) is trying to create a standardized process to evaluate evidence in the built environment. According to a recent report to the “US Military Health System”, there were gaps in conducting healthcare related POEs that included a “lack of standardized POE methods and metrics” (Taylor, Quan, Nanda, & Joseph, 2012, p. 14). They further reported the results were not accessible, they were focused more on building performance and not on patient-centered care and the information gained from
the POE was not connected to “institutional processes” (Taylor, Quan, Nanda, & Joseph, 2012, p. 14). This is clear evidence that standardization can have a different meaning for different clients and that it is important to understand what information is important for each client for each evaluation and the standardization may lean toward each client or client typology.

The Center for Health Design (CHD) (website: http://www.healthdesign.org/chd) is in the process of creating a database where designers, facility owners or other interested parties can compare similar healthcare facilities online through what they call their “Ripple” effect to support “facility evaluations” and “decision making for future projects” (Taylor, Quan, Nanda, & Joseph, 2012, p. 14). The more people that participate in entering POE data the larger and more informative the database grows and its ability to feed forward to future projects.

“The Center for Health Design (CHD) has been involved in a major research effort over the past few years aimed at developing such a framework and database for linking healthcare facility design with key user outcomes” (Taylor, Quan, Nanda, & Joseph, 2012, p. 14). Their goal is to create a POE that encompasses effects of the built environment on healthcare outcomes. The CHD is also designing a group of standardized “Toolkits” (Table 5) and databases for specific types of healthcare facilities. The concept is to gather empirical information that has been lacking in previous research (Taylor, Quan, Nanda, & Joseph, 2012, pp. 14-16).
<table>
<thead>
<tr>
<th>HCD Design Toolkit &amp; Databases</th>
<th>Components</th>
</tr>
</thead>
</table>
| Clinic (outpatient) POE        | • General Information, project details, design intents  
                                • Audit tool, customizable rating  
                                • Anonymous staff and patient questionnaires  
                                • Data collection form for outcomes |
| Acute-care facility (inpatient facility) POE | • Building envelope  
                               • Building layout  
                               • Unit configuration  
                               • Room layout  
                               • Acoustics, lighting, air, ventilation, thermal comfort  
                               • Positive distractions  
                               • Interior Material Selection |
| Inpatient rooms (medical/surgical, ICU, labor/delivery) POE | • Walk-through checklist for each room type  
                               • Questionnaire for patients, family, and staff  
                               • Framework for structured interviews |

Table 5: HCD Design Toolkit and Database (Taylor, Quan, Nanda, & Joseph, 2012, p. 14-16)

The last POE standardization attempt that will be mentioned in this literature review but far from the last one is probably the one that will be the hardest to accomplish. It seeks to be an umbrella for what looks like the entire design field.

Wolfgang Preiser another proponent of POEs is now directing his building evaluation expertise toward “Universal Design (UD) performance assessments” (Preiser, 2011, p. 38.1). Using standardized methods of assessments in his more recent writings he agrees there isn’t any standardization developed as of yet but does suggest that this UD system is spreading widely throughout the design world (Preiser, 2011, p. 38.2) not just in architecture and interior design but industrial, product, graphic, fashion, urban, information technology and many more. Preiser believes that the UD methodologies and measures could “transcend its “soft” ideals” and “move in the direction of “hard” science and facts” (Preiser, 2011, p. 38.4). There is a lot more research information on UD but for the extent of this research, it was mentioned as an alternative assessment tool that was not used but was reviewed for applicability.
Standardization seems like the wave of the future but there seems to be many limitations. User interface being one of them. The more in-depth results required the more input would be required. Data-input would require a lot of education on the part of the designer or perhaps there will be fulltime data-input technicians. An expert in every building type would be needed and in the Universal Design (UD) case in every product created you would have to invent new instruments to record your data. Just how far can you take standardization? Where do you draw the line? These answers should come from the clients and the end users because the buildings, the spaces, and the products are being designed and developed for them.

In the case of the NHC and this current research project there is no standardized POE for the project undertaken that could be found. The POE undertaken is utilizing several adaptations to achieve the best outcome with the intent to learn how the built environment contributes to healing within the education spaces at the health center.

2.3.2 Safety and Security

Security needs within the environment are a major concern. The visitors to the institution and the staff need to feel safe. “The cultural, social, and architectural aspects of the campus should work in unison to convey the message of a safe and secure environment” (Kopeck, 2012, p. 231) to the community.

During the post occupancy evaluation one morning it seemed the entire building, staff, visitors, and patients were all congregating outside the front of the building. There was a lot of shouting and pointing taking place. Men in military uniform were present and according to the translator, someone had stolen the Rwandan flag that was prominently displayed on a pole in the front of the health center. A translator speculated that many people believed someone wanted the old flag hung in its place, the one before the existing presidential regime. This caused a lot of fear around the health center. The
entrance that was never observed to be closed had iron barred gates standing ready to be shut at a given moment and the bars on the windows serving as constant reminders of the need for security, constant reminders of the genocide in 1994. The next day a young child came carrying the flag in a small bundle wrapped in her thin arms. She returned it somewhat reluctantly, in front of a large shouting crowd that had once again gathered in front of the building near the regretfully bare flagpole. The translator said he did not believe she took it he said she had some mental health challenges and was not capable of doing such a thing. The safety and security of the health center was shaken that day.

The genocide of 1994 even now and for good reason causes fear in the people of Rwanda. The ability to use the built environment to try to convey safety is very difficult. “Designs should be calming and convey the message that people have entered a safe refuge where competent people are ready to provide assistance in any way possible” (Kopec, 2012, p. 269). Spaces that optimize the design environments that support people’s behaviors, activities, cultures, and norms and prevent harm from coming to them in the spaces in which they lead their daily lives” (Kopec, 2012, p. 15).

2.4 Building Codes and Standards

Very little information could be found online as far as Rwandan building codes for Healthcare facilities or education facilities were concerned. What was found was a work in progress for basic construction projects. The Rwandan Ministry of Infrastructure does have a publication titled; “Rwanda Building Control Regulation’s printed in 2009 but it has limited useful information. Another source suggested using the United Kingdom’s buildings regulations while another suggested that a recent project completed in the north by MASS Design Group for the Butaro Hospital was going to create a new set of architectural guidelines but none had been implemented or found. One process that was mentioned, (this is not written) is for the registered architect to design the facility in
plan and have it reviewed at the Ministry of Health (MOH) before getting permission to build. The building code information outlined herein is as though it was to be built in the United States (US) and is for reference only. It is not a full list of the building codes but pertinent to a POE. It has been found that POEs “have had a definitive influence on building standards and design” (Preiser, Rabinowitz, & White, 1988, p. 20) and it is prudent to review the codes while conducting building evaluations for conformance. In some situations, building codes or standards may not apply and considerations or special circumstances may override the regulations.

The building code is a relevant part of the literature for a POE and the rationale will follow below. Keep in mind the health center is not a school and the participants are not traditional students. The health center provides voluntary educational programs for the patients and visitors of the community at its facility. Although some rooms were designated as education rooms, the building was never constructed specifically as a school. As such, these codes and references are a cross between a healthcare institution and the education spaces of the facility that were studied. For future studies should designated spaces be specifically designed and built for education this information would become much more environmentally specific toward each space.

Life Safety Codes, Fire Safety, certain Occupancy evaluations are not within the scope of this research and will not be included in this evaluation.

2.4.1 Lighting

International Building Code 1205.3

Artificial light shall be provided that is adequate to provide an average illumination of 10 foot-candles (107 lux) over the area of the room at a height of 30 inches (762 mm) above the floor level.
Foot-candle: a unit of Illuminance on a surface that is everywhere one foot from a uniform point source of light of one candle and equal to one lumen per square foot. One foot-candle is equal to 10.76 lux. 

“The quality of light in a space profoundly affects one’s perception of that space.” A space with proper lighting design will draw the user attention to “points of interest and helps to guide the user of a space about” (Ramsey & Sleeper, 1994, p. 51). It is up to the lighting designer to place light fixtures in such a manner that it draws the users toward the intended point of interest or in this case the area where the instructor will be teaching the class. “Good lighting promotes seeing – in the sense of performing such visual tasks as reading or operating equipment” (Ramsey & Sleeper, 1994, p. 51). Improper lighting can cause headaches and fatigue when attempting to work on tasks (Ramsey & Sleeper, 1994, p. 52). Table 6 offers a recommended Illuminance value for classrooms and offices of the NHC should daylighting not be sufficient or evening classes be an option.

**Recommended Illuminance Values for Various Types of Activities**

<table>
<thead>
<tr>
<th>Classrooms, Offices</th>
<th>Foot-candles 50 – 75 – 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The work surface is usually a horizontal surface and the most commonly used calculation technique, (the lumen method) to achieve approximate uniformity of Illuminance (foot-candles) at any desired horizontal plane in a room (Ramsey &amp; Sleeper, 1994, p. 52).</td>
<td></td>
</tr>
</tbody>
</table>

Table 6: Recommended Illuminance Values for Various Types of Activities

**2.4.2 Daylighting and Windows**

2012 International Building Code, Section 1205.2

The minimum net glazed area shall not be less than 8 percent of the floor area of the room served. The Rwandan Ministry of Infrastructure would actually supersede this. They stipulate in section: 3.3.12.4 that “all windows intended for the purpose of lighting, ventilation shall open directly to external air, shall be glazed or provided with wooden
shutters, or other approved shutters, and shall have a total area of not less than 10% of the floor area of the room.” In addition per section: 3.3.12.1 “a room of any building shall have in the external walls an adequate number of openable windows that shall be of such size as to afford effective lighting of the room and ventilation by communication with external air” (Republic of Rwanda, Ministry of Infrastructure, Rwanda Building Control Regulations, 2009).

“The level of illumination in daylit classrooms can vary from 30 to 250 foot-candles and still be acceptable for most tasks. Usually, an average of 40 to 45 foot-candles is acceptable, which means that much of the room would have about 50 foot-candles of illumination” (Energy Star Building Manual p. 7).

“Daylighting is the controlled admission of natural light—direct sunlight and diffuse skylight—into a building” while saving energy and provides a “stimulating” environment for building users (Ander, 2012, para. 1). Many things need to be considered when daylighting. Selecting north south exposures over east west exposures is important so that heat gain is not an issue. Providing window covering and the proper window glazing can also be very instrumental. Interior finishes that do not cause glare and would be blinding to occupants is another possibility that requires planning. Allowing uninterrupted and undiffused daylighting can cause fatigue during very bright days when the occupants have no means to shade themselves from the brightness of the sun (Ramsey & Sleeper, 1994, p. 52).

“The location and size of windows” (Preiser, Rabinowitz, & White, 1988, p. 20) is significant as they will affect interior privacy floor plan and seating layouts. Locating windows to provide views of nature have been known to have healing properties (Ulrich, 1984) (Ulrich, 1991) (Ulrich, Zimring, Joseph, Quan, & Choudhary, 2004) and relieve stress for building occupants. Occupants “visual comfort depends on having an adequate
amount of evenly distributed illumination” (Energy Star Building Manual p. 2). Having dark and bright areas in the room caused by the sun and cloud movements can cause eyestrain and discomfort to the inhabitants.

“Small-scale studies have proposed a link between lighting and attainment” providing the teacher had control over the lighting diffusion and the daylighting controls in the classrooms (Heschong & Knecht, 2002) (Winterbottom & Wilkins 2009, p. 63). Having operable windows in another study showed students progressed seven to eight percent faster on “standard tests in one year than students in rooms with fixed windows” (Heschong, Wright, & Okura, 2002, p. 106). From these studies, it is possible to infer that proper window and lighting design has an impact on education.

2.4.3 Ventilation and Thermal Comfort

2012 International Building Code, Section 1204.1

Equipment and systems: Interior spaces intended for human occupancy shall be provided with active or passive space-heating systems capable of maintaining a minimum indoor temperature of 68°F (20°C) at a point 3 feet (914 mm) above the floor on the design-heating day.

The built environment or the actual environment must be capable of removing “bodily heat and moisture” at the same rate it is being produced by an individual or individuals in order for that individual or individuals to be comfortable (Ramsey & Sleeper, 1994, p. 65). Ramsey & Sleeper states that thermal comfort is dependent upon how it flows through or about building materials and whether it is “by means of convection, radiation, or conduction” (Ramsey & Sleeper, 1994, p. 65). The Rwandan Ministry of Infrastructure states in section: 3.3.11.1 “building materials shall have insulating qualities, attested by an approved laboratory, so that where the material is used in the construction of any building it is capable of balancing the extremes of
temperature effects in the building to tolerable levels as approved by the Committee” (Republic of Rwanda, Ministry of Infrastructure, Rwanda Building Control Regulations 2009). The location of committee standards was not available.

Ramsey & Sleeper (1994) ranks the high end of the comfort zone in buildings to correspond with a relative humidity (RH) reading no higher than 65% for lightly clothed individuals. Individuals will become uncomfortable because they will no longer be able to dispel moisture and suggest buildings employ means to increase air movement but warn too much or too fast movement can decrease or make working conditions unpleasant or undesirable due to breezes and blowing papers. They also recommend that the indoor temperature range be maintained between 70°F and 80°F [21.1° and 26.6°C] for most individuals (Ramsey & Sleeper, 1994, p. 65).

During this research, the NHC was not equipped with any heating, ventilation or air conditioning systems (HVAC). The average year round temperature in Rwanda is between 24.6° and 27.6°C [76.3° and 81.7° F] and the hottest months are August and September (Briggs & Booth, 2009, p. 2). During wet or damp seasons, the building has no means of rapidly dissipating moisture, which could allow the formation of mold or fungi to form which is known to cause upper respiratory infections and other allergic reactions. It may also cause damage to the building itself in the form of rust or rot.

According to an available historical weather report found at “WeatherSpark,” http://weatherspark.com/history/29294/2013/Kigali-Rwanda. The 2013 historical records were listed as follows: The hottest day of 2013 at the Kigali International Airport (Kigali, Rwanda) was August 14, with a high temperature of 102°F. In addition, according to the source the high temperature exceeds 85°F only one day in ten. The coldest day of 2013 was August 12, with a low temperature of 52°F. Moreover, according to the source, the low temperature drops below 60°F only one day in ten and the least
humid month of 2013 was July with an average daily low humidity of 39%, and the most humid month was March with an average daily low humidity of 62%.

Dr. Mark Schneider, American Enterprise Institute, American Institutes for Research wrote a paper linking academic outcomes to school facilities. He noted in papers written by Harner (1974), Wyon, Andersen, and Lundqvist (1979) that the optimum range for students performing “mental tasks” is when the temperature is between sixty-eight and seventy-four degrees Fahrenheit and the humidity is between forty and seventy percent (Schneider, 2002, p. 2).

Studies show that thermal comfort affects student performance with “warm temperatures” decreasing alertness, and “cold temperatures” decreasing dexterity. “Frequently and widely fluctuating temperatures” have been shown to deter the ability to concentrate “although broader fluctuations tend to be more acceptable with natural ventilation” (Energy Star Building Manual p. 2). Weather permitting, “natural ventilation through operable windows can provide fresh air and comfortable temperatures without introducing excessive humidity” and gives the teachers control over their environment (Energy Star Building Manual p. 12). Natural ventilation has shown that the “range of comfortable temperatures may extend from 62° to 86°F” (Energy Star Building Manual p. 12).

2.4.4 Water Closets, Lavatories, and Drinking Fountains


2902.1.1 Fixture calculations (Assisted Toilets/Fountains are considered a very important subject but they were not part of this research as nothing was located in Rwandan Standards or in the field for reference).
<table>
<thead>
<tr>
<th>Educational Classification n/building occupant</th>
<th>Business Classification n/building occupant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Closets: 1 per 50</td>
<td>Water Closets: 1 per 25 for the first 50 and 1 per 50 for the remainder exceeding 50</td>
</tr>
<tr>
<td>Lavatories: 1 per 50</td>
<td>Lavatories: 1 per 40 for the first 80 and 1 per 80 for the remainder exceeding 80</td>
</tr>
<tr>
<td>Drinking Fountains: 1 per 100</td>
<td>Drinking Fountains: 1 per 100</td>
</tr>
</tbody>
</table>

2902.2 Separate facilities. Where plumbing fixtures are required, separate facilities shall be provided for each sex.


Since the NHC is neither a hospital nor a school, both an education and a business classification were used as a possible option in determining fixture calculations.

2902.3.2 Location of toilet facilities in occupancies other than malls:

In occupancies other than covered and open mall buildings, the required public and employee toilet facilities shall be located not more than one story above or below the space required to be with toilet facilities, and the path of travel to such facilities shall not exceed a distance of 500 feet (152 m).

2.4.5 Acoustics

The following are a list of reference standards/organizations when designing for acoustics but it is recommended that an acoustician be consulted to properly design within healthcare or education settings whenever possible.


The recommended maximum noise levels at the NHC are shown on Table 8 taken from Ramsey & Sleeper, 1994, pp. 59-61 and Facility Guidelines Institute, 2010, p. 35.

<table>
<thead>
<tr>
<th>Type of Space</th>
<th>Recommended Background Noise Criterion Curve (NC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auditoriums, large lecture rooms</td>
<td>NC 20-25 equivalent to 30-35 dBA</td>
</tr>
<tr>
<td>Large Conference Room, Small auditorium</td>
<td>NC 25-30 equivalent to 35-40 dBA</td>
</tr>
<tr>
<td>Small conference room, classrooms</td>
<td>NC 30-35 equivalent to 40-45 dBA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of Space</th>
<th>Sound Transmission Class (STC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classrooms, Laboratories</td>
<td>STC 2 50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sound Level</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>85~ to 140 dBA</td>
<td>Continuous exposure can cause hearing loss</td>
</tr>
<tr>
<td>45~ to 65~ dBA</td>
<td>is considered the range of speech</td>
</tr>
</tbody>
</table>

1. **Noise Criterion Curves (NC)** - An NC level is a standard that describes the relative loudness of a space, examining a range of frequencies (rather than simply recording the decibel level). This level illustrates the extent to which noise interferes with speech intelligibility. Retrieved from: http://www.acoustics.com/nc.asp.

2. **Sound Transmission Class (STC)** - Refers to effectiveness of partition construction.

3. **Decibel (dBA)** - Also known as a dB, it is a unit for measuring the relative intensity of sounds, equal to one-tenth of a bel. A bel is used in physics to measure the difference in the intensity level of sounds to normal human ears, equal to ten decibels. Retrieved from: http://wordinfo.info/unit/620/ip:1/il:D. The “A” is for ‘A weighting’ and has to do with the way electronic instruments simulate human hearing.

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Table 8: Acoustical Design Facts

“Sound can also be easily transmitted through common building materials (steel, concrete, wood, metal framing, piping and gypsum wallboard) this is called “structure-borne sound” (Ramsey & Sleeper, 1994, p. 59). Floors, footfalls, and dropping things are some of the major building occupant contributors to these sounds. The most common medium for transmission is the air: “Air-borne sound” (Ramsey & Sleeper, 1994, p. 59) is the name for this medium. “Good acoustics is not cosmetics; it must be an integral part of the building design” (Ramsey & Sleeper, 1994, p. 60).

The majority of classroom activities involve spoken communication, “acoustic comfort is vital” (Energy Star Building Manual, p. 7) for student success. Noises from the
outside, building equipment, and people can be a significant distraction. Contact with finishes such as floor tile, metal equipment, furniture, metal benches also contributes to disturbing noise levels. Included in the numerous byproducts of a turbulent setting are: headaches, people becoming “less interpersonally engaged, less caring, less reflective, and cognition is impeded” (Schweitzer, Gilpin, and Frampton, 2004, p. S-74). Noise has also been known to cause stress affecting workplace performance and student learning (Evans & Cohen, 1987) (Ulrich, 2000, p. 2) (Energy Star Building Manual, p. 7).

Hard surfaces and finishes in healthcare institutions make it easier to clean and right angles in construction tend to require less effort to build but both furnish surfaces designed to keep noise levels high and cause reverberation and sound to reflect off of them which make for a very undesirable space (Busch-Vischniac, et al, 2005) (Kopec, 2012, p. 272). Surfaces can be reflective, absorptive or diffused. The least desired when it comes to unwelcome noise is reflective.

Noise Reduction Coefficients (NRC) is a term given to common building materials. It refers to the building materials ability to absorb sound generated from speech but typically does not apply to sounds from low frequencies or music. The harder and less porous the material the less likely the material will absorb sound. The ratings for NRC are from (0) zero which is perfectly reflective to (1) perfectly absorptive (www.nrcratings.com). An open window, which is not a building material, is an exception it has a rating of (1) one it is perfectly absorptive. All the materials within the space are calculated within a formula to provide an overall rating.

Research has credible evidence connecting good classroom acoustics to positive scholastic achievements (Schneider, 2002, p. 6). In 2004, the American Speech-Language-Hearing Association’s (ASHA’s) endorsed the ANSI standard and recommended the following criteria for classroom acoustics: Unoccupied classroom
reverberation must not surpass 0.6 seconds in smaller classrooms or 0.7 seconds in larger rooms (Schneider, 2002, p. 7). Reverberation time refers to the amount of time it takes for the sound to die away. In a highly reflective room, it takes longer for sound to die. Noise is described as unwanted sound “there appears to be sufficient evidence on negative effects of noise to justify the recommendation that noise reduction should be a major consideration in the design of new healthcare buildings” (Ulrich, 2000, p. 2).

There are two common ways used to control unwanted noise. One is called active control, which is an electro-acoustical noise canceling method that is more costly, and the other is passive control using sound absorptive materials, which is more economical. Some facilities use a combination of both for added benefit.

2.4.6 Space Requirements

ASU Classroom Design Guide. Revised: March 2011 found at (http://www.asu.edu/fm/documents/Classroom_Design_Guide.pdf) is based on the Space Planning Guidelines for Institutions of Higher Learning’ published in 1985 by the Council of Educational Facility Planners International (CEFPI). This guide was used to provide the following information.

Every jurisdiction seems to have its own requirements for classroom design. For the purpose of this research, ASU’s design guidelines were used. ASU determines classroom size by type of classroom. Three types were reviewed that came closest to what the NHC uses at its facility. The first type is Traditional, Loose Seating. This type has many requirements but minimally calls for 20 – 22 square feet per student and allows for 25 – 60 students. The next type is the Lecture Hall it is supposed to be “tiered” seating and allows for 50 – 150 seats but calls for only 10.5 square feet per student in the seating area or 18 – 20 square feet overall. Finally, the Auditorium, it can contain more than 150 seats that call for tiered seating. It must provide a minimum of 18 square feet
per student overall, but at least 6.5 square feet in the seating area. Both the Auditorium and the Lecture Hall style must allow for circulation space among the seats. The benefit of the tiered seating is in the larger class sizes the people sitting toward the rear of the class have a clearer view of the front of the classroom. When the traditional classroom has such a large number of participants, it becomes overcrowded and the views become obstructed.

The NHC is not an education facility and these classroom comparisons are far-reaching. The intent is to show that some of the rooms used at the NHC facility, including the ones labeled “Education Rooms” might be undersized for their intended purpose or their programs are so well attended a larger space might be better suited.

2.5 Ambiance of a Space

In research “we may theorize that beautiful environments evoke happy or pleasant feelings where as ugly rooms evoke annoyance or discomfort” (Kopec, 2012, p. 9). Wherein actuality research is proving to be much less theory as it is now proving to be fact. Although beauty is still in the eye of the beholder and design is still finding the right blend of acceptable stimuli to capture the eye without making it uncomfortable.

According to the Merriam-Webster online dictionary “ambiance” is defined as a feeling or mood associated with a particular place, person, or thing: atmosphere. For the purpose of this thesis, it is the mood or atmosphere of a place and how it is perceived. Perception is based on the size, shape, and temperature of the space as well as what has been applied to that space. That application can include colors, textures, works of art, carpets, lighting (Kopec, 2012, p. 226). Then the room can be filled with furniture, televisions, radios, and computers along with people all of which contributes to the ambiance of the room. What is missing or lacking from the space also adds to the overall feeling or mood set by the space.
2.5.1 Finishes

The first impression of a space is a reflection of the caregivers within (Malkin, 2002, p. 529) and provides a perceived expectation of the level of professionalism received. If room “decor is sterile and unstimulating” (Van Note Chism, 2006, p. 2.5) in a standard classroom then the occupants may tend to be under engaged while persons will show signs of exhibiting greater interests in surroundings that are “relatively complex and stimulating” (Preiser, Rabinowitz, & White, 1988, p. 46).

Availability of materials in Rwanda is of primary concern, being able to obtain products from within the country easily and economically for the initial installation and then restocking and replacement as needed is a critical concern. “As a developing country, resource constraints constitute a major limiting factor to national development” (Republic Of Rwanda, Capacity Development and Building a Capable State Rwanda Country Report, Kigali, 2007, p. 28).

The ease of cleaning the finishes must also be considered especially in the more remote areas where everything is done by hand and there are no machines to do the work. The color white has been used predominately possibly due to the perceived feeling of cleanliness or giving the illusion of an “antiseptic environment” creating a frame of mind for the occupants (Van Note Chism, 2006, p. 2.7). Whatever the finishes, they are required to be durable, provide maximum use (National Institute of Building Sciences, 2009) and be of high quality to last as long as possible due to extreme budgetary constraints.

2.5.2 Furnishings

“A learning environment can be improved by providing appropriate furniture” (Sommer & Olsen, 1980), (Leung, & Fung, 2005, p. 587). Appropriate furnishings could include; comfortable seating, bulletin boards, live plants, wall hung magazine racks for

On the walls, some tastefully displayed “educational exhibits” (Malkin, 2002, p. 543) placed in public areas to stimulate interests and encourage learning. Display “positive cultural artifacts” and artwork (Schweitzer, Gilpin & Frampton, 2004, p. S-76) from local artists on the walls and in display cases. Hire a local artist and designer from the community to consult with on appropriate works of art from the community.

Providing appropriate furniture to sit on is important taking “into account different body sizes and the long periods of time students must sit without moving. Uncomfortable seating causes people to become distracted and loose attention and this is not desirable in a learning environment (Van Note Chism, 2006, p. 2.6) (Gee, 2006, p. 10.2). Students will focus more on pain than on learning “because the human brain is configured to satisfy psychological needs before cognitive needs” (Kopec, 2012, p. 226). Selecting the right piece of furniture that will “allow for natural body positions” (Kopec, 2012, p. 226) is optimum.

2.5.3 Color

Colors can evoke sadness or joy, they can incite anger or bring warm memories, they have different effects on different people or they can do nothing “the design community has promoted the oversimplification of the psychological responses to color” (Tofle, Schwartz, Yoon, Max-Royale, 2004, p. 4). Many researchers have attempted to link health outcomes to their research in color related studies according to a 2004 literature review conducted by Tofle, R. B., Schwartz, B., Yoon, S. Y, & Max-Royale, A.
they could not find any “direct linkage” between the colors of a physical space to healthcare outcomes (Tofle, Schwartz, Yoon, Max-Royale, 2004, p. 4).

The healthcare studies show colors affect experience and performance (Tofle, Schwartz, Yoon, Max-Royale, 2004, p. 5) in particular environments as well as “color-mood associations” but not associated to a specific color (Tofle, Schwartz, Yoon, Max-Royale, 2004, p. 60).

In schools, “soft greens, pale blues, and creamy yellows have a soothing effect on people” (Kopec, 2006) and are often used in other institutions “where behavioral control is necessary” (Kopec, 2012, p. 225). Influencing students attitudes and attention levels has been affected by the use of color in learning environments according to a 1981 article by Sinofsky & Knirck titled; “Choose the right color for your learning style” (Kopec, 2012, p. 227). Focusing on laborious assignments can be accomplished under low lighting using “cool colors” and aids in reducing interruptions (Sharpe, 1974) and “cool colors neutralize the negative effects of noise distraction” (Bosch, Edelstein, Cama, & Malkin, 2012, p. 66).

“Spaces do not become “active”, “relaxing”, or “contemplative” only because of their specific color” (Tofle, Schwartz, Yoon, & Max-Royale, 2004, p. 4) but according to Dak Kopec, Ph.D., MCHES, IDEC “color can often set the tone of a space as being practical, whimsical, sophisticated, or playful” (Kopec, 2012, p. 298).

Research reveals that culturally learned responses along with “the physiological and psychological makeup of people” cause emotional responses to colors (Tofle, Schwartz, Yoon, & Max-Royale, 2004, p. 5) not the colors themselves. Some colors may have religious significance or certain customs or taboos associated with them in different parts of the world and need to be researched with local people and customs. Proper research and investigation should be conducted before color selections are made because
“color often possesses cultural significance and symbolism that is not uniform throughout the world” (Color environment and human response Book by Frank Mahnke, 1996) (Kopec, 2012, pp. 298-299).

Not only cultural standards but, time of day, temperature, health, purpose at facility, psychological state all can modify a person’s “aesthetic response” (Tofle, Schwartz, Yoon, & Max-Royale, 2004, p. 5) to color. Color selections by design professionals for designated environments depend on several determinants such as geographic location, culture, users, age groups, activities, size and configuration of the space, and the light source (Tofle, Schwartz, Yoon, & Max-Royale, 2004, p. 6).

Color can fill specific needs in facility design. It can “inform wayfinding” (Bosch, Edelstein, Cama, & Malkin, 2012, p. 43) by providing either intuitive color accents or actual color paths for visitors to follow. It uses color coding “to reduce confusion and aid in decision making by specifying color stereotypes: warning information in red, caution information in yellow or amber, and advisory information in another color clearly discriminable from red or yellow/amber” (Bosch, Edelstein, Cama, & Malkin, 2012, p. 43).

When designing around windows the designer needs to know that “the wall opposite a window should generally be kept light, or it will absorb much of the daylight.” In addition, “a window wall and frame should be light so as not to contrast too much with daylight sky”. Designers should also consider that “high contrast can result in headaches and eyestrain” (Bosch, Edelstein, Cama, & Malkin, 2012, p. 37).

In art, white is often called the absence of color and in the visual environment; white may be seen as the “absence of variety” which may cause “sensory deprivation” (Mahnke & Mahnke, 1987) if overloaded with white or actually any single monotonous color (Bosch, Edelstein, Cama, & Malkin, 2012, p. 59). One author found “the use of
white and off-white decrease human efficiency by an average of 25 percent” (Book entitled: The power of color by Faber Birren, 1997) (Kopec, 2012, p. 227).

White walls tend to give a clinical or institutional feeling for its occupants and visitors and a sense of cleanliness whether warranted or not. The white environments “appear cold, austere, and impersonal” and also proved to cause passivity in patients leading them to take on a behavior called “the sick role” and learned helplessness according to Talcott Parsons, who was a professor of sociology at Harvard University (Kopec, 2012, p. 258). Creating an environment with color and accents can help to eliminate these types of behavioral problems (Bosch, Edelstein, Cama, & Malkin, 2012, pp. 12, 15) (Tofle, R., Schwartz, B., Yoon, S., and Max-Royale, A. 2004, p. 58).

A professional designer given proper training and experience is still the best choice for bringing the colors, shapes and uniformity of a space together. The literature may not show proof of relationships between colors to healing but there are indications that color serves other purposes (Bosch, Edelstein, Cama, & Malkin, 2012, p. 55) and in the future studies promise to be more rigorous than previous.

2.6 Healing Environment

“Still recognized as “the Land of a Thousand Hills” and the Land of Gorillas,” Rwanda had become known as the “Land of Violence” and “the Land of Genocide.” People don’t focus on any of the positives not to say there are not positives that have resulted since the genocide but the people of Rwanda had rich culture, customs and heritage long before the genocide (Adekunle, 2007, p. ix).

“Architecture can be more than just walls and roofs. It can be a provider and promoter of health” (Schroer, 2000, p. 7). The interior environment is a holistic approach where the attributes of the entire facility are looked upon to create the healing environment. The environment has positive effects on the occupants’ wellbeing with the
quality of light, ventilation, acoustics, color, temperature, providing a sense of security, privacy, and connection to nature. The environment is full of sensory varieties and stimulation. If the occupant is an employee he/she has job satisfaction, has positive impact on work effectiveness and the job provides a sense of pride and purpose (WBDG Productive Committee, 2011).

“Environments that positively affect the healing process and wellbeing” of people whether it is related to the architecture, interior design, atmosphere, and/or ambient features (Dijkstra, 2006, p. 167) are healing environments. A building well placed and designed to adapt to different activities and programs that serve its community, is safe, inviting, comfortable, and offers wellness programs such as preventative and promotional health education classes will improve the social and physical wellness of its community (Schroer, 2000, p. 3).

2.7 Evidence-based Design (EBD)

EBD has been around for many years and has been accepted by some and politely shunned by others. A few architects in the past have reportedly shunned the notion that evidence rather than their experience and personal knowledge could hold up to their standards. The current definition by Kirk Hamilton: “Evidence-based design is a process for the conscientious, explicit, and judicious use of current best evidence from research and practice in making critical decisions, together with an informed client, about the design of each individual and unique project” (Hamilton, 2013, p. 20). EBD Explains the rigorous process that is undergone to achieve the best information available and with the architect and designers design an informed project. Sara Marberry’s definition of EBD is similar but it emphasizes linking “the design of the physical environment to outcomes, and then measure the results of those decisions” (Marberry, 2014).
Another term, “Informed Design” is also being used with similar meaning and came about more in the architectural realm where as EBD was used interchangeably among designers and architects. Informed design says that no longer can architects rely on “intuition” they must move to “rigorously developed evidence about predictive relationships between design and human response. Design “decisions” are “informed with credible (scientific) research” (Chong, Brandt, & Martin, 2010, p. 307) before putting pen to paper. Extensive literature reviews of past projects as well as reporting of current findings must now be encouraged for the future of design.

Designers using the EBD process must use their best theories based on research and data then quantify and justify the output and publish their results. This ever-changing ever-growing procedure done repetitively and constantly building up the resources will methodically advance or feed forward the evidence available for future projects (Dent, 2009, p. 95). “Once enough robust evidence is collected, evidence-based design will become second nature no longer the differentiator, but rather the norm” (Dent, 2009, p. 101).

POEs are an important part of the EBD makeup (Shepley, 2011, p. 7) and lay the groundwork for improvement on the existing design and incorporating changes into future designs. EBD and POEs support “good design” (Shepley, 2011, p. 86) practices and should be part of every design project.

2.8 **Rwandan Vernacular and Culture**

Is vernacular or culture important when building in a foreign country? Is it proper to think that since it is assumed that western culture has so many better advancements that it is ok to build as though it were in the United States or any other western civilization?
September of 2011 was the first visit to the Ngeruka Health Center (NHC) by five ASU graduate students and one ASU faculty member. Upon the first sighting, one of them was overheard to say, “this looks like a Howard Johnsons.” The building had a bright reddish, orange roof and it was spread out like a motel with the white columns, a large center mass with clerestory windows, and a drive up canopy at the front entrance (Photo 1).

![Photo 1: Ngeruka Health Center, Main Entrance](image)

After more than two hours of driving on mostly unpaved dirt roads full of potholes, past small villages and rural communities it was not what was expected, much like when visitors come to the western United States and want to see Cowboys and Indians most likely. In Rwanda, something more traditional was expected although knowing what was traditional is somewhat illusive.

When investigating the traditional architecture of Rwanda there was two types of houses that seemed to fall into that category. One, made of “wood, reeds, straw, clay, and soil from termites’ nests and had intricately woven mats that were used as partitions” inside (Traditional architecture, 2010) and one made of grass-thatch called a Nyakatsi home, which was round and kind of resembled a “beehive” (Kent, 2011, p. 23). In 2010, the government started a program to eradicate all of the Nyakatsi homes (70,985 homes) and relocating the occupants to more modernized, metal corrugated roofed houses stating health risks as the problem. They cause disease, harbored vermin and caught fire
very easily due to cooking around a very flammable environment. The new houses would be closer to infrastructure and the government would help families with the cost of purchasing materials that are more durable and help in their construction (Rwanda Governance Board, 2013). This vernacular will soon be lost. One similar remnant of this type of construction remains but at a much grander scale, the Ancient Kings Palace located in Nyanza, Rwanda (Photo 2). It is now a museum for tourists and visitors.

Meara Sharma was a journalism student traveling through Rwanda and attended the Faculty of Architecture and Environmental Design (FAED) year-end exhibition in 2012. She learned first-hand about how Rwandans have to build a new “Rwandan identity” out of the genocide. How their culture is changing and reshaping. She interviewed an architecture student at FAED who is unhappy going from a close family life of many generations that co-existed together in a communal life style to being relocated to an urban sprawl environment (Sharma, 2012) without much input from the family on deciding if they wanted to move.
When Rwandans had to seek out people and countries willing to help them out of their undesirable situation they had to give-in on some of their “core values.” According to the United Nations, in doing so they “lost self-respect, self-confidence and self-determination” (Omaswa & Crisp, 2014, pp.39-40). During the last twenty years of rebuilding Rwanda, an effort has been made to get some of these back and re-establish their identity.

There is a need for the architects, the government and the communities to work and talk together in making the design decisions to do what is best and to achieve understanding and a sense of buy-in from the community before relocating entire families and communities. Sharma commented that there were not many Rwandan architects and that the architecture of Rwanda was being designed, built and profited by foreign architects. In an interview with yet another architect, Jean-Marie Kamiy, Sharma was told: “As the world globalizes, everything and everyone is becoming more homogenous” (Sharma, 2012) and that culture is not as important as it once was. Perhaps its true people want more and they want the same conveniences everyone shares around the world.

A group of foreign architectural students brought a plan to the remote Burera District in Rwanda in 2010 and they used an ethnographic approach, they had gotten to know the people and they built a hospital together. It was not about vernacular it was about working with the community and bringing a hospital and a community together. This was a documented as a great success. Taking a quote from one of those students’ answers where you draw the line on vernacular. “In a place like Rwanda, it’s not neo-colonialist to work on high-quality design projects as long as you’re deeply and authentically engaged with the community. In today’s world, it’s more neo-colonialists to
assume that African people don’t want well-designed buildings and spaces” (Shioiri-Clark, 2013).

Interestingly as the old culture is slipping into the past, the new modern era seems to be just around the corner. The new conceptual master plans for Kigali were revealed in 2007 by Oz Architecture. The story, according to Donna Rubinoff, Rwanda’s Director of Urban Planning was that President; Paul Kagame visited Denver, Colorado and became so impressed by the cityscape that he commissioned a conceptual master plan for Kigali, the capital of Rwanda. The conceptual master plan was quite grand and futuristic but showed no signs of vernacular or culture. Two of the renderings from the Conceptual Master Plan can be seen in Photos 3 and 4.

Photo 3: Conceptual Master Plan Rendering 1

Kigali Conceptual Master Plan, Urban Planning Design is the Premier Financial Hub

Permission was granted to use Renderings of Conceptual Master Plans provided by: The City of Kigali, Rwanda and the designers, Surbana International Consultants PTE Ltd. www.surbana.com (Appendix Z)
Perhaps the place for vernacular and culture are places of honor and respect “celebratory spaces; [for] artifacts and symbols of cultural and group identity; [for] sense of uniqueness” (Heerwagen, 2007) that can be displayed for all to admire.

Rawlings and Stackel (2011) said the most common mistakes US-based design teams make is “not realizing the impact culture has on physical space” (Rawlings, Stackel, 2011, p. 36) conceivably to go one step further and to expand on the statement by saying the need is to incorporate culture through stakeholder involvement. The stakeholders such as the designers, the owners, the future employees and the people from the communities for which the projects are being made. The design teams need to participate in community life and activities to learn about the people and the things that matter to them. What works in one region may not work in another and as designers, assumptions should not be made. Asking questions and getting clarifications by showing full-scale examples should be expected so that there are no surprises when the project is satisfactorily completed.
Once someone is exposed to, what he or she perceives is better or appears is more advanced is it fair to ask them to remain in the past or in what they think is a substandard condition? In some westerners mindsets there is such a thing as “soft bigotry” (Ruxin, 2013, p. 122) where just because a substandard situation occurs in Africa it is OK because its Africa and surely it is normal to assume these conditions are acceptable to the African people even though they would never be acceptable in the westerners mind. Substandard means the same thing in Africa; if it can be improved, it must be improved. A designer must design keeping soft bigotry out of the concepts and design to the best products available. Even though keeping parts of cultural heritage is not meant to withhold technological and advancements from societies it seems it may be perceived as such. In an effort to decide whether or not vernacular should or should not be part of the design considerations within a community or even a society it should not be up to one person to decide. As long as the community takes part in the decisions and input, part of the community and therefor their vernacular is part of the design concepts. Moreover, who is to say that the westerners are always the advanced society?

2.9 Educational Environment

The early classroom designs seemed universal, they were frequently being located in bad environments, they were noisy, unattractive, and experientially repulsive (Barnard, 1842, Weisser, 2006) they were “factory-like”, “dark and dank”, and crowded, (Baker, 2012, p. 4-5). In contrast, the early classrooms in Rwanda and the Congo were the out-of-doors where the elders of the village would sit under the Akabimbi tree and pass on their stories and their knowledge (Dr. Kigabo Mbazumutima a guest lecturer in the fall of 2011 at Arizona State University as well as the President & CEO of Africa Health New Horizons).
An education environment is any place where learning happens. For this research, it is a multifunctional space designated at the Ngeruka Health Center (NHC) utilized as “Education Space” during which time specific educational programs are taught to the visitors, patients, and attendees at the health center. Other times and sometimes concurrently, the space is used as the reception or waiting room, immunization, family planning, anti-natal or pre-natal waiting areas and an outdoor kitchen.

The educational requirements of the community “drive the design” (OECD, 2011, p. 5) of the educational facilities. It must sustain the students, staff, and the programs for which it was designed. “They do not need to be iconic pieces of architecture, but they do need to be fit-for-purpose and appropriate for their context” (OECD, 2011, p. 5).

Learning environments need to be all things at once. They need to be adaptable, flexible, accommodate different levels of learners and different methods of teaching, they need to provide a place that is safe and secure, comfortable, free of unwanted noise and interruptions and makes use of available resources (Bingler, Quinn, & Sullivan, 2003, p.5). The environment “should foster high levels of student-to-student and student-to-faculty contact to create active and collaborative learning” (George, Erwin, & Barnes, 2009, p. 7). The facility must provide access to food, water (Fisher, 2005b, p. 161) (OECD, 2006, p. 70) and lavatories within a reasonable distance. The physical environment also needs to incorporate day lighting, ventilation and acoustics” (OECD, 2006, p. 31).

“Learning spaces that are physically and psychologically comfortable promote a sense of wellbeing, keep minds focused, and limit distractions” according to a renowned furniture designer, Herman Miller (2009, p. 3). Providing comfortable seating, appropriate for the classroom setting can enhance the student’s experience.
The seating placement in classrooms can set the tone for student teacher interaction. Placing the chairs all facing one direction, in rows give the teacher full authority in the room and is “teacher centered” which usually does not allow for much interaction among the students (Leung, & Fung, 2005, p. 587). The “practice of arranging seating side-by-side along the walls of a room markedly inhibits social interaction” (Sommer & Ross, 1958; Holahan, 1972) (Ulrich, 2001, p. 52-53). Whereas placing the seating in semicircles or in circular shapes provides an opportunity for open discussion and student-to-student interaction, which provides a different kind of learning environment.

Research of the built environment has shown that it “clearly” affects learning. “School design can enhance—or hinder—academic achievement,” (Bingler, Quinn, & Sullivan, 2003, p.6) however, the research offers little explanation “on the nature or strength of the relationship between the quality of school facilities and educational outcomes” (OECD, 2006, p. 49). Some of the ways used to measure success of educational designs is to conduct POEs or through achievement determined through such things as student retention rates, absenteeism, vandalism, student behavior (reprimands) and test scores (Fisher, 2005b, pp. 164-165).

2.10 Participant Engagement

Participant Engagement is when the attendees of the educational programs are actively paying attention and listening to the presenters of the materials being offered. The engagement is demonstrated by eye contact, the body positioning is forward facing and alert. Asking questions and opening up a dialogue regarding presentation topic is further indication of engagement. The definition of engagement this research is concerned with is the “positive academic outcomes” that will allow the participants the “willingness to exert effort necessary to comprehend” (Fredricks, Blumenfeld, & Paris,
the subjects being taught as well as “behavioral engagement” that reflects “active participation in class” (Furlong & Christenson, 2008, p. 366).

Participant education achievement indicators can be “observed and measured” (Hunley & Schaller, 2006, p. 13.4) via participant engagement according to literature. Observational measurement of engagement can be direct and/or indirect through survey methods (Hunley & Schaller, 2006, p. 13.5).

While the research at the NHC poses a unique situation at a healthcare facility with nontraditional students there are ways to use standardized surveys that “can tap the perspectives of a larger number of students and validate findings from other measures.” Such as “The National Survey of Student Engagement (NSSE) (http://nsse.iub.edu/index.cfm), for example, assesses engagement of students across multiple institutions: annually developed norms can be used to compare institutions” (Hunley & Schaller, 2006, p. 13.6). The High School Survey of Student Engagement (HSSSE), Center for Evaluation & Education Policy (http://ceep.indiana.edu/hssse/contact/index.shtml) is the organization this research reviewed and obtained information from and partially modeled some of its participant questions after. This was reviewed and permission was obtained from Robert M. Gonyea, Associate Director, at the Center for Postsecondary Research at Indiana University (Appendix BB). The object is to determine through positive feedback how engaged a participant is with their learning experience and combined with observational research to add validity.

Space or the built environment can add or subtract from a learning experience and it has “a role in determining the quantity and quality of engagement” (Gee, 2006, p. 10.3). A learning environment needs to be stimulating and “have the ability to motivate and engage students and educators” (Gee, 2006, pp. 10.4-10.5).
2.11 Why Does It Matter, Rwanda Statistics

Rwanda is primarily a rural agricultural country. Ninety percent of the population is involved in farming and the majority of them only farm for family sustenance. There is a minimal amount of agricultural commercial processing and mineral extraction according to the Central Intelligence Agency (CIA), World Factbook https://www.cia.gov/library/publications/the-world-factbook/geos/rw.

It is impossible to compare Rwanda to the United States when it comes to definitions of poor. In the US, a poor family has a home, with concrete or wood floors that are usually covered in carpet or tile; they have electricity, indoor plumbing, air conditioning, television, refrigerators, stoves, washers, dryers and an automobile. Trying to compare that to the Bugesera District or to Rwanda for that matter is a difficult task as noted by Figure 3 where across the board comparisons could not be made.
Figure 3: Bugesera District Statistics Comparisons with the US

In the US it is not a question of who owns a radio but just “how many” TV’s a person owns in their house. Radios are not even a matter of record. In the US poor is determined by how much money is brought into the household in Bugesera poverty is calculated by how much a basket of food costs and the amount of calories it takes to consume that quantity of food (Republic of Rwanda, National Institute of Statistics of Rwanda, 2010/11, p. 5). People in Bugesera have to walk to their health centers when they are ill. If they are too ill perhaps, they are lucky enough to be carried on a litter.
Some health centers have a motorcycle that can transport the ill if the patient can hang on. The nearest hospital for the Ngeruka village is in Nyamata, which is about an hour’s drive. It has two ambulances but they are for the hospital and it has over 300,000 surrounding residents they are responsible for, including Ngeruka.

Walking to an “improved” water source; water that does not have to be chemically treated, filtered, and boiled by the user before consumption was not a readily available or comparable statistic. Then having to carry home at least one (sometimes more) five gallon plastic containers (Photo 5) called a “jerry can” weighing over forty pounds every day for cooking, bathing, and drinking is not something transferable to US standards nor is locating firewood (Photo 6), chopping it down and carrying it home to cook meals on a wood burning stove.

The extreme living conditions in rural Rwanda tied in with the struggle to overcome the memories and the history left behind by the genocide and the devastating impact it had on the country and its people is severe. Then compounding the situation are the high mortality rates from malaria, HIV/AIDS, acute respiratory problems, and various other diseases (Figure 4) affecting not only the population but also an overburdened healthcare system.
Providing education at the health center level that will prevent unnecessary visits to health facilities could relieve them of having to treat curable, preventable illnesses and diseases that had previously been part of their services and could have an immense impact on the problem of being understaffed and under equipped. Promoting good health and teaching healthier lifestyles will add to the community’s health and quality of life.

Rwanda’s long range vision for 2020 is to reduce poverty, overcome illness, improve the health system and to promote the health status of the people of Rwanda by “providing quality preventative, curative, rehabilitative and promotional services” (Health Sector Policy, Government of Rwanda, 2005, p. 8). Teaching health prevention and promotion is one step toward that vision.

Figure 5 statistics were obtained from the NHC and show the impact patients with preventable conditions have on the healthcare system. Sixty percent of the cases seen at the health center are preventable. If just a portion of those cases could be stopped through early detection, care, and treatment at home from participants of the education programs at the health center it would no longer be overburdened with unnecessary cases or worry about being under equipped. The people would learn how to prevent injuries and illnesses from escalating into more severe cases requiring medical attention. Teaching health promotion by educating the community on the importance of vaccinations or the value of hygiene will prevent other harmful diseases. The statistics on Figure 5 should start shrinking.
Figure 4: Main Causes of Mortality in Rwanda

- 16% Malaria
- 15.1% HIV/AIDS and Opportunistic Infections
- 14.3% Acute Respiratory Disease
- 6% Diarrhea
- 5.2% Cardiopathies
- 3.4% Tuberculosis
- 3.3% Malnutrition
- 2.3% Gastro-intestinal diseases
- 1.2% Premature Birth
- 50.1% Other diseases


According to this source, the “highest proportion of people living with HIV/AIDS is in rural areas” (p. 15) but none were reported by the Ngeruka staff. They do teach HIV/AIDS prevention at the center. May be due to the stigma attached to HIV/AIDS.

Figure 4: Main Causes of Mortality in Rwanda
Figure 5: Ngeruka Patients with Preventable Conditions

- 32% Malaria
- 8% Intestinal Parasites
- 7% Skin Infections (not Scabies)
- 3.8% Teeth and Gum Infections
- 2.3% Ear Infections
- 2.2% Skin Infections (Scabies)
- 1.4% Diarrhea with no dehydration
- 1.2% Anemia confirmed
- 1.1% Malaria Confirmed simple in pregnancy
- 1.9% All Other Preventable Illness/Diseases *
- 38.8% Non Preventable

* “All Others” Listed from Highest to Lowest Instances
  - Diarrhea bloody dysentery • Vaginal discharge • Diarrhea with dehydration • Abscesses
  - Food poisoning • Urethral (male) discharge • Tuberculosis • Meningitis suspected
  - Ulcers of the skin • Scrotal Swelling • Skin Infections opportunistic

Note: There were 18,997 Total Out Patients recorded from January thru October 2012
2.12 Conclusion

An in-depth examination of past POEs, the built environment, building codes and standards, vernacular, educational environments, participant engagement and other critical aspects important to inform this research were reviewed in order to have a more complete knowledge base to complete this study.

A comprehensive investigation has linked participant engagement to the built environment and participant engagement to learning. The built environment has also been linked to healing environments. Environments that foster healing are of vital importance to healthcare design. There is little research on connecting all three: the built environment, education, and healing. This research intends to show a connection through a post occupancy evaluation, questionnaires, semi-structured interviews and observations of the Ngeruka Health Center. A healthcare facility capable of providing valuable educational spaces that through their physical design engage participants and staff with programs that are not only located within healing spaces but promote healing as well will have an impact on the future of the built environment in healthcare construction/design and on existing overloaded healthcare systems.

The original Conceptual Framework as shown in Figure 2 has been updated to reflect this literature review. Many of the citations overlap in their scope have been shown here (Figure 6) as the Second Level to the original framework to verify all elements of this research has been investigated.
Figure 6: Second Level, Conceptual Framework
Chapter Three

METHODOLOGY

3.1 Research Design and Methodology

The methodology of this work is a mixed method approach due to its nature and complexity. This approach was employed to answer the research questions as stated below, Section 3.2. Utilizing both quantitative and qualitative methods adds to the degree of reliability placed on research. Using qualitative research as a standalone tool to prove the credibility of the study draws more criticism from the scientific community that does not put a lot of credence to qualitative methods.

Research combining the built environment, healing spaces in conjunction with education spaces that promote healing is nonexistent. A mixed methods approach will better inform this type of research, its subject matter and the desire to have a more thorough understanding and insight into this project. Where quantitative methods are more rigid and tend to be geared more toward statistical, numerical data, qualitative is more flexible and has the ability to generate a more rich understanding of the subject (Rubin, 2008, p. 41). Both qualitative and quantitative methodologies are required to understand the built environment and the interaction of the occupants within. This research was designed to learn, report, and inform the design community, building stakeholders and the local community for which the building serves of the potential benefits that a healing environment, which includes health education and prevention, has to offer. The perceived impact of this type of healing environment will make for a healthier population and reduce burdens on health service providers.

The research started with an in-depth literature review to inform the readers of what pre and post occupancy evaluations (PrOE) (POE) mean and the value of such an assessment and the nuances of their purpose. The POE was determined to be the best
tool for the job. Part of PrOEs and POE includes knowing about building codes and standards (lighting, daylighting, windows, ventilation, thermal comfort, water closets, lavatories, drinking fountains, and acoustics), the ambiance of space (finishes, furnishings, and color), healing environments, and evidence-based design (EBD). When the POE is conducted in a foreign country or even unfamiliar region knowledge of those unfamiliar areas such as Rwanda its unique vernacular and culture is important and research is required. Research into educational environment and participant engagement was required to learn about the interaction of attendees in an educational setting and then combining that research with a health setting. Obtaining the background and statistical data on Rwanda (health statistics) was also conducted to inform this research. Access to public records on the treatment of preventable diseases that were seen at the health center were made available to the research for review and were converted into the chart shown in Figure 5 of the previous chapter.

Semi-structured interviews with key staff and the Executive Director of Rwanda Works were conducted to ascertain any insight that may not have been immediately obvious based on their responses to the questionnaires. These interviews were also significant in determining the design intent of the facilities education spaces and if they believed, they had been met.

Satisfaction questionnaires translated in English, Kinyarwanda, and French were distributed among the staff, administrators, and attendees of the education environment, which also included demographic information for statistical purposes. The questionnaires were voluntary and no personal or identifiable information as to who was completing the forms was requested. The questionnaires were used to obtain the qualitative and subjective data on user satisfaction. Thematic coding was used to identify patterns and themes that surfaced from the collected data. The Participant Engagement
Questionnaire (PEQ) was used to determine how the participants interacted with the built environment by engaging in their respective programs. They were used in tandem with on-site observation of the classes to verify participant engagement within the classroom environment.

Observations of four separate classes in four individual education environments were conducted on four consecutive days at the facility utilizing Rothstein’s a(x4) coding technique grouping the observations into actors, activities, artifacts, and atmosphere (Rothstein, 2001). Observations could add context to the questionnaires that might not have been apparent otherwise. Sketching was utilized during the class periods because photographs were prohibited by the Rwanda Biomedical Center (RBC)/Ministry of Health (MOH). The sketches appear in Chapter 4, Section 4.10 under Observational Research. As an observer and an ethnographer an attempt was made “to provide a vocabulary in which what symbolic action has to say about itself—that is, about the role of culture in human life—can be expressed” (Geertz, 1973, p. 27) by using “thick descriptions” (Geertz, 1973, pp. 9-10).

Grounded Theory was used to “generate theories strictly from the data” not letting any preconceived misconception misguide the findings (Strauss and Corbin, 1994, pp. 273-285) (O’Leary, 2004, p. 101) (Glaser and Strauss 1967) to aid in measuring participant engagement. Participant engagement was the only way to determine if the education environment was conducive to learning based on the literature without using testing materials to gauge knowledge learned.

As part of the POE quantitative data was taken in the four education environments using measuring devices brought on site for such purposes to record lighting levels, thermal comfort, acoustics, and room dimensions. Measurements were taken on five consecutive days as close to the same time each day whenever possible.
Public records were requested and obtained from the NHC’s medical records office for the previous year on the numbers of patients treated for preventable illnesses. The records contained no personal information or identifiable data that could be traced back to patients or staff. Drawings and Photographs were also generated to explain the findings of the POE. No records were available on the year prior.

3.2 Research Questions

Due to the history, geography, the actual terrain, and the financial constraints of Rwanda itself, working on health related problems becomes a wicked problem, no matter what you try to accomplish other challenges arise. There are many questions that could be asked but to limit the size of this paper the following two questions were selected as being most important for the topic of this research.

1. Does the built environment of the NHC contribute to healing by engaging education program attendees to learn about preventing illness, disease and promoting other health related strategies?
   a. Can you measure healing effects of the built environment?

2. Was there design intent specific to the education space within the NHC (there were five areas used as education spaces upon arrival on site)? Moreover, was the design intent met?
   a. What were the successes that were noted and observed?
   b. Was there room for improvement that were noted and observed?

Since it had been established in previous works that the built environment does contribute to healing this research (through question 1) asked if an education space within the built environment that teaches about disease prevention and health promotion could have similar properties. Further to ask if these healing effects could be measured. In a an earlier research paper by Roger Ulrich (1984) he discovered that built
environments that have views of nature speed healing times and patients in those environments required less pain medications. His research was measured by patient records and the nurses that were assigned to those patients. To be able to measure the effects of the topic of this paper could prove that the education programs are helping to reduce persons with preventative injuries and diseases from entering the healthcare facility. The people of the community are learning how to prevent these illnesses from needing professional medical attention. This will also reduce the burden on the health center and their staff.

The second research question regarding design intent would help to formulate the basis for future designs if the outcome of the original design was specific to prevention and promotion of health within the education spaces. Noting the successes and failures of the original design intent would help to guide future designers wishing for similar outcomes. The ultimate goal is to have a healthier community through the education courses taught and to reduce admission of preventable illnesses into the healthcare facility.

3.3 Site Description and Access

The NHC was chosen as the research site after an onsite visit in September of 2011 when a group of ASU students and faculty visited the facility during an investigative trip as part of a separate project that looked into the future needs of healthcare in Rwanda. The Executive Director of the Rwanda Works, the NGO responsible for the health center that was built in Ngeruka, was receptive to having a POE of the education spaces at the NHC conducted and gave his permission for the research.
Previously the 27,000+ people of Ngeruka had to rely on this (Photo 7) small health post and local community Health Workers (CHW) before the NHC was constructed. This was not only undersized for the population it did not have the appropriate staff or equipment to perform the services needed. Some health posts did little more than distribute drugs (anti-retroviral), take vital statistics and refer patients to the nearest hospital.

Approval had to be obtained before any research could commence in Rwanda. Rwanda Works, Arizona State University’s Institutional Review Board (IRB), Republic of Rwanda’s, Ministry of Education (MINEDUC), and Rwanda Biomedical Center (RBC) approved the premise of the research before any research was conducted. Copies of all approvals can be found in the appendices of this research paper located in Appendices A, E, J, K, and N.

Arrangements were made to meet with the Access Project District Health Advisor and the person in charge of the NHC, the Titulaire, on Monday, November 26, 2012 on site to conduct a walkthrough at the NHC but neither party were present. The staff on
duty gave permission for an unguided walkthrough of the entire NHC facility and site by the researcher and translator with particular attention paid to the designated education spaces as indicated on the architectural plans (Figure 7). These plans acted as a plan for a self-guided tour. There were no educational programs taking place at the time. When the Titulaire arrived later that day, the researcher met and reviewed the plan for the POE and the observations that were to take place.

During the meeting it was discussed how the research was to be conducted in the presence of a translator. The Titulaire spoke “fair” English but the translator was there for any clarifications. A regularly scheduled staff meeting took place first thing the following morning where the researcher, the translator and the project would be introduced.

The researcher was introduced to the entire staff at the end of the meeting and was invited to explain the scope of the research to them with the aid of the translator. The researcher then spoke a few words of appreciation and explained the purpose of the study was to view the NHC from an architectural perspective and see how the learning spaces contribute to healing through its ability to educate the community. The researcher further explained that as a student of this process she wanted to hear their opinions and thoughts of how well they are satisfied with the health center and if they had any suggestions or thoughts that could improve the center. The translator then repeated everything in Kinyarwanda because not everyone spoke English. Voluntary staff participants were asked to complete questionnaires where they could provide their comments about the health center. The researcher strongly expressed that the research questionnaires and participation was voluntary and anonymous, all participants must be eighteen years of age or older, and at any time the participant could withdraw from the research without any consequence.
Figure 7: NHC Original Floor Plan

It was also explained that at the end of every observation session, the *Titulaire* or a designated staff member would introduce the research project and researcher as outlined in the cover and information letter (Appendix O) backed up by the translator in the classes that were observed.
Not all of the spaces designated or utilized for education were marked on the plan and some of the spaces were repurposed since the plan had originally been made. There were no new plans or as-built drawings to note changes to the existing conditions. The original drawing was in a small-scale PDF format and was difficult to read. The dimensions were even more difficult to make out. Enlarged views were printed and brought to Rwanda to take notes, add dimensions and show placement of equipment used to take internal building measurements.

REVIT (drafting software) generated drawings were prepared later to show furniture layout, calculated square footages, and provide images for clarification. Alpha designations were given to each education space for ease of marking plans and making notations both in the POEs and in the participant engagement observations. The REVIT
drawings are only for reference and are not to scale. They were taken off the PDF drawings provided by Rwanda Works. The dimensions in the education spaces were the ones taken while on site. Figure 8 is the REVIT drawing of the NHC Site Plan with the Alpha designations indicated in plan. The shading indicates the education spaces utilized at the NHC.

The larger southern building is the main facility for the NHC. The smaller northern building shown in Figure 8 is a twenty-bed facility for emergency overnight patient stays if the need arises. The Site Plan drawing has some minor conflicts with what was actually built on site and some of the locations differ from what is shown. Figure 9 is a slightly larger, more legible, plan showing only the main building at the
These drawings reflect what was in the original drawings provided by Rwanda Works.

This plan was used for five separate facilities at five separate locations in Rwanda and not all were built identical. The floor plan for the southern building of the NHC where the majority of the care takes place is shown in Figure 8 enlarged for ease and legibility. The Demonstration Kitchen, “E,” uses open flames and is not attached to the facility it is located off to the east of the site. The original plan from Rwanda Works was in French, in the REVIT plans the room names were translated to English from the original drawing and the education spaces along with their alpha designations are shown.

### 3.4 Post Occupancy Evaluation (POE) Rationale

A POE is a broad term to include all the methodologies incorporated into this study. It was conducted to obtain quantitative and qualitative information about the built environment of the NHC. A POE can be used to “focus inquiries into select aspects of building performance” such as the education spaces and to “document successes and failures” of the building performance (Preiser, Rabinowitz, & White, 1988, p. ix). The POE used observations, questionnaires, and walkthroughs to “evaluate the effectiveness of the design from the users” and the developers perspectives to “establish best practice guidelines (OECD, 2006, p. 50).

The POE also takes physical (quantitative) measurements of the actual built environment to compare them with other facilities and to see if the building meets standards set forth by different governing bodies. The size, lighting, thermal comfort, sound levels, room design and windows are all included. Aesthetics is also a part of the POE which is a qualitative measure determined by the users and research.
The determination in selecting the POE method was based on the desire to obtain results pertaining to the design of built environment and its influence on its occupants. This method was best suited to answer the research questions.

The first question:

Does the built environment of the NHC contribute to healing by engaging education program attendees to learn about preventing illness and disease and other health promotion strategies? In addition, the sub question, “can you measure healing effects of the built environment?”

A positive or yes response to this question would mean that the built environment can have an impact on healing environments and buildings can be designed to heal. To answer these questions the engagement questionnaires were geared toward participant involvement with the space. Site observations of the class interactions were made to verify engagement through body language and attentiveness of the participants to obtain a better understanding of how they interacted within the space. The actual space itself had to be measured, tested and observed, recording the actual data for comparisons to codes and standards and similar facilities.

The next question and its sub questions include:

Was there design intent specific to the education space within the NHC (there were five areas used as education spaces upon arrival on site)? Moreover, “was the design intent met?” What were the successes that were noted and observed?

Was there room for improvement that were noted and observed?

Knowing what the design intent of the facility can be used as a tool to gauge the built environment and its occupants on how the design elements meet, exceed, or fall short of the original intent. This question relied on the quantitative information obtained from the building walkthrough and site investigation identifying and verifying the
education spaces were built as designed and the rooms still had the same purpose as when the design was being formulated. Both qualitative and quantitative methods utilizing semi-structured interviews with key staff and personnel aided in learning the overall design intent and the staff questionnaires acknowledged whether the design intent had been met or if there were items that needed improvement. Finding design elements that met the goals and were found to be desirable can be repeated in future design projects.

Whether or not there were, successes or failures would depend on the satisfaction of the staff and participants that were noted in the questionnaires and during the semi-structured interviews. The code review would list the physical aspects of the building and whether it met the codes and standards for this building type. Finding out if actual improvements are need based on comments from the users of the building and on the recommended design considerations that codes, standards and guidelines have to offer. When viewing something after it has occurred using hindsight things can more easily be pointed out after the building was built and occupied but were unseen or not thought of at the onset.

3.4.1 Literature Review

The literature review in Chapter Two focused on the background and baseline information as to the purpose and drivers of this study and included the content as well as WHY the research was conducted. The methodology focuses on HOW the research was conducted. The next chapter will inform on WHAT were the results using these methods. The literature review informs the study on existing research and determines the direction the research will take. A comprehensive review on Rwanda, POE’s, education, Codes and Standards, healing environments was made to develop the best approach for evaluating participant engagement and healing architecture in Rwanda.
3.4.2 Building Research and Baseline Data

Review of existing building design to become familiar with the site and to formulate a baseline for future studies was imperative. The building design can be compared to similar existing buildings that fulfill the same purpose if no baseline data was available for the building in the study. This data is then used to inform the project.

3.4.3 Semi-Structured Interviews

The use of interviews allow for more comprehensive understanding and firsthand knowledge of a subject that the interviewee may be the best source. It allows the interviewer the opportunity to delve into responses that may not have pinpointed the answers that were initially intended or to find deeper meaning in actual responses. Interviews also may bring up subjects that may not have been considered but have important consequence to the research. Sometimes asking open-ended questions can spark intriguing answers that were not considered but add valuable data had the spark not been ignited. Semi-structured interviews provide the interviewer a structure as the name implies that takes advantage of a script “but will shift in order to follow the natural flow of a conversation” (O’Leary, 2010, p. 195). An interviewer must first use “observational research methods” to investigate the subject of the interview to form an outline before any questions should be asked (Zeisel, 2006, p. 228). After the interview has begun, the interviewer is continually adjusting the outline so that it moves in the direction of the conversation.

3.4.4 Observational Research

Observations, according to Erlandson, Harris, Skipper, & Allen, (1993) provide a “written photograph” of the circumstances under observance using the researcher’s five senses (Kawulich, 2005, p. 2). DeWalt & DeWalt, (2002) describes it as “active looking”
(Kawulich, 2005, p. 2) and Schmuck, (1997) says it is a way “to check for nonverbal expression of feelings” (Kawulich, 2005, p. 4).

As a part of a mixed methods approach, this research used qualitative research design with participant observation as a three-part on-site data collection method. Selective observations were used to verify engagement of the participants within the built environment. According to Angrosino & dePerez, (2000) selective observations are “systematic in which the researcher focuses on different types of activities to help delineate the differences in those activities” (Kawulich, 2005, p. 15). As discussed earlier the physical environment affects an individual’s behavior. It could be inspired or it could be restrained. The questionnaires can provide details regarding interactions between the environment and the individuals (Hunley & Schaller 2006 p. 13.4) and the POE provides quantitative and qualitative data regarding the built environment and its occupants. Participant observations strengthen research when combined with questionnaires and interviews (Kawulich, 2005, p. 5). There is limited research linking all three of these methods into one study and then furthering that study that will tie healthcare education within a healthcare facilities’ built environment. In this study, observation was used to ascertain how the built environment affects participant engagement in an education setting at a health center. In the way of an ethnographer the participants will be observed, their actions recorded and later analyzed (Geertz 1973 p. 20) with “empathetic understanding” (O’Leary, 2004, p. 10).

The key to observational research is getting as close to unadulterated, untainted real life events as they happen without putting an elephant in the room to skew the events you want to observe. If time were not an issue and the researcher could spend years in the community and become immersed in the local culture, learn the language and resembled one of the community perhaps the old ethnological approach would be
feasible. This concept provided the rationale for the first criteria on how to be a foreign observer without the element of being able to go unnoticed. The NHC staff was introduced to the researcher and informed what the research entailed and was asked not to pay any special attention to the researcher during the classes and to try and let her go as unnoticed as possible while the presentation was taking place. The plan was for the researcher to be in the room and settled before any of the attendees arrived for classes and not draw any extra attention than necessary. The participants would come, take an initial look and find their seats. The researchers clothing selected were very informal and casual trying not to draw any unnecessary attention as well. Taylor and Bogdon (1984) suggest the researcher “be unobtrusive in dress and actions” (Kawulich, 2005, p. 18). There was no way to conceal a white woman, that was considered pretty rare in the area, that did not speak the local language, sitting in a room full of people and taking notes from the surrounding community. Most white people in the area were associated with NGOs and were known for having money. According to Schensul, Schensul, and LeCompte (1999) “There are a number of things that affect whether the researcher is accepted in the community, including one's appearance, ethnicity, age, gender, and class” (Kawulich, 2005, p. 7). The researcher used a sketchpad, sat in a back corner of the room, and pretended to draw sketches in-between taking notes hoping that would take away some of the suspicions of what she was doing.

Rapid assessment methods were used in the observation at the health centers, education classrooms. Total time in country was from November 7, 2012 Through December 1, 2012. The first ten days of which was spent living in a small guest house and commuting around the city of Kigali obtaining the necessary permits from the authorities having jurisdictions with the aid of many newly acquired friends along the way. The remaining time was spent living in the house of a local family that became close
friends but not part of the community that was to be observed. Five days were spent observing the classes and conducting the POEs at the health center in Ngeruka. A combination of the “observer as a participant” and the “complete observer” stance best describes the researchers status while conducting observations at the NHC. Gold (1958) relates “The observer as a participant stance” is an observer that is known by the group as an observer and is allowed to participate in group activities even though the main goal is observation (Kawulich, 2005, p. 9). The “complete observer” can be completely hidden or in plain sight and the public does not know they are being observed (Kawulich, 2005, p. 9). The rationale behind stating the researcher is a combination of both was that it was impossible to believe the participants did not have some inkling something was going on when they saw the researcher in the room so there was no possible way to hide from the participants and observe at the same time within the scope of this research.

The observations were conducted as stated and per agreement with the RBC, no photographs or audio recordings were taken during the class sessions. The observations included rough sketches of the overall room configurations and seating arrangements that were done during the class presentations along with notes that were taken using a modified version of Rothstein’s a(x4) Data Collection Tool (Figure 9) to coordinate the manual recording procedure. Rothstein’s framework (Rothstein, 2001, p. 12) which includes atmosphere as its boundary where actors, artifacts, and activities all interact within was utilized. Rothstein identifies the atmosphere as the place the observation is occurring. It is not just the physical space but also the aura of the space and its surroundings. The smells, the ambiance or anything that makes the space unique or even typical of any other space is included. The actors are the people found within the atmosphere. Who are they? What are they doing? Why are they there” How did they get there? Who are their companions? Anything relating to the people would be put in this
category. Also in the atmosphere are artifacts and these can be objects or devices. They can be things the actors brought with them or were found in the space. They may be part of the atmosphere. They could serve different uses and have different purposes for different people. The a(x4) is subjective and identifying what is an artifact one day may become part of the atmosphere the next. The last things found in the atmosphere are the activities. Activities can serve a purpose or be meaningless. They can follow a set order of things or just go with the flow. Activities can be commonplace or one of a kind anything goes but the more commonplace the more recording that has to be done (Rothstein, 2001, p. 14).

A Modified a(x4) Data Collection Tool, Figure 10 was used for each education space. The modification of adding a sketch box to the center of the page allowed the researcher to capture the atmosphere in a sketch and draw any significant items for future reference. This was also useful since this research included a POE segment and the participant use of the space was an important factor and proved to be quite valuable for recollection purposes. Bernard, (1994) advocates drawing a map of the physical space to help remember details (Kawulich, 2005, p. 20).

An Observation Checklist, Figure 11 was used as part of an observation coding scheme (Robson, 2002, p.327) based primarily on non-verbal and verbal behaviors of the participants. The research was interested in the engagement of the participants in the classrooms they were attending. This is a method along with the questionnaires in determining if education is taking place within the built environment. The checklist provides a tool combined with the observations and questionnaires to determine in the end, how the built environment contributes to healing.

A sketch box was added to show the physical space and how it was used when occupied. It can also depict the participants themselves in that environment. The coding
scheme did not prove effective as it related to the actors in this environment, which will be discussed further in Chapter Four. The observation checklist (Figure 11) was utilized as a type of researcher script to focus on the observed behaviors of the participants.
Figure 10: Modified a(x4) Data Collection Tool
Figure 11: Observation Checklist Coding Scheme

OBSERVATION CHECKLIST CODING SCHEME
(Robson, 2002, p. 327)

Location: __________________________ Date: ______________________

<table>
<thead>
<tr>
<th>NON-VERBAL BEHAVIOR:</th>
<th>SEE COMMENT</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position in Seat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eye Contact with Instructor</td>
<td><img src="image.png" alt="Image" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paying Attention</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Easily Distracted</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facing Instructor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affirmations (nodding head, clapping)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Responsibilities (breastfeeding, paperwork)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VERBAL BEHAVIOR:</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Asking Questions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affirmations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private Conversations</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| COMMENTS:                                   |             |     |    |
3.4.5 Questionnaires

The written instruments used in the POE were created combining several sources to obtain information relevant to this research (Preiser, Rabinowitz, & White, 1988), (McCuskey, 2011), (Boddington & Boys, 2011), (High School Survey of Student Engagement (HSSSE), National Survey of Human Engagement (NSSSE). The questions had to be geared toward answering the research questions through qualitative and quantitative methods.

A pilot questionnaire was not possible due to the population being outside of the US, language barriers, and time constraints. A past resident of Rwanda translated the questionnaires into the native languages of Rwanda. They were also reviewed by Nalini Chhetri, Assistant Director, School for the Future of Innovation in Society and Asst Director, Consortium for Science, Policy & Outcomes at ASU. Her review was to offer suggestions as to the verbiage and correctness of the questions based on the demographics of the population. There were six instruments used for this research and are listed below.

1. Cover and Information Letter (Appendix “O”)
   • Required to inform the participants the nature of the study, the ability to withdraw at any time with no penalty and the anonymity of participating.

2. Informed Consent Form (Appendix “P”)
   • Required to inform of any possible risks that may be involved and to assure anonymity along with the disposition of all forms completed by the participant.

3. Ngeruka Education Participants Engagement Questionnaire (Appendix “Q”)
• Engagement questionnaires are meant to extrapolate how the participants interact with the built environment and how the built environment of the education spaces can be classified as a “healing environment.”

4. Ngeruka Dedicated Education Space Staff/Administrators Questionnaire/Interview (Appendix “R”)

• This questionnaire was geared toward the staff and administrators of the facility. It gauges user satisfaction of the NHC. The staff and administrators have greater knowledge of the facility and their responses would be different from the visitors of the facility.

5. Post Occupancy Evaluation (POE) Form to be Completed by Staff (Appendix “S”)

• This form is meant for staff to rate each of the education spaces based on their feelings of the room’s performance. It also can allow the staff member to interject their likes and dislikes of the facility.

6. Administrator Checklist for Conducting a POE at the Ngeruka Health Center Education Spaces (Appendix “T”)

• This list outlines items necessary to perform the POE. It is important to send this form out ahead of time so it can be returned during the design process of the POE. The responses are then incorporated into questions used in the POE.

   Equipment to measure lighting, temperature, humidity, room size and configurations were used to obtain objective data on the space itself. Photographs were also taken to provide a visual record.

3.5 Data Analysis

Data analysis of each of the four education spaces were evaluated separately since each had individual qualities and different educators that could sway participant
responses on the questionnaires. The overall averages were combined after individual results were recorded.

The physical measurements of the space required the gathering of quantitative data, which was photographed, measured, tested, and recorded. This data was used to compare the facility to the codes, standards and similar building types to determine if the building met, exceeded or fell short of how this type of building should measure up. There is no flexibility as with qualitative data. The building either does or does not conform to the buildings requirements. The one flexibility this particular assessment may offer a degree of fluctuation is determining what type of building this facilities education spaces fall under. The building is labeled a “Health Center” but the spaces pertaining to this study are education spaces and in some cases can have varying degrees of latitude on the requirements. The code review and analysis breaks it down into the different parameters for each space. The code review used many of the codes and standards written for the United States since Rwanda had very little information in this area available. Codes should be written for the region they are to be enforced. Using the US codes does not take into account the building materials and environmental impacts that are particular to Rwanda. The code review that is shown in Chapter Four can be universal for the most part but may have some concerns that were not apparent during this research.

Originally, a modified version of Rothstein’s a(x4) coding scheme (Figure 10) was to be utilized in the observation portion of the research. The recording of events as it relates to the four main categories of this model to include actors, artifacts, activities and atmosphere (Rothstein 2001) was still completed per the Rothstein framework only the coding scheme during the data analysis phase was changed. The framework used correctly allows the main observations to emerge as a pattern. In this research, the
emergent factors were not as rich and informative. This was thought, due to the people or the actors all had the same purpose for being at the center and that was felt throughout the observation process. Emerging patterns did not seem to fit this facility in a form that added to this research. There were some overarching elements that did develop and are stated in Chapter Four but not to the degree associated with Rothstein's Framework. The tools were still used for recording purposes and aided in organizing the raw material for further analysis.

Occupant satisfaction is a qualitative segment of the POE. Getting the opinion of the building users and having them provide their input based on their experiences within the built environment is essential. Two sets of questionnaires were distributed to staff. The questions were formulated based on standard POE questionnaires, translated from English to Kinyarwanda and French and distributed to the building occupants to be voluntarily completed and returned. Each returned questionnaire was recorded; the results were averaged together by category. Part of the questionnaire consisted of a four point Likert scale with responses of; Excellent Quality, Good Quality, Fair Quality and Poor Quality being the selection choices. The hope was to keep it simple and to force the respondent to choose a side rather than offer a neutral midpoint. The remainder of the questionnaire consisted of demographics, and opportunities for personal input requesting the respondent to add their thoughts in the form of open-ended responses on what was lacking, needed improvement, and what they liked about the facility. The personal input was gathered together and analyzed to see if any patterns or similar thoughts emerged from the respondents. To help process the data obtained through observation and questionnaires “Grounded Theory,” theory that emerges from data which “may be flexible, iterative, and emergent, but it is never ill defined, haphazard, or ad hoc” (O’Leary 2004 p. 101) “that is systematically obtained and analyzed” (Glaser &
Strauss, 1967, p. 1) will help formulate the final synthesis of the data analysis for the end results located in Chapter Four.

Participant engagement questionnaires (PEQ) were distributed to attendees of the education programs also on a volunteer basis to determine if the built environment had an effect on education. This is measured through questionnaires that were composed using comparable questions currently utilized by organizations such as the NSSE and the HSSSE. These organizations compile questions for schools or similar institutions to determine participant engagement and provide written reports to the schools based on their findings. This method is preferred over standardized testing to assess retention of materials taught. Positive feedback to the questions indicates engagement with the facility. This process is backed-up by observational research.

The responses to the questions will also fulfill part of the POE satisfaction questionnaires as they answer questions relating to the built environment. These questionnaires consist of demographics, a Likert Scale as outlined previously with similar choices of; Strongly Agree, Agree, Disagree and Strongly Disagree. This questionnaire also had opportunity for personal input by the respondents.

The information obtained from the semi-structured interviews will be used not only to inform this research but also to feed forward information into future projects and in some instances compare data from what had happened in the past with what happened during the conducting of this research.
Chapter Four

FINDINGS AND ANALYSIS

4.1  Introduction

The findings and analysis of the research conducted at the NHC are stated herein. The space analysis of the built environment is broken down room by room and by the codes and standards that are applicable. The satisfaction surveys from all participants have been recorded, analyzed, and the findings documented with the following charts, graphs and supporting materials. Participant engagement questionnaires have been recorded to show the effects of the education spaces at the NHC on the participants.

The open-ended questions that encouraged self-disclosure of the participant’s feelings, likes and dislikes regarding the space were reviewed for overarching themes that emerged from the responses. Using grounded theory to refine the collected data the emergent themes are reported here (Charmaz, 2006, p. 15).

Semi-structured interviews were conducted and reported here to obtain the background and history of the NHC. The “design intent” was needed to help frame a reference of what was intended versus what was achieved in the original architectural plan as well as answering one of the research questions. Once learned questions can be given to the building occupants to determine if this goal was accomplished.

Linking the education space with health promotion and disease prevention by providing classes within the built environment encouraging engagement helps to create healing environments. The link is the focus of this research and the findings that went into this investigation are noted within this chapter.

4.2  Study Demographics

Out of approximately one hundred and ninety-two participants of the education programs at the NHC from Tuesday morning, November 27 through Friday afternoon,
November 30, 2012, 41% (78) volunteered to participate in the research project. They were advised they could withdraw at any time with no consequence or if they did not want to answer a question, they could skip it and move on to the next. The non-responsive questions were recorded along with the responsive ones and are noted in the analysis. Eight of the participants were male and sixty-eight were female. Two respondents did not reply to the gender question. The NHC caters to maternal and infant health, which could be the reasoning behind the huge difference in male versus female attendance. One of the larger classes was geared specifically toward mothers and their newborns and the participants from that study were all female.

There was approximately thirty staff at the facility when the research was taking place. On the two staff questionnaires, thirteen volunteered to participate and complete both questionnaires. Five of those respondents were male and seven were female with one staff member that did not respond. One of the staff participant’s questionnaire was eliminated due to answers that did not appear to make sense...this could be due to misunderstanding the questions or translation errors. This left twelve respondents totaling 40% of the staff. All of the staff questionnaires were supplied in English, French and Kinyarwanda. Many of the staff took copies of the English translations. It was thought to test their English vocabulary.

4.3 **POE Education Space Analysis**

Total evaluated area of the NHC was 3,147SF. The rooms were evaluated and measured to see if they met the codes and regulations pertaining to each space and to take note of the color, supplies, materials that make up the rooms. Everything in the room could have significance to any one of the participants. There could be something in the room that could distract the participant from the education classes or be a reason for
their return. The floor plans and sketches are provided in this chapter along with supporting photographs.

4.3.1 POE of the “A” Anti-natal Education Space Analysis

Spatial measurements of the room were taken as well as locating the doors, windows and ceiling height. Instruments were used to determine the amount of light in the room, the current humidity and temperature. These readings were taken on five consecutive days and the findings of each measurement were averaged. An attempt was made to take sound readings but the sound meter had malfunctioned and the readings were invalid. Information on the noise distractions that were observed and heard by the researcher during this investigation was noted.

The floor plan with typical furniture layout consisting of several rows of non-back supporting benches typical in all rooms is shown in Figure 12. The room was also used as an access point for the counselling office staff located in the adjoining space.
The windows were typically left open throughout and were fitted with “decorative” iron bars for security. There were no screens to keep out unwanted insects or pests. Above each window and the exterior doors were perforated blocks to provide ventilation for additional outside air. The windows and doors were also fitted with gold curtains to assist in blocking the bright sun and possibly to add a decorative element. The room has a northwest and southeast exposure to sunlight, which allows the room to be heated by the morning and late day sun. This could cause overheating on warmer days with direct sunlight.
Photographs 8 and 9 of the space were taken while no activities were going on. People were coming in early for an activity scheduled later. There are fluorescent lights in the ceiling but were never used nor did the electricity in the building seem to work with any dependability.

The floor was covered in glossy white marble tile that seemed very hazardous in times of inclement weather and was very hard on the eyes due to its reflectivity when the sun shone through the door and windows. The floors did appear easy to clean as the staff was observed using long handled squeegees and buckets of water to push the dirty water efficiently out of the building. The walls and ceiling were also a very close shade of white with no artwork or educational aids on any of the walls. There was a small easel in the NW corner with a mini chalkboard and pad of paper on it but it did not appear utilized.
The interior door to the adjacent rooms made use of borrowed light by adding glazing to the transom panel over the door. This looked to be standard throughout the entire building.

Figure 13 shows the Anti-natal light meter spot location plan. The light meter spot location was shown, in plan to show the relationship to the occupants of the room and the light source.

The numbers 7, 8, 9, and 10 correspond to Table 9 indicating what the readings were on the five days the readings were taken from those locations. The spots were marked and measured so that the same spot could be measured each day.
The light meter readings are normally used for artificial light situations or controlled light situations and when used with daylighting without any source of diffused or controlled lighting the readings are abnormal in most instances. Since the building occupants operate without the use of artificial light it was deemed a “normal operating condition” to test under these circumstances. The readings were taken for baseline measurements. It is hoped that if the situation arises the occupants can and will switch on the existing lights if needed and hopefully the power will be available. Averages were calculated to try and offset some of the erratic readings that were obtained during the course of the week they were taken. The weather varied from very bright sunshine to cloudy and rainy days that also played a key factor in the readings. The window coverings were not altered or changed and left as they were for normal conditions as they would be for normal use of the room.

Table 9 was used to indicate the square footage of the room and the window dimensions to calculate the size of windows needed per size of space according to code.
Table 9: Anti-natal Education Light Meter Readings

<table>
<thead>
<tr>
<th>Day/Date/Weather Cond./Time</th>
<th>Spot Location No. 7</th>
<th>Spot Location No. 8</th>
<th>Spot Location No. 9</th>
<th>Spot Location No. 10</th>
<th>Daily Average</th>
<th>Greatest Fluctuation (Δ) For ONE DAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday 11/26/2012 Cloudy/Sunshine 1130 Hours ±</td>
<td>94.5</td>
<td>77.6</td>
<td>130</td>
<td>92.5</td>
<td>98.65</td>
<td>Δ 52.4*</td>
</tr>
<tr>
<td>Tuesday 11/27/2012 Cloudy/Sunshine 1445 Hours ±</td>
<td>138</td>
<td>99.4</td>
<td>131</td>
<td>82.7</td>
<td>112.775</td>
<td>Δ 55.3*</td>
</tr>
<tr>
<td>Wednesday 11/28/2012 Cloudy/Sprinkling 0830 Hours ±</td>
<td>106</td>
<td>85.3</td>
<td>126.8</td>
<td>86.5</td>
<td>101.15</td>
<td>Δ 41.5*</td>
</tr>
<tr>
<td>Thursday 11/29/2012 Cloudy/Sprink./Sunshine 1145 Hours ±</td>
<td>66</td>
<td>75</td>
<td>40</td>
<td>28</td>
<td>52.25</td>
<td>Δ 47*</td>
</tr>
<tr>
<td>Friday 11/30/2012 Cloudy/Foggy 0820 Hours ±</td>
<td>141</td>
<td>129</td>
<td>96.5</td>
<td>121</td>
<td>121.875</td>
<td>Δ 44.5*</td>
</tr>
<tr>
<td><strong>5 Day AVERAGE</strong></td>
<td><strong>109.1</strong></td>
<td><strong>93.26</strong></td>
<td><strong>104.86</strong></td>
<td><strong>82.14</strong></td>
<td><strong>97.34</strong></td>
<td><strong>Δ 48.14</strong>*</td>
</tr>
</tbody>
</table>

Δ Indicates the time these measurement began for the day
* Fluctuation for WEEK and DAY obtained by subtracting the lowest reading from the highest reading (vertically and horizontally)
** Greatest fluctuation average for entire space (horizontally)
*** Greatest fluctuation average over five DAYS (vertically)
Δ Delta obtained by subtracting the lowest reading from the highest reading vertically

Notes: 1. There were five exposed single tube fluorescent light fixtures in the room that were never in use
2. The total room area was 529 square feet (SF) 10% of 529 S.F. is 52.9 S.F.
3. Exterior windows were 39" Above Finished Floor (AFF) and measured 58" high x 66" wide (26.58 S.F. x 3 = 79.75 S.F.)
4. The finished ceiling was 10'- 0" AFF
5. Minolta, Illuminance T-1 used to take all light readings
Humidity and temperature readings (Table 10) were taken during the five-day period and should be taken several times a year to get the year-round temperatures inside the facility. Since there is no mechanical temperature control for the facility this information is valuable for baseline data. Humidity and temperature levels are closely related to comfort levels so this information becomes important for user satisfaction.

### “A” ANTI-NATAL EDUCATION SPACE

<table>
<thead>
<tr>
<th>Day/Date/Weather Cond./Time</th>
<th>Humidity</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday 11/26/2012 Cloudy/Sunshine 1130 Hours ±</td>
<td>58.9%RH</td>
<td>77.5°F</td>
</tr>
<tr>
<td>Tuesday 11/27/2012 Cloudy/Sunshine 1445 Hours ±</td>
<td>49.6%RH</td>
<td>81.1°F</td>
</tr>
<tr>
<td>Wednesday 11/28/2012 Cloudy/Sprinkling 0830 Hours ±</td>
<td>71.2%RH</td>
<td>76.0°F</td>
</tr>
<tr>
<td>Thursday 11/29/2012 Cloudy/Sprinkle/Sunshine 1145 Hours ±</td>
<td>66.2%RH</td>
<td>75.0°F</td>
</tr>
<tr>
<td>Friday 11/30/2012 Cloudy/Foggy 0820 Hours ±</td>
<td>75.0%RH</td>
<td>73.5°F</td>
</tr>
<tr>
<td><strong>5 Day AVERAGE</strong></td>
<td><strong>64.18%RH</strong></td>
<td><strong>76.62°F</strong></td>
</tr>
<tr>
<td>Greatest Fluctuation (∆) for WEEK</td>
<td>∆ 25.4%RH</td>
<td>∆ 7.6°F</td>
</tr>
</tbody>
</table>

± Indicates the time these measurement began for the day

∆ Delta obtained by subtracting the lowest reading from the highest reading vertically

RH – Relative Humidity

Extech Model 445580 Humidity/Temperature Pen used for taking all readings

Table 10: Humidity & Temperature Reading for Anti-natal Education

“While “acceptability” is never precisely defined by the standard, it is commonly agreed within the thermal comfort research community that “acceptable” is synonymous with “satisfaction” (de Dear, & Brager, 2002, p. 549). People become sensitized to working in environments controlled by HVAC systems and have a lower tolerance for the fluctuating temperature than a naturally ventilated building (NVB) has to offer. Whereas
the NVB occupants tend to enjoy the diversity and the control, they have with their seasonal environments (de Dear, & Brager, 2002, p. 552).

Tables 9 and 10 show the daily record of the conditions in the Anti-natal room. Table 11 lists all the material in the room and notes the highs and lows of the temperature and humidity. This table note gives a quick overview of exactly how the room is equipped and is a useful tool when performing a code review to have all the data in a quick easy to read format.
<table>
<thead>
<tr>
<th><strong>Ante-natal</strong> (Education Room)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Area</strong></td>
<td>529 SF (10% = 52.9' SF) (8% = 42.32' SF) Window Requirements</td>
</tr>
<tr>
<td><strong>Ceiling</strong></td>
<td>10' AFF Sheetrock(^1) with 2' x 2' (approx.) wood trim painted white</td>
</tr>
<tr>
<td><strong>Walls</strong></td>
<td>Sheetrock(^1) painted off white</td>
</tr>
<tr>
<td><strong>Floor</strong></td>
<td>White glazed or marble flooring, no skid resistance</td>
</tr>
<tr>
<td><strong>Doors</strong></td>
<td>Inoperable, glazed transom panels over interior and exterior doors</td>
</tr>
<tr>
<td><strong>Windows</strong></td>
<td><strong>Quantity</strong></td>
</tr>
<tr>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Inoperable, glazed transom panels over exterior windows</td>
<td></td>
</tr>
<tr>
<td><strong>Finishes</strong></td>
<td>Gold curtains on windows/exterior doors. Dark wood stained interior door</td>
</tr>
<tr>
<td><strong>Furniture</strong></td>
<td>Metal benches with a finished wood plank seat, no backrests.</td>
</tr>
<tr>
<td><strong>Lighting</strong></td>
<td><strong>Quantity</strong></td>
</tr>
<tr>
<td></td>
<td>5</td>
</tr>
<tr>
<td><strong>Light Meter Readings (LMR)</strong></td>
<td><strong>Date/Time Collected</strong></td>
</tr>
<tr>
<td>Highest</td>
<td>141.0</td>
</tr>
<tr>
<td>Lowest</td>
<td>28.0</td>
</tr>
<tr>
<td>5 Day Average</td>
<td>97.3</td>
</tr>
<tr>
<td><strong>Temperature Readings (TMP)</strong></td>
<td><strong>Date/Time Collected</strong></td>
</tr>
<tr>
<td>Highest</td>
<td>81.1°F</td>
</tr>
<tr>
<td>Lowest</td>
<td>73.5°F</td>
</tr>
<tr>
<td>5 Day Average</td>
<td>76.6°F</td>
</tr>
<tr>
<td><strong>Relative Humidity Readings (RH)</strong></td>
<td><strong>Date/Time Collected</strong></td>
</tr>
<tr>
<td>Highest</td>
<td>75.0%RH</td>
</tr>
<tr>
<td>Lowest</td>
<td>49.6%RH</td>
</tr>
<tr>
<td>5 Day Average</td>
<td>64.2%RH</td>
</tr>
<tr>
<td><strong>Ventilation</strong></td>
<td>Approx. 18 (8&quot; x 8&quot;) Perforated Cement Blocks over exterior windows and doors.</td>
</tr>
<tr>
<td>Doors and windows remain open when room in use. No screen cover.</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
1. Appears to be sheetrock but it was not tested.
2. Readings were taken over 5 consecutive days.

**Table 11: Anti Natal (Education Room), Data Table**
4.3.2 POE of the “B” Hygiene Education Space Analysis

The Hygiene Education Space is primarily the waiting room and reception area for the NHC. The visitors are a captive audience when it comes to the education programs but in lieu of no other forms of entertainment or forms of positive distractions it may come as a welcomed change of pace. The area is cavernous with the only source of light coming from the clerestory windows towering eighteen feet overhead and the tunnel like entrances cut into the three sides of the building (See photos 10 and 11).

The waiting room is the “Grand Central Station” of the NHC and all the foot traffic even bicycle traffic come and go through this space which is quite noisy. The motorcycle ambulance revs up right outside the main entrance shown at the bottom of Figure 14 where the arrow is pointing.

Figure 14: Hygiene Education Enlarged Floor Plan (“B”) (not to scale)
The photographs were taken at a time when no education programs were taking place and the space was less occupied. The mornings tend to be more crowded it starts to thin out at the latter part of the day.

From the photos it is evident the walls are sparse. There are only a few identical posters on immunization that are barely discernible in the photographs. Near the end of the Chapter in section 3.3.6 POE Supplemental Information, Photo 19 is a close-up of the poster. The only furniture are the benches being used by the patients and visitors and a desk in the southwest corner of the room where patients are checked in, weighed on what looks like a bathroom scale and have their temperature taken.
The din in the space can be deafening during the busier times of the day. The children and infants crying, the motorcycle revving up outside, the hygiene class being taught and the normal operation of the health center all were being conducted at the same time, even the footfalls of the staff and patients coming and going have an impact on the sound quality in the room. The acoustics in the space, with all hard surfaces and right angles make it deafening at times.

The single tube, fluorescent light fixtures, six in all, some of which can be seen in photos 10 and 11 mounted high on the walls, may not be enough to properly illuminate the entire space depending on the activity desired. The upper area of the space, eighteen feet above floor level does have clerestory windows that does provide indirect light to the space below but not enough to offer proper lighting. There are no windows at eye level.

The air circulation is limited through the open doors at the north and south sides of the building and the one at the far east end that is usually open. There are two perforated blocks before and between each clerestory window to allow for some ventilation but for the size of space, it seems inadequate. The Ministry of Infrastructure (MINFRA), Rwanda Building Regulations 2009, Section 3.3.12.1 requires the windows to allow for “effective ventilation with external air” into the design space of buildings. Figure 15 is a section through the NHC Waiting Room and Hygiene Education Space.
Some of the dimensions shown are the researchers best guess based on the information available. A laser devise and standard tape measure was used to obtain the interior dimensions, take-offs from the plan were used to guestimate the rest.

The clerestory windows at the north and south walls are inoperable and they bring bright indirect light into the space that for the most part seems to divert the light up onto the higher portions of the walls around fifteen feet or above. This can be seen more clearly in Photos 10 and 11. This may change for different times of the year during different earth rotations but it is an undesirable result for a room that depends on daylighting for its main lightsource. Normally north/south exposure is considered a good design decision; it keeps the hot morning sun off the windows and does the same thing for the evening whether this holds true in Rwanda would have to be studied further. It
does not seem to hold true with daylighting and clerestory windows when no other windows are available. Presuming full sun can enter the clerestory windows, Figures 16 and 17 show the extent of how much sun the space could get, and if the sun were bright enough, it would reflect off of the walls and onto the floor, lighting up the space more thoroughly.

Currently the sunlight glaring through the east entrance shown in Photo 11 is reflecting off of the marble floor. It is one of the major sources of light for the room.

The computer sketch (Figure 15) also visually demonstrates the huge void above the patients and visitors heads as do Photos 10 and 11. A further analysis of this space will be discussed in Chapter Four.

Light meter readings taken to record the amount of light entering the Hygiene Education space was recorded and the spot locations are shown in Figure 18. The locations were measured at floor level because it was the only area that was constant. The furniture/benches was moved daily. Tape markers were placed on the floor at the spot locations and left there for the five days during the period of time the readings were recorded and instructions were given to staff to leave them until the research was complete.
The window sizes and room size shown in Table 12 are to calculate the window per square foot requirements needed per code, whether using the US standards, which utilizes the 2012 International Building Code (IBC), Section 1205.2 or the MINFRA, Rwanda Building Control Regulations 2009, Section 3.3.12.4. The room has no windows at floor level and provides no views to the outside as shown in Figure 14. The borrowed light from the adjacent rooms does provide some additional light but it is minimal. The education class participants that were observed, sat on the benches located between spot meter reading locations one and three. There was seating around the perimeter that served as waiting areas for other visitors seeking various other services within the space. The darkest areas were in the corners of the room that can best be seen in photo’s 10 and 11. It should be noted that different times of the day can cause different lighting levels within the space as sunlight enters the clerestory windows.
### Table 12: Hygiene Education Light Meter Readings

**“B” HYGIENE EDUCATION SPACE (12 clerestory windows/north & south exposure)**

<table>
<thead>
<tr>
<th>Day/Date/Weather Cond./Time</th>
<th>Spot Location No. 1</th>
<th>Spot Location No. 2</th>
<th>Spot Location No. 3</th>
<th>Spot Location No. N/A</th>
<th>Daily Average</th>
<th>Greatest Fluctuation (Δ) For ONE DAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday 11/26/2012 Cloudy/Sunshine 1130 Hours ±</td>
<td>18.2</td>
<td>31.0</td>
<td>14.9</td>
<td>N/A</td>
<td>21.367</td>
<td>Δ 16.1*</td>
</tr>
<tr>
<td>Tuesday 11/27/2012 Cloudy/Sunshine 1445 Hours ±</td>
<td>26.1</td>
<td>46.2</td>
<td>35.1</td>
<td>N/A</td>
<td>35.8</td>
<td>Δ 20.1*</td>
</tr>
<tr>
<td>Wednesday 11/28/2012 Cloudy/Sprinkling 0830 Hours ±</td>
<td>15.8</td>
<td>20.9</td>
<td>15.5</td>
<td>N/A</td>
<td>17.4</td>
<td>Δ 5.4*</td>
</tr>
<tr>
<td>Thursday 11/29/2012 Cloudy/Sprink./Sunshine 1145 Hours ±</td>
<td>28</td>
<td>53</td>
<td>35</td>
<td>N/A</td>
<td>38.667</td>
<td>Δ 25*</td>
</tr>
<tr>
<td>Friday 11/30/2012 Cloudy/Foggy 0820 Hours ±</td>
<td>8</td>
<td>13</td>
<td>8</td>
<td>N/A</td>
<td>9.667</td>
<td>Δ 5*</td>
</tr>
</tbody>
</table>

**5 Day AVERAGE**

| | 19.22 | 32.82 | 21.7 | N/A | 24.580 | Δ 14.32*** |

**Greatest Fluctuation (Δ) for WEEK at ONE SPOT**

| | Δ 20* | Δ 40* | Δ 27.1* | N/A | Δ 29.033** |

---

- ± Indicates the time these measurement began for the day
- * Fluctuation for WEEK and DAY obtained by subtracting the lowest reading from the highest reading (vertically and horizontally)
- ** Greatest fluctuation average for entire space (horizontally)
- *** Greatest fluctuation average over five DAYS (vertically)
- Δ Delta obtained by subtracting the lowest reading from the highest reading vertically

**Notes:**
1. There were six exposed single tube fluorescent light fixtures in the room that were never in use.
2. The total room area was 1124 S.F. 10% of 1124 S.F. is **112.4 S.F.**
3. Exterior clerestory windows were approximately 18’ AFF and measured approximately 20” high x 76” wide (10.55 S.F. x 12 = **126.7 S.F.**)
4. The exposed joist truss roof (bottom of truss) at 20’ - 4” AFF. The highest point in standing seam metal roof is approximately 25.4’
5. Minolta, Illuminance T-1 used to take all light readings.
The next set of readings (Table 13) for this space were for humidity and temperature levels. It was typical for all readings taken at the facility that five consecutive days of readings were taken from Monday, November 26, 2012 through Friday, November 30, 2012 in the same spaces each day.

<table>
<thead>
<tr>
<th>Day/Date/Weather Cond./Time</th>
<th>Humidity</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday 11/26/2012 Cloudy/Sunshine 1130 Hours ±</td>
<td>63.4%RH</td>
<td>78.4°F</td>
</tr>
<tr>
<td>Tuesday 11/27/2012 Cloudy/Sunshine 1445 Hours ±</td>
<td>50.1%RH</td>
<td>79.7°F</td>
</tr>
<tr>
<td>Wednesday 11/28/2012 Cloudy/Sprinkling 0830 Hours ±</td>
<td>77.6%RH</td>
<td>69.8°F</td>
</tr>
<tr>
<td>Thursday 11/29/2012 Cloudy/Sprinkle/Sunshine 1145 Hours ±</td>
<td>61.5%RH</td>
<td>75.5°F</td>
</tr>
<tr>
<td>Friday 11/30/2012 Cloudy/Foggy 0820 Hours ±</td>
<td>74.1%RH</td>
<td>71.2°F</td>
</tr>
</tbody>
</table>

**5 Day AVERAGE**

<table>
<thead>
<tr>
<th>Humidity</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>65.34%RH</td>
<td>74.92°F</td>
</tr>
</tbody>
</table>

**Greatest Fluctuation (Δ) for WEEK**

<table>
<thead>
<tr>
<th>Humidity</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δ 27.5%RH</td>
<td>Δ9.9°F</td>
</tr>
</tbody>
</table>

± Indicates the time these measurement began for the day

Δ Delta obtained by subtracting the lowest reading from the highest reading vertically

RH – Relative Humidity

Extech Model 445580 Humidity/Temperature Pen used for taking all readings

Table 13: Humidity & Temperature Reading for Hygiene Education
<table>
<thead>
<tr>
<th>Hygiene</th>
<th>(Waiting Room/Reception)</th>
</tr>
</thead>
<tbody>
<tr>
<td>This class is taught concurrently with waiting room activities. The attendees are waiting for other health related services.</td>
<td></td>
</tr>
</tbody>
</table>

| Area      | 1,124 SF (10% = 112.4 SF) (8% = 89.92' SF) |
| Ceiling   | Exposed joist truss, (bottom of truss) 20'-4” AFF |
| Highest point of standing seam roof 25'-4” AFF |
| Walls     | Sheetrock¹ painted off white |
| Floor     | White glazed or marble flooring, no skid resistance |
| Doors     | Inoperative, glazed transom panels over interior and exterior doors |

<table>
<thead>
<tr>
<th>Windows</th>
<th>Quantity</th>
<th>Location</th>
<th>AFF</th>
<th>Size</th>
<th>SF</th>
<th>TSF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12</td>
<td>Clerestory: (6) N, (6) S</td>
<td>18’</td>
<td>20&quot; H x 76&quot; W</td>
<td>10.55’</td>
<td>126.7’</td>
</tr>
<tr>
<td>No windows at eye level³.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Finishes | Dark wood stained interior doors. |
| Furniture | Metal benches with a finished wood plank seat, no backrests. |

<p>| Lighting | Exposed Fluorescent Tube |</p>
<table>
<thead>
<tr>
<th>Quantity</th>
<th>4’ Size</th>
<th>2’ size</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>6</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Light Meter Readings (LMR)</th>
<th>Date/Time Collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest</td>
<td>46.2</td>
</tr>
<tr>
<td>Lowest</td>
<td>8.0</td>
</tr>
<tr>
<td>5 Day Average</td>
<td>24.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temperature Readings (TMP)</th>
<th>Date/Time Collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest</td>
<td>79.7°F</td>
</tr>
<tr>
<td>Lowest</td>
<td>69.8°F</td>
</tr>
<tr>
<td>5 Day Average</td>
<td>74.9°F</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Relative Humidity Readings (RH)</th>
<th>Date/Time Collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest</td>
<td>77.6%RH</td>
</tr>
<tr>
<td>Lowest</td>
<td>50.1%RH</td>
</tr>
<tr>
<td>5 Day Average</td>
<td>65.3%RH</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ventilation</th>
<th>Approx. 38 (8” x 8”) Perforated Cement Blocks over exterior doors and between clerestory windows. Clerestory windows inoperable.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doors remain open when room in use. No screen cover.</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. Appears to be sheetrock but it was not tested.
2. Readings were taken over 5 consecutive days.
3. Adjacent offices with internal windows afford slight views when visitors are standing.

Table 14: **Hygiene** (Waiting Room/Reception), Data Table
4.3.3 POE of the “C” Family Planning Education Space Analysis

Family Planning is an irregularly shaped room with only the short north wall receiving any sun exposure. In the evening, the west doors do allow for a bright evening sun through the west doors. The room, as noted by the existing floor plan was designed to be the “Maternity Waiting Room” and “Reception” and was a point of contention when some of the staff saw the original plans (Figure 7) and wanted to know why the room was not built as designed. It is always important to review the documents with administrators and key staff before distributing to entire staff so no surprises come up during the investigation. The researcher observed many of the visitors seemed to wait outside, many peering through the windows of the maternity unit at the mothers and mother’s-to-be at the health center instead of using the originally designated space as shown in Figure 19.
The southern half of the room was a passage from the Waiting Room to the west side of the health center where both staff and visitors utilized this route of travel. The northwest side was the entrance to the maternity workroom. The health center had ninety-five childbirths in September of 2011 (Janvier Hakizimana, Titulaire, NHC) so an interruption in this space could occur at any moment... the classroom is in a direct line with the delivery area. There were also two office/consultation rooms to the south that were being used at the same time as well. The arrows and dashed lines indicate the travel paths and points of interruptions that could affect the classroom. The room was clearly not designed for a classroom function. One advantageous reason for the use of this space
may be the proximity to the maternity unit and staff that teach the class. The room shown in Figure 19 to the east was used by the staff member teaching the class and she kept her teaching aids inside the room.

The room was poorly lit and with what little lighting the window did provide the reflective flooring caused unwanted glare. The odd shape of the room made it difficult to organize the benches in an accessible arrangement for persons to attend education classes. It was suitable for small group discussions in a circular format similar to what is shown in Photo 12. Figure 19 is what the bench layout looked like when it was being set up for classes. The one window does offer some views of nature but the configuration positions the participant’s backs to the window away from the view. Sometimes more benches were added making the configuration even more awkward for attendees to maneuver through the occupied benches. The people sitting with the bench directly in front of the window had the sunlight shining directly on their backs and people in front of the window would almost appear as silhouettes to the instructor in poor lighting situations.

The noises from the adjacent Waiting Room were transmitted through the adjoining double doors and the sounds of children crying and the motorcycle ambulance could easily be heard through the closed doors.
Another issue is that many of the visitors and patients bring their children to these educational programs but no space had been provided for the children to be watched or entertained. The parents or guardians must hold or be in control of the children during the education programs at all times. If the children act out, there is no quiet space provided to take them until they calm down.

Light meter readings were taken for this space as well although the space was much darker than the rest of the facility. The light meter readings indicated in Figure 20 were taken in the areas where the majority of the persons attending classes were seated during the classroom presentation. The different times of day and different weather patterns caused varying readings throughout the five-day recording period giving intermittent low-level spot readings for the semi-confined space.
Table 15 was generated with the recorded spot meter locations, window data, and room calculations.
<table>
<thead>
<tr>
<th>Day/Date/Weather Cond./Time</th>
<th>Spot Location No. 4</th>
<th>Spot Location No. 5</th>
<th>Spot Location No. 6</th>
<th>Spot Location No. N/A</th>
<th>Daily Average</th>
<th>Greatest Fluctuation (Δ) For ONE DAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday 11/26/2012 Cloudy/Sunshine 1130 Hours ±</td>
<td>38.4</td>
<td>37.6</td>
<td>46.9</td>
<td>N/A</td>
<td>40.967</td>
<td>Δ 9.3*</td>
</tr>
<tr>
<td>Tuesday 11/27/2012 Cloudy/Sunshine 1445 Hours ±</td>
<td>60.1</td>
<td>95.3</td>
<td>99.1</td>
<td>N/A</td>
<td>84.833</td>
<td>Δ 39*</td>
</tr>
<tr>
<td>Wednesday 11/28/2012 Cloudy/Sprinkling 0830 Hours ±</td>
<td>33.9</td>
<td>87.3</td>
<td>88.6</td>
<td>N/A</td>
<td>69.933</td>
<td>Δ 54.7*</td>
</tr>
<tr>
<td>Thursday 11/29/2012 Cloudy/Sprink./Sunshine 1145 Hours ±</td>
<td>66</td>
<td>12</td>
<td>21</td>
<td>N/A</td>
<td>33</td>
<td>Δ 54*</td>
</tr>
<tr>
<td>Friday 11/30/2012 Cloudy/Foggy 0820 Hours ±</td>
<td>33</td>
<td>16</td>
<td>27</td>
<td>N/A</td>
<td>25.333</td>
<td>Δ 17*</td>
</tr>
<tr>
<td>5 Day AVERAGE</td>
<td>46.28</td>
<td>49.64</td>
<td>56.52</td>
<td>N/A</td>
<td>50.013</td>
<td>Δ 45.4***</td>
</tr>
<tr>
<td>Greatest Fluctuation (Δ) for WEEK at ONE SPOT</td>
<td>Δ 33*</td>
<td>Δ 83.9*</td>
<td>Δ 78.1*</td>
<td>N/A</td>
<td>Δ 64.8**</td>
<td></td>
</tr>
</tbody>
</table>

* Indicates the time these measurement began for the day
* Fluctuation for WEEK and DAY obtained by subtracting the lowest reading from the highest reading (vertically and horizontally)
** Greatest fluctuation average for entire space (horizontally)
*** Greatest fluctuation average over five DAYS (vertically)

Notes:
1. There were three exposed single tube fluorescent light fixtures in the room that were never in use
2. The total room area was 632 S.F. 10% of 632 S.F. is 63.2 S.F.
3. Exterior windows were 39” AFF and measured 58” high x 66” wide (26.58 S.F. x 1 = 26.58 S.F.)
4. The finished ceiling was 10’-0” AFF
5. Minolta, Illuminance T-1 used to take all light readings
Table 16 is the humidity and temperature readings for Family Planning. The air circulation in the room was poor when the east exterior door and west door to the Waiting Room were closed during the classroom presentations.

<table>
<thead>
<tr>
<th>Day/Date/Weather Cond./Time</th>
<th>Humidity</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday 11/26/2012 Cloudy/Sunshine 1130 Hours ±</td>
<td>62.8%RH</td>
<td>77.3°F</td>
</tr>
<tr>
<td>Tuesday 11/27/2012 Cloudy/Sunshine 1445 Hours ±</td>
<td>55.5%RH</td>
<td>78.6°F</td>
</tr>
<tr>
<td>Wednesday 11/28/2012 Cloudy/Sprinkling 0830 Hours ±</td>
<td>72.5%RH</td>
<td>71.0°F</td>
</tr>
<tr>
<td>Thursday 11/29/2012 Cloudy/Sprinkle/Sunshine 1145 Hours ±</td>
<td>75.6%RH</td>
<td>72.8°F</td>
</tr>
<tr>
<td>Friday 11/30/2012 Cloudy/Foggy 0820 Hours ±</td>
<td>84.2%RH</td>
<td>71.6°F</td>
</tr>
<tr>
<td>5 Day AVERAGE</td>
<td>70.12%RH</td>
<td>74.26°F</td>
</tr>
<tr>
<td>Greatest Fluctuation (Δ) for WEEK</td>
<td>Δ 28.7%RH</td>
<td>Δ 7.6°F</td>
</tr>
</tbody>
</table>

± Indicates the time these measurement began for the day

Δ Delta obtained by subtracting the lowest reading from the highest reading vertically
RH – Relative Humidity
Extech Model 445580 Humidity/Temperature Pen used for taking all readings

Table 16: Humidity & Temperature Reading for Family Planning Education
**Family Planning** (Maternity Waiting Room/Reception)

<table>
<thead>
<tr>
<th>Area</th>
<th>632 SF (10% = 63.2 SF) (8% = 50.56' SF) Window Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceiling</td>
<td>10’ AFF Sheetrock(^1) with 2’ x 2’ (approx.) wood trim painted white</td>
</tr>
<tr>
<td>Walls</td>
<td>Sheetrock(^1) painted off white</td>
</tr>
<tr>
<td>Floor</td>
<td>White glazed or marble flooring, no skid resistance</td>
</tr>
<tr>
<td>Doors</td>
<td>Inoperable, glazed transom panels over interior and exterior doors</td>
</tr>
</tbody>
</table>

**Windows**

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Location</th>
<th>AFF</th>
<th>Size</th>
<th>SF</th>
<th>TSF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N</td>
<td>39”</td>
<td>58” H x 66” W</td>
<td>26.58’</td>
<td>26.58’</td>
</tr>
</tbody>
</table>

Inoperable, glazed transom panels over interior/exterior windows

**Finishes**

Gold curtains on windows/exterior doors. Dark wood stained interior doors

**Furniture**

Metal benches with a finished wood plank seat, no backrests.

**Lighting**

<table>
<thead>
<tr>
<th>Exposed Fluorescent Tube</th>
<th>Quantity</th>
<th>4’ Size</th>
<th>2’ size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

**Light Meter Readings (LMR)**

<table>
<thead>
<tr>
<th>Highest</th>
<th>Date/Time Collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>99.1</td>
<td>Tue, 11/27/2012, 1445 hrs</td>
</tr>
<tr>
<td>Lowest</td>
<td>Thu, 11/29/2012, 1145 hrs</td>
</tr>
<tr>
<td>5 Day Average</td>
<td>Mon-Fri, 11/26-30/2012</td>
</tr>
</tbody>
</table>

**Temperature Readings (TMP)**

<table>
<thead>
<tr>
<th>Highest</th>
<th>Date/Time Collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>78.6°F</td>
<td>Tue, 11/27/2012, 1445 hrs</td>
</tr>
<tr>
<td>Lowest</td>
<td>Wed, 11/28/2012, 0830 hrs</td>
</tr>
<tr>
<td>5 Day Average</td>
<td>Mon-Fri, 11/26-30/2012</td>
</tr>
</tbody>
</table>

**Relative Humidity Readings (RH)**

<table>
<thead>
<tr>
<th>Highest</th>
<th>Date/Time Collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>84.2%RH</td>
<td>Fri, 11/30/2012, 0820 hrs</td>
</tr>
<tr>
<td>Lowest</td>
<td>Tue, 11/27/2012, 1445 hrs</td>
</tr>
<tr>
<td>5 Day Average</td>
<td>Mon-Fri, 11/26-30/2012</td>
</tr>
</tbody>
</table>

**Ventilation**

Approx. 10 (8” x 8”) Perforated Cement Blocks over exterior windows and doors.

Doors and windows remain open when room in use. No screen cover.

**Notes:**
1. Appears to be sheetrock but it was not tested.
2. Readings were taken over 5 consecutive days.

Table 17: **Family Planning** (Maternity Waiting Room/Reception), Data Table
4.3.4 POE of the “D” Immunization Education Space Analysis

Immunization education was for new mothers and their infants and the space is in an open-air environment that might not be healthy to newborn children during the cooler and wetter months of the year. The space was originally designed and designated as an education room. It is completely open on the northeast and southwest as Figure 21 and Photo 13 indicates. The trusses above make excellent roosting places for birds and they cause quite a bit of mess down below in the form of bird droppings.

It is a beautiful outdoor environment but became very cool and uncomfortable on the day the class was given. The open design seemed to encourage people wandering in and out of the space at all times. There was no audio or visual aids in the space and the lack of acoustics make it difficult to hear without sound enhanced audio equipment. The walls that are present are painted white and lack any form of art or media of any kind. They are blank and sterile. The surrounding grounds are full of green vegetation that adds color and beauty and some of the nearby bushes are doubling as surfaces to dry clothes.
The floor shines like glass with the typical white marble tile that is throughout the center. This outdoor environment might be hazardous in wet conditions it could become quite slippery.

The orientation and lack of walls also brought in the sun. The light meter readings were very erratic considering it was an outdoor environment but they were taken purely as a baseline measure. Figure 22 shows where the light meter spot locations were taken.
The immunization area is situated to the rear and east end of the facility surrounded by nature and appears to be a quaint concert hall or cathedral from a distance (Photo 13).
During the day, it is quiet and visitors and staff go there to talk and spend time in small groups (Photo 14) getting away from the noise and crowds of the rest of the health center. The rear of the health center is farmland and is quite calming compared to the activity at the entrance.

The light meter readings in Table 15 were very inconsistent and extremely high levels due to the outdoor nature of the Immunization space. The measurements were taken for visual comfort information and for possible future studies, acknowledging this was an unusual circumstance.
<table>
<thead>
<tr>
<th>Day/Date/Weather Cond./Time</th>
<th>Spot Location No. 11</th>
<th>Spot Location No. 12</th>
<th>Spot Location No. 13</th>
<th>Spot Location No. 14</th>
<th>Daily Average</th>
<th>Greatest Fluctuation ((\Delta)) For ONE DAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday 11/26/2012</td>
<td>185</td>
<td>426</td>
<td>234</td>
<td>456</td>
<td>325.25</td>
<td>(\Delta 271^*)</td>
</tr>
<tr>
<td>Cloudy/Sunshine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1130 Hours ±</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tuesday 11/27/2012</td>
<td>196</td>
<td>224</td>
<td>245</td>
<td>284</td>
<td>237.25</td>
<td>(\Delta 88^*)</td>
</tr>
<tr>
<td>Cloudy/Sunshine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1445 Hours ±</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wednesday 11/28/2012</td>
<td>283</td>
<td>1000</td>
<td>329</td>
<td>1040</td>
<td>663</td>
<td>(\Delta 757^*)</td>
</tr>
<tr>
<td>Cloudy/Sprinkling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0830 Hours ±</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thursday 11/29/2012</td>
<td>255</td>
<td>635</td>
<td>383</td>
<td>682</td>
<td>488.75</td>
<td>(\Delta 427^*)</td>
</tr>
<tr>
<td>Cloudy/Sprink./Sunshine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1145 Hours ±</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friday 11/30/2012</td>
<td>58</td>
<td>152</td>
<td>52</td>
<td>91</td>
<td>88.25</td>
<td>(\Delta 100^*)</td>
</tr>
<tr>
<td>Cloudy/Foggy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0820 Hours ±</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Day AVERAGE</td>
<td>195.4</td>
<td>487.4</td>
<td>248.6</td>
<td>510.6</td>
<td>360.5</td>
<td>(\Delta 328.6^{***})</td>
</tr>
<tr>
<td>Greatest Fluctuation ((\Delta)) for WEEK at ONE SPOT</td>
<td>(\Delta 225^*)</td>
<td>(\Delta 848^*)</td>
<td>(\Delta 331^*)</td>
<td>(\Delta 949^*)</td>
<td>(\Delta 588.25^{**})</td>
<td></td>
</tr>
</tbody>
</table>

\(\Delta\) Indicates the time these measurements began for the day

* Fluctuation for WEEK and DAY obtained by subtracting the lowest reading from the highest reading (vertically and horizontally)

** Greatest fluctuation average for entire space (horizontally)

*** Greatest fluctuation average over five DAYS (vertically)

\(\Delta\) Delta obtained by subtracting the lowest reading from the highest reading vertically

Notes:
1. There were four exposed single tube fluorescent light fixtures in the room that were never in use
2. The total room area was 862 S.F. \(10\%\) of 862 S.F. is 86.2 S.F.
3. There were no walls on the northwest and southeast sides of the room which equates to about 736.7 S.F. total window area
4. The exposed truss roof began (bottom of truss) at 11' - 4" AFF
5. Minolta, Illuminance T-1 used to take all light readings
The temperature and humidity readings for the Immunization Space are for participant comfort purposes and suitability of the space for its purpose. The researcher acknowledges there is no control of the weather. These readings will fluctuate throughout the year and should be taken several times to develop an accurate baseline for the outdoor environment.

<table>
<thead>
<tr>
<th>Day/Date/Weather Cond./Time</th>
<th>Humidity</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday 11/26/2012 Cloudy/Sunshine 1130 Hours ±</td>
<td>56.7%RH</td>
<td>83.3°F</td>
</tr>
<tr>
<td>Tuesday 11/27/2012 Cloudy/Sunshine 1445 Hours ±</td>
<td>46.4%RH</td>
<td>82.2°F</td>
</tr>
<tr>
<td>Wednesday 11/28/2012 Cloudy/Sprinkling 0830 Hours ±</td>
<td>69.6%RH</td>
<td>75.3°F</td>
</tr>
<tr>
<td>Thursday 11/29/2012 Cloudy/Sprinkle/Sunshine 1145 Hours ±</td>
<td>56.0%RH</td>
<td>78.4°F</td>
</tr>
<tr>
<td>Friday 11/30/2012 Cloudy/Foggy 0820 Hours ±</td>
<td>78.2%RH</td>
<td>68.7°F</td>
</tr>
</tbody>
</table>

5 Day AVERAGE 61.38%RH 77.78°F

Greatest Fluctuation (Δ) for WEEK Δ 31.8%RH Δ 14.6°F

± Indicates the time these measurement began for the day

Δ Delta obtained by subtracting the lowest reading from the highest reading vertically
RH – Relative Humidity
Extech Model 445580 Humidity/Temperature Pen used for taking all readings

Table 19: Humidity & Temperature Reading for Immunization Education
### Immunization (Education Room)

*This class is taught while new mothers are waiting for infant immunizations.*

<table>
<thead>
<tr>
<th>Area</th>
<th>862 SF</th>
<th>(10% = 86.2 SF) (8% = 68.96’ SF) Window Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceiling</td>
<td>Exposed joist truss, (bottom of truss)</td>
<td>11’-4” AFF</td>
</tr>
<tr>
<td></td>
<td>Highest point of standing seam roof</td>
<td>16’-4”± AFF</td>
</tr>
<tr>
<td>Walls</td>
<td>Cementitious painted white. No NW or SE walls.</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>White glazed or marble flooring, no skid resistance</td>
<td></td>
</tr>
<tr>
<td>Doors</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Windows</td>
<td>Quantity</td>
<td>Location</td>
</tr>
<tr>
<td>None. No NW or SE walls equates to about 736.7 SF of windows.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Finishes | None |
| Furniture | Metal benches with a finished wood plank seat, no backrests. |

| Lighting | Exposed Fluorescent Tube |
| Quantity | 4’ Size | 2’ size |
| 4 | 0 |

| Light Meter Readings (LMR) | Date/Time Collected |
| Highest | 1040.0 | Wed, 11/28/2012, 0830 hrs |
| Lowest | 52.0 | Fri, 11/30/2012, 0820 hrs |
| 5 Day Average | 360.5 | Mon-Fri, 11/26-30/2012 |

| Temperature Readings (TMP) | Date/Time Collected |
| Highest | 83.3°F | Mon, 11/26/2012, 1130 hrs |
| Lowest | 68.7°F | Fri, 11/30/2012, 0820 hrs |
| 5 Day Average | 77.8°F | Mon-Fri, 11/26-30/2012 |

| Relative Humidity Readings (RH) | Date/Time Collected |
| Highest | 78.2%RH | Fri, 11/30/2012, 0820 hrs |
| Lowest | 46.4%RH | Tue, 11/27/2012, 1445 hrs |
| 5 Day Average | 61.4%RH | Mon-Fri, 11/26-30/2012 |

| Ventilation | Open to exterior on two sides. |

#### Notes:
1. Appears to be cementitious but it was not tested.
2. Readings were taken over 5 consecutive days.

Table 20: **Immunization** (Education Room), Data Table
4.3.5 POE of the “E” Demonstration Kitchen Education Space Analysis

The Demonstration Kitchen (DK) is another outdoor environment at the NHC. This space was not used during the time of this research nor had it looked like it had been used in some time. The floor plan (Figure 23) is shown since it is an education space but a full evaluation was not conducted since no participant observation could be conducted.

Figure 23: Demonstration Kitchen Education Enlarged Floor Plan (“E”)
The DK is detached from the main facility (Photo 15) because when in operation it utilizes an open wood burning fire (Photo 16).

The kitchen area has five burners along the east wall and two wash sinks along the south wall where people come to teach nutrition to the patients and visitors of the NHC. There is also laundry facility to the north of the kitchen but the water in both the kitchen and the laundry did not work and the faucets were disabled. There were people occupying the laundry space but it appeared to be a social gathering.
4.3.6 POE Supplemental Information

The typical visitor/patient furniture consisted of a 79” long, 11” deep, 19” tall steel legged bench with no back support (Photo 17). It had a finished wooden plank on top for seating. The benches were carried from place to place because there were not enough to go around and constantly had to be relocated. The premium seats were the ones against the wall where there was the wall to provide back support.

The staff furniture (Photo 18) was standard office furniture that was mix and match and some of it tattered from wear and tear.

There was no classroom furniture or accessories. The NHC utilized what they had available.
The one piece of visual aid that seemed to stand out, mainly because it was the only visual on the walls were the four immunization posters (Photo 19) that were displayed in the Waiting Room (Photo 10) where the Hygiene Education classes were held. They were the only splash of color on the otherwise colorless walls of the health center. They were very small posters on the massive walls and hung at eye level.

A bicycle shelter (Photo 20) that was not indicated on the original plans was built on the west side of the facility that seemed to make a lot more sense than the garage that was originally scheduled to be built ... at least until a few cars start coming to the facility. The shelter was frequently used on a daily basis.
There are two latrine buildings (Photo 21) indicated on the site plan (Figure 7) provided for the patients and visitors of the NHC. One is shown in the northeast corner and one is shown in the northwest corner of the site plan. The one in the northeast corner was built more to the mid-east of the site plan.

When this researcher was conducting a walkthrough of the NHC site, all but two of the mid-east side latrines were observed to be padlocked and the two that were not had refuse (Photo 22) inside the receptacle, not feces but discarded trash. The latrines observed were not being used. They looked as though they were designed for flushing but did not have any water service currently available.
Each room is equipped with small perforated blocks (see figure 24) on the exterior walls above the operable windows and doors with the exception of the Hygiene space, where the perforated concrete blocks are between the inoperable clerestory windows about 18 feet above the finished floor (AFF). These provide very minimum ventilation when the windows and doors are closed and allow for entry of unwanted insects, birds and other undesirable pests.

### 4.4 Codes, Regulations, Standards, and Guidelines

It is important to note that the health center is not an education facility and it is not in the United States (US). The following comparisons are made for recommendations based on what could be done to make the existing program operate more smoothly in future projects or remodels. The majority of these constraints are placed on construction projects built within the boundaries of the US. The standards that could be found that pertain to Rwanda are noted.

It is essential to assess areas where learning is expected to take place to achieve the desired results. Research of the built environment has shown that it “clearly” affects learning. “School design can enhance—or hinder—academic achievement,” (Bingler, Quinn, & Sullivan, 2003, p.6).

It has been found that POEs “have had a definitive influence on building standards and design” (Preiser, Rabinowitz, & White, 1988, p. 20).
LIGHTING

The NHC relies heavily on daylighting and at no time during the evaluation period did the facility use electrical fixtures nor for the most part were they required. When the fixtures were tried, they did not function but this could have been during a time of power failure or power outage as the electricity was intermittent.

The education programs that were observed did not involve reading but the staff was observed checking documents and papers that the attendees of some of the programs were turning in for review. One program did hand out visual aids that had written information included with it but the instructor seemed to explain the products very thoroughly. Improper lighting can cause headaches and fatigue when attempting to work on tasks (Ramsey & Sleeper, 1994, p. 52).

Light Meter Reading were taken in each space under the daylighting conditions and the highest and lowest condition as well as a five day average for each of the four education spaces measured. A lighting designer should be consulted for the proper evaluation and design of various types of activities to be conducted within each space. According to Ramsey & Sleeper (1994), the lighting level for classrooms and offices should be in the foot candle range of 50-75-100.

Anti-natal’s 5 day average was at 97.3 within the range its highest was 141.0 and lowest 28.0 both fell outside the range. Hygiene’s LMR’s were all below the recommended lighting levels. Family Planning’s highest pushed the limit at 99.1 and its 5 day average at 50.8 the lowest reading was 12.0. The inconsistencies make it very difficult to plan activities within the space. Immunization only had three days the entire week it fell into the recommended level the rest of the days were above the recommended levels. This is primarily an outdoor classroom and it should be expected. If reading activities are expected the high lighting levels would make this difficult.
Observation

There was an array of photovoltaic panels on the roof of the facility. There was a problem with not having the staff trained to know how to work with the equipment and it was not functioning.

Potential solutions:

1. It is possible that the limited number of fixtures is not adequate to illuminate the spaces adequately in low light or night time conditions depending upon the activity and further light meter testing should be done during the low light or night time conditions.

2. A back-up generator (if none exists) or similar system might be an item to put on a wish list in the future for more reliable electrical service.

DAYLIGHTING AND WINDOWS

The Rwandan Ministry of Infrastructure stipulate in section: 3.3.12.4 that “all windows intended for the purpose of lighting, ventilation shall open directly to external air, shall be glazed or provided with wooden shutters, or other approved shutters, and shall have a total area of not less than 10% of the floor area of the room.” In addition per section: 3.3.12.1 “a room of any building shall have in the external walls an adequate number of openable windows that shall be of such size as to afford effective lighting of the room and ventilation by communication with external air” (Republic of Rwanda, Ministry of Infrastructure, Rwanda Building Control Regulations 2009).

The only room that does not meet the 10% requirement at the NHC is the Family Planning space or the area indicated as Maternity Waiting room in plan. The room is 632 SF and would require 63.2 SF of windows. It only has one window that is 26.6 SF in size, which is why the room is so dark even on days of full sun. The majority of the attendees
sit with their backs toward the window making them appear more like silhouettes to the instructors. Facial expressions are essential forms of feedback when attempting to communicate with subjects and if it is difficult to see an individual’s face it is difficult to know if the messages are being received.

The Hygiene education space, which primarily serves as the Waiting Room for the health center, meets the letter of the code but does not have any windows at eye level. While the clerestory windows bring in daylighting to a space otherwise surrounded by needed ancillary spaces access to views of nature which have been known to have healing properties and relieve stress (Ulrich, 1984) (Ulrich, 1991) (Ulrich, Zimring, Joseph, Quan, & Choudhary, 2004) for building occupants is not possible. In addition, the lighting provided by the clerestory windows is uneven and leaves both dark and bright areas within the space, which can cause eyestrain and discomfort to the inhabitants (Energy Star Building Manual p. 2).

All of the spaces have a backup system of exposed fluorescent tube lighting fixtures. The limited number of fixtures in some of the larger spaces that if needed they may not provide adequate lighting for certain tasks. If these situations arise, it is the discretion of the facility to offer these programs and as mentioned earlier the programs are primarily lecture oriented and require no reading or task related operations that were made known during the observations other than those stated.

All of the spaces have highly reflective flooring that is also a contributor to the lighting in these spaces. Another factor that should be taken into consideration is the time of the year. These measurements will vary depending on the different seasons and the different weather patterns. During these measurements, intermittent rain was a factor.
Potential solutions:

1. The fluorescent light fixtures should be used as backup on days of low light conditions when the problem with the electrical system is worked out.
   a. Exposed fluorescent lighting has been shown to cause eyestrain and headaches. If possible finding ways to add diffusers to the fixtures would be beneficial.

2. The glare from flooring is a direct result from the light passing through the windows. Closing the curtains can help to block some of the glare or provide louvers to deflect the light in a positive direction.

3. Family Planning was determined to be too small for the amount of participants and the lighting is inefficient for teaching. Some Staff comments recommended returning this space back into its originally designated space, Maternity Waiting and Reception from the questionnaires that were distributed. It may be possible to teach this class in an alternate location such as the Education Room used by Anti-natal on the off days it is not used or another available space.

VENTILATION AND THERMAL COMFORT

The Rwandan Ministry of Infrastructure states in section 3.3.11.1 that “building materials shall have insulating qualities, attested by an approved laboratory, so that where the material is used in the construction of any building it is capable of balancing the extremes of temperature effects in the building to tolerable levels as approved by the Committee” (Republic of Rwanda, Ministry of Infrastructure, Rwanda Building Control Regulations 2009). There is no reason to believe this process was not undertaken but there was no documentation available for verification. The built environment or the actual environment must be capable of removing “bodily heat and moisture” at the same
rate it is being produced by an individual or individuals in order for that individual or individuals to be comfortable (Ramsey & Sleeper, 1994, p. 65).

As stated by the 2012 International Building Code, Section 1204.1 (the US standard), interior spaces intended for human occupancy shall be provided with active or passive space-heating systems capable of maintaining a minimum indoor temperature of 68°F (20°C) at a point 3 feet (914 mm) above the floor on the design-heating day. The NHC is not equipped with any heating, air conditioning or ventilation system. The average year round temperature in Rwanda is between 76.3° and 81.7° F (Briggs & Booth, 2009, p. 2). To get a more precise forecast for the year a search was made for the high and low temperatures for the year 2013 as well as the humidity to compare with the readings taken at the health center (see Table 21).

According to an available 2013 weather report found at “WeatherSpark” (http://weatherspark.com/history/29294/2013/Kigali-Rwanda), the records were listed as follows: The hottest day of 2013 at the Kigali International Airport (Kigali, Rwanda) was August 14, with a high temperature of 102°F. In addition, according to the source the high temperature exceeds 85°F only one day in ten. The coldest day of 2013 was August 12, with a low temperature of 52°F. In addition, according to the source, the low temperature drops below 60°F only one day in ten and the least humid month of 2013 was July with an average daily low humidity of 39%. The most humid month was March with an average daily low humidity of 62%.

“The upper range of the comfort zone for summer operation of public buildings will be tolerable for most lightly clothed adults until the relative humidity rises above 60 to 65%. At that condition, because of their inability to dissipate metabolic moisture many building occupants will experience discomfort. Increases in air velocity are beneficial under these conditions, but velocities above about 70 feet per minute (fpm) will generally
result in unpleasant working conditions because of drafts, blowing papers, and so on” (Ramsey & Sleeper, 1994, p. 65). “An indoor temperature between 70°F and 80°F will be tolerable for most lightly clothed adults” (Ramsey & Sleeper, 1994, p. 65).

Table 21, the Temperature and Humidity Data Table is shown to record the different temperature and humidity that were experienced during this research. The highs and lows are shown with the average for the five days period that the readings were taken. The highs and lows experienced during these readings go above and below the recommended comfort zones; this will change throughout the year given the year round temperatures.

<table>
<thead>
<tr>
<th>Anti-natal</th>
<th>Temperature</th>
<th>Date, Time collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest TMP</td>
<td>81.1°F</td>
<td>Tue, 11/27/2012, 1445 hrs</td>
</tr>
<tr>
<td>Lowest TMP</td>
<td>73.5°F</td>
<td>Tue, 11/27/2012, 1445 hrs</td>
</tr>
<tr>
<td>5 Day Average</td>
<td>76.6°F</td>
<td>Mon-Fri, 11/26-30/2012</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest RH</td>
<td>75.0%RH</td>
<td>Tue, 11/27/2012, 1445 hrs</td>
</tr>
<tr>
<td>Lowest RH</td>
<td>49.6%RH</td>
<td>Tue, 11/27/2012, 1445 hrs</td>
</tr>
<tr>
<td>5 Day Average</td>
<td>64.2%RH</td>
<td>Mon-Fri, 11/26-30/2012</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hygiene</th>
<th>Temperature</th>
<th>Date, Time collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest TMP</td>
<td>79.7°F</td>
<td>Tue, 11/27/2012, 1445 hrs</td>
</tr>
<tr>
<td>Lowest TMP</td>
<td>69.8°F</td>
<td>Wed, 11/28/2012, 0830 hrs</td>
</tr>
<tr>
<td>5 Day Average</td>
<td>74.9°F</td>
<td>Mon-Fri, 11/26-30/2012</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest RH</td>
<td>77.6%RH</td>
<td>Wed, 11/28/2012, 0830 hrs</td>
</tr>
<tr>
<td>Lowest RH</td>
<td>50.1%RH</td>
<td>Tue, 11/27/2012, 1445 hrs</td>
</tr>
<tr>
<td>5 Day Average</td>
<td>65.3%RH</td>
<td>Mon-Fri, 11/26-30/2012</td>
</tr>
</tbody>
</table>
Family Planning

<table>
<thead>
<tr>
<th></th>
<th>Temperature</th>
<th>Date, Time collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest TMP</td>
<td>78.6°F</td>
<td>Tue, 11/27/2012, 1445 hrs</td>
</tr>
<tr>
<td>Lowest TMP</td>
<td>71.0°F</td>
<td>Wed, 11/28/2012, 0830 hrs</td>
</tr>
<tr>
<td>5 Day Average</td>
<td>74.3°F</td>
<td>Mon-Fri, 11/26-30/2012</td>
</tr>
</tbody>
</table>

Relative Humidity

<table>
<thead>
<tr>
<th></th>
<th>RH</th>
<th>Date, Time collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest RH</td>
<td>84.2%RH</td>
<td>Fri, 11/30/2012, 0820 hrs</td>
</tr>
<tr>
<td>Lowest RH</td>
<td>55.5%RH</td>
<td>Tue, 11/27/2012, 1445 hrs</td>
</tr>
<tr>
<td>5 Day Average</td>
<td>70.1%RH</td>
<td>Mon-Fri, 11/26-30/2012</td>
</tr>
</tbody>
</table>

Immunization

<table>
<thead>
<tr>
<th></th>
<th>Temperature</th>
<th>Date, Time collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest TMP</td>
<td>83.3°F</td>
<td>Mon, 11/26/2012, 1130 hrs</td>
</tr>
<tr>
<td>Lowest TMP</td>
<td>68.7°F</td>
<td>Fri, 11/30/2012, 0820 hrs</td>
</tr>
<tr>
<td>5 Day Average</td>
<td>77.8°F</td>
<td>Mon-Fri, 11/26-30/2012</td>
</tr>
</tbody>
</table>

Relative Humidity

<table>
<thead>
<tr>
<th></th>
<th>RH</th>
<th>Date, Time collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest RH</td>
<td>78.2%RH</td>
<td>Fri, 11/30/2012, 0820 hrs</td>
</tr>
<tr>
<td>Lowest RH</td>
<td>46.4%RH</td>
<td>Tue, 11/27/2012, 1445 hrs</td>
</tr>
<tr>
<td>5 Day Average</td>
<td>61.4%RH</td>
<td>Mon-Fri, 11/26-30/2012</td>
</tr>
</tbody>
</table>

Table 21: Temperature and Humidity Data Table

Potential solutions:

1. The cost of heating and cooling systems and their operation does not seem necessary in a climate such as Rwanda along with the financial limitations. The weather does offer some challenging days for thermal comfort. Providing high velocity low speed ceiling fans (See Photo 23) as used elsewhere in the country have proved effective means of circulating air in the summer and pushing warm air down in the winter.

2. The Immunization classes can be broken down into smaller groups and brought indoors where the attendees and their infants are not subjected to the elements. Try teaching the class two times a week to keep the classes smaller when the weather restricts the use of the outdoor environment.
3. Provide louvers on the windows to deflect the sunlight on warm days. The clerestory windows in the Hygiene/Waiting room have no means to prevent sunlight from entering the space nor are the windows operable to allow for ventilation. Making the clerestory windows operable would aid in removing heated air from the space. Long handled extension rods can be used to operate the windows.

![High velocity, low speed ceiling fan](image)

**Photo 23: High Velocity, Low Speed Fan Option**

**WATER CLOSETS, LAVATORIES, AND DRINKING FOUNTAINS**

According to the 2012, International Building Code (International Code Consortium 2012) and the 2902.1.1 Fixture calculations the NHC meets the “Educational Classifications” and the “Business Classifications” for numbers of toilet and lavatory fixtures per occupant required and the minimum travel distance of 500’ as noted in Figure 7. The red dashed circle in Figure 25 represents a 100-foot radius indicating the toilets and lavatories are within the required distance. The Drawing is based off of a plan that was provided for several health centers. The site plan is not completely accurate.
with what was built, distances to outer building is unknown and the drawing is not to scale.

Figure 25: Public Water Closets, Lavatories and Latrine Locations

The NHC is neither a school nor a hospital so business classification and educational classifications were used to make the calculations. Section 2902.2 calls for separate facilities for each sex and the NHC does have one room where both urinals and toilets are in the same room but stalls are provided for the toilets for privacy. The latrines and toilets were not functioning during the period of observation. The toilets had to be primed with buckets of water and the latrines did not look as if the water had worked in some time if at all.
The one area the NHC was completely lacking was access to drinking water. There were no drinking fountains or known sources of potable water for drinking. According to code, the ratio of one fountain per one-hundred occupants is required. According to The Facility Guidelines Institute (2010) Section 2.2-6.1.4 Public Toilet Rooms, all public waiting areas serving more than fifteen people shall include toilet room(s) equipped with hand-washing stations. Section 2.2-6.1.4.2 stipulates these toilet rooms shall be located near the waiting areas.

Observation

Work was currently being done on site to provide water to the facility and this may solve some of the problems listed.

Potential solutions:

1. The only source of potable drinking water seemed to be that which was carried in. Safe drinking water needs to be made available to the staff, patients, and visitors.

2. Rainwater Harvesting (RWH) is an option where water can be collected using gutters and downspouts from the roof channeling the water into a cistern. The water is then filtered or chemically treated and then made safe for drinking.
   a. RWH is an excellent way to water vegetable gardens once the water situation is resolved it does not have to be filtered and can be used as grey water for flushing toilets.

3. Hand washing stations need to be provided for everyone as well. Several facilities use a simple solution called a “Tippy Tap” where they take a “Jerry Can” filled with filtered water and thread a dowel through its handle, mount it on a stand, operate it with a makeshift foot pedal that is designed to tilt the can forward and gently pour out the water on their hands like a faucet. If the water
is not operational in the building or should malfunction, again these temporary stations should be installed along with a bar of soap (http://www.tippytap.org/build-a-tippy-tap-manual).

ACOUSTICS

The majority of classroom activities involve spoken communication, the “acoustic comfort is vital” (Energy Star Building Manual p. 7) for student success. Noises from the outside, building equipment, and people can be a significant distraction. Contact with solid finishes such as tile, metal equipment, furniture, e.g. metal benches also contribute to disturbing noise levels. Included in the numerous byproducts of a turbulent setting are: headaches, people becoming “less interpersonally engaged, less caring, less reflective, and cognition is impeded” (Schweitzer, Gilpin, and Frampton, 2004, p. S-74). Noise can also been known to cause stress affecting workplace performance and student learning (Evans & Cohen, 1987) (Ulrich, 2000, p. 2) (Energy Star Building Manual p. 7). The American Speech-Language-Hearing Association ((ASHA) states that aside from the many health and educational detriments noise can also affect productivity as well as the ability to pay attention to tasks in the workplace (http://www.asha.org/public/hearing/noise/).

Hard surfaces in healthcare make it easier to clean and right angles in construction tend to require less effort to build but these finishes keep noise levels high and cause reverberation and sound to reflect off of them which make for a very undesirable space (Busch-Vischniac, et al 2005) (Kopec, 2012 p. 272). The NHC typical building materials and finishes consist of the materials shown in Table 22.
### Table 22: Finish Materials at the NHC

Noise Reduction Coefficients (NRC) are assigned to building materials dependent on their ability to absorb sound, the more absorbent the material the higher the number. The ratings for NRC are from (0) zero which is perfectly reflective to (1) one perfectly absorptive (www.nrcratings.com). The materials at the NHC are very reflective and have very low NRC ratings as noted in Table 6. The more reflective a space is the longer it takes for sounds to die away which can be very unpleasant.

The recommended background noise for classroom design is 40-45 dBA (Ramsey & Sleeper, 1994, pp. 59-61). To try and put that into a frame of reference the decibels are given in Table 23 for the associated common sounds that can be heard at the NHC.

<table>
<thead>
<tr>
<th>Material</th>
<th>Noise Reduction Coefficient (NRC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gypsum</td>
<td>.05</td>
</tr>
<tr>
<td>Concrete, smooth, painted</td>
<td>.00 - .05</td>
</tr>
<tr>
<td>Marble</td>
<td>.00</td>
</tr>
<tr>
<td>Drapery, light weight</td>
<td>.05 - .15</td>
</tr>
<tr>
<td>Window, opened</td>
<td>1</td>
</tr>
<tr>
<td>Glass</td>
<td>.05 - .10</td>
</tr>
<tr>
<td>Seating, occupied</td>
<td>.80 - .85</td>
</tr>
<tr>
<td>Wood doors</td>
<td>.05 - .15</td>
</tr>
</tbody>
</table>

Source: www.nrcratings.com/nrc.html
<table>
<thead>
<tr>
<th>Decibel Table</th>
<th>dBA</th>
</tr>
</thead>
<tbody>
<tr>
<td>A whisper</td>
<td>15 - 20 dBA</td>
</tr>
<tr>
<td>Moderate rainfall</td>
<td>50 dBA</td>
</tr>
<tr>
<td>Normal conversation</td>
<td>60 dBA</td>
</tr>
<tr>
<td>Permanent hearing loss¹</td>
<td>85 dBA</td>
</tr>
<tr>
<td>Motorcycle</td>
<td>90 - 110 dBA</td>
</tr>
<tr>
<td>Baby crying</td>
<td>110 dBA</td>
</tr>
</tbody>
</table>

1. The level of a noise and the length of time subjected to it can cause noise-induced hearing loss starting at 85 dBA.

Sources: http://www.asha.org/public/hearing/noise/
http://condor.admin.ccny.cuny.edu/~ms6785/page4.html
http://science.howstuffworks.com/question124.htm

Table 23: Common Decibel Levels

These numbers emphasize the importance of designing facilities that factor in acoustical considerations. It is recommended that an acoustician is consulted to properly design within healthcare settings whenever possible.

Potential solutions:

1. Provide a crying room for mothers to take their babies.
2. Do not allow the motorcycle ambulance or any other vehicle to operate immediately outside the main entrance or near any open windows.
3. Provide baffles, banners or other sound absorbing surfaces (See Figure 26) in the Waiting Room to help eliminate some of the reflective surfaces. Other areas can benefit from sound absorbing materials as well but the configuration of the Waiting Room would seem to make it benefit the most and it has the largest occupant usage.
a. A wave baffle suspended from the ceiling consists of one and a half inches of fiberglass sewn between nylon cloths draped in such a way it looks like it forms a wave across the upper portion of the ceiling. This type of acoustical treatment is to reduce reverberation within the space.

b. Baffles may also be suspended vertically in short sections to achieve a similar affect.

4. The use of “cool colors neutralize the negative effects of noise distraction” (Bosch, Edelstein, Cama, & Malkin, 2012, p. 66). A few well designed and well thought out color schemes may help to keep occupants more focused on their tasks.

Figure 26: Possible Acoustic Solutions
SPACE REQUIREMENTS

A traditional classroom with loose seating requires 20 - 22 SF per student and is designed for 25 to 60 students. The Immunization program had at least 60 adult participants that brought their infant children with them. Using Arizona State University’s (ASU) Classroom Design Guide’s recommended square footages based on the Space Planning Guidelines for Institutions of Higher Learning published in 1985 by the Council of Educational Facility Planners International (CEFPI) the actual space requirement for the rooms were calculated. These calculations did not account for the loose seating being benches nor the need to leave room at the front of the classroom for the instructor to conduct the class. These are just minimum raw numbers for reference. The numbers in the column headed Minimum Required SF” shown italicized and in red in Table 24 indicate the rooms do not meet minimum standards for occupant space planning.

The Anti-natal space, which is designated as an education room in the original plan, was overcrowded during the education program for the number of attendees. The staff had to keep bringing in more benches to accommodate the overflowing numbers. A room that size should not have more than twenty-five people maximum in attendance.

The Hygiene/Waiting Room met the space requirements but that did not take into account the people that were in the waiting room actually waiting for other services and not attending the Hygiene lecture. This space is multipurpose and pathways must be maintained to allow access to other areas within the facility so it is important not to impede access to any of the other functions within the space. Major pathways entering and exiting from the north, south, east, and west also take place at all times which would technically subtract from the actual square footage.
Family Planning which was originally designated in plan as the maternity waiting and reception room and appears to meet the requirements for space planning for its current purpose but when the fact that the space also serves as an exit to the east and an access passage to the maternity unit the size shrinks to about 178 SF of useable space.

Immunization education space is an open space designated as an education room. It is the largest space used for education and had the most attendees during this research. The calculation was based on approximately 60 adults and not the infants they were carrying strapped to their backs. This space was also overcrowded per the source cited.

<table>
<thead>
<tr>
<th>Space</th>
<th>Actual SF</th>
<th>Approximate Number of Attendees</th>
<th>Minimum Required SF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anti-natal</td>
<td>529 SF</td>
<td>50±</td>
<td>1000 SF</td>
</tr>
<tr>
<td>Hygiene</td>
<td>1,124 SF</td>
<td>50±</td>
<td>1000 SF</td>
</tr>
<tr>
<td>Family Planning</td>
<td>632 SF</td>
<td>30±</td>
<td>600 SF</td>
</tr>
<tr>
<td>Immunization</td>
<td>862 SF</td>
<td>110± (60 adults &amp; 50 infants)</td>
<td>1200 SF</td>
</tr>
</tbody>
</table>

Table 24: Recommended Minimum Square Footage Requirements

**Potential solutions:**

1. Hold more than one class on the same subject per week. If large numbers are anticipated, spread the classes out.

2. Utilize some of the other spaces within the facility for education spaces. Hold Family Planning in the Anti-natal space on the off days.

3. The patient facility to the north was vacant. Is it possible to utilize some of that space on an “as needed” basis?

4. There was a meeting room shown in the southeast wing, is that available for small classes?
FINISHES, COLOR, FURNITURE

The first impression of the NHC is at the main entrance and the Waiting Room. The openness of the space with the white walls and reflective white floors with the daylighting flooding in from the small clerestory windows eighteen feet overhead appear cavernous at first because the room is so tall and there are no windows at eye level to offer perspective. The room is void of visual distractions. There are no visual stimulations such as artwork or color schemes. The occupants themselves become the only visual stimulation with their brightly colored clothing sitting on rows of rigid benches.

The finishes found at the NHC may be used for ease of cleaning and to limit the amount of stocking supplies needed for repair and maintenance. This way only, a few stock items are required. Everything is predominately painted white or near white, the walls, the ceilings and the floor is white marble tile. The Waiting Room has exposed joists and an aluminum roof but it is so high and above the bright clerestory windows, it is almost unnoticeable that it is a different color. White often gives a false sense of a clean sterile environment and has a sense of institutionalization. Influencing students attitudes and attention levels has been affected by the use of color in learning environments according to a 1981 article by Sinofsky & Knirck titled; “Choose the right color for your learning style” (Kopec, 2012, p. 227). Many researchers believe color does influence behavior and some believe color can influence health outcomes but there needs to be more rigor in the research.

The only furniture for the visitors of the NHC consists of the 79” long by 19” high by 11” deep benches. Each bench should comfortably seat four person’s side-by-side at a minimum of eighteen inches per person (Ramsey and Sleeper, 1994, p.837). The benches appear to be simple and affordable but are lacking when it comes to comfort. They have a
finished wood plank to sit on and metal legs for support. They do not have any back support or arm rests.

**Potential solutions:**

1. With the importance of the education objective at the NHC the use of color can positively influence students attitudes and attention levels according to a 1981 article by Sinofsky & Knirck titled; “Choose the right color for your learning style” (Kopec, 2012, p. 227).

2. Paint one wall a shade different to add an accent wall or provide a mural that incorporates community artwork into the health center.

3. Adding artwork if paint color is not an option. Colorful fabric banners would also help the acoustic problem if designed properly.

4. Adding backrests (See Photo 24) on the existing benches might be beneficial for the people spending long periods at the health center. Further research may be made as to the rationale behind not providing back support or if there are cultural differences that were unknown at the time of this investigation. Arranging the benches in conversational pods so people can talk with one another so all eyes are not facing frontwards makes for a more relaxed environment. In an education setting, placing the seating in a semicircular pattern provides for more interactive group discussion. Keeping a few benches without the backrests for mothers choosing to keep infants strapped to their backs is also recommended.

   a. Some of the classes were so well attended that the attendees had to sit up to six to seven per bench, which made the seating even more uncomfortable for prolonged periods of time.
5. Adding appropriate reading materials with magazine or book racks strategically placed could provide for some positive distractions. Putting up bulletin boards with current information to help keep attendees informed of health concerns and programs that are being offered.

Photo 24: Bench with Added Back Support

4.5 **POE Questionnaires**

The instrument labeled, “Post Occupancy Evaluation (POE) Form to be Completed by Staff” can be found in Appendix “S” for reference. The instructions to the staff included the following statement:

The purpose of this evaluation is to assess how well the building education spaces perform for those who occupy it in terms of health, safety, security, functionality, psychological comfort. The benefit of a post occupancy evaluation includes identification of good and bad performance aspects of the building, better building utilization, and feedback on how to improve future, similar buildings. Your responses are completely anonymous so please
answer thoughtfully and honestly. Please respond only to those questions that are applicable only to you.

The responses that could identify the individual respondents were omitted for the security and privacy of the individuals.

The question requesting how many hours the staff respondents spent in the various education spaces they provided the following information: Of the twelve respondents forty-two percent (five) indicated they worked forty-one or more hours in the interior education spaces (Family Planning, Hygiene, Anti-natal care, Post-natal care, Immunization, Prevention of Malaria, Sickness and Origin of Illness, and Disease Prevention) per week. Three of them spent six to fifteen hours in the same area. Three spent up to twenty hours in the exterior education (immunization) space and six of them said they spent up to ten hours in the kitchen space.

The following figure (Figure 27) represents the respondent’s answers to the questionnaires. There were twelve responses from the staff of the NHC to this set of voluntary questions.
Post Occupancy Evaluation (POE) Form to be Completed by Staff, Responses

Overall Quality Indicators:

<table>
<thead>
<tr>
<th>EX</th>
<th>G</th>
<th>F</th>
<th>P</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent Quality</td>
<td>Good Quality</td>
<td>Fair Quality</td>
<td>Poor Quality</td>
<td>No Response</td>
</tr>
</tbody>
</table>

The staff was asked to rate the overall quality of the following spaces using the above indicators.

<table>
<thead>
<tr>
<th>Interior Education Space: Family Planning, Hygiene, Anti-natal, etc.</th>
<th>Exterior Education Space: Immunization</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="chart1" alt="Pie Chart" /></td>
<td><img src="chart2" alt="Pie Chart" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Demonstration Kitchen Space:</th>
<th>Public Toilets:</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="chart3" alt="Pie Chart" /></td>
<td><img src="chart4" alt="Pie Chart" /></td>
</tr>
</tbody>
</table>

Figure 27: Post Occupancy Evaluation (POE) Form to be Completed by Staff Responses
Post Occupancy Evaluation (POE) Form to be Completed by Staff, Responses (cont.)

Overall Quality Indicators:

<table>
<thead>
<tr>
<th>EX = Excellent Quality</th>
<th>G = Good Quality</th>
<th>F = Fair Quality</th>
<th>P = Poor Quality</th>
<th>N = No Response</th>
</tr>
</thead>
</table>

The staff was asked to rate the overall quality of the **Interior Education Spaces** in terms of the following.

### Interior Education Space: Adequacy (meets needs) of Space

- **Exemplary (EX):** 67%
- **Good (G):** 25%
- **Fair (F):** 8%
- **Poor (P):** 8%
- **No Response (N):** 2%

### Interior Education Space: Lighting

- **Exemplary (EX):** 50%
- **Good (G):** 17%
- **Fair (F):** 8%
- **Poor (P):** 8%
- **No Response (N):** 17%

### Interior Education Space: Acoustics (sound quality)

- **Exemplary (EX):** 42%
- **Good (G):** 25%
- **Fair (F):** 8%
- **Poor (P):** 8%
- **No Response (N):** 17%

### Interior Education Space: Temperature (climate control)

- **Exemplary (EX):** 58%
- **Good (G):** 8%
- **Fair (F):** 8%
- **Poor (P):** 25%
- **No Response (N):** 17%

Figure 27: (Continued)
Post Occupancy Evaluation (POE) Form to be Completed by Staff, Responses (cont.)

Overall Quality Indicators:

<table>
<thead>
<tr>
<th>EX = Excellent Quality</th>
<th>G = Good Quality</th>
<th>F = Fair Quality</th>
<th>P = Poor Quality</th>
<th>N = No Response</th>
</tr>
</thead>
</table>

The staff was asked to rate the overall quality of the **Interior Education Spaces** in terms of the following (continued).

**Interior Education Space:** Odor (smells)

**Interior Education Space:** Esthetic Appeal (attractiveness)

**Interior Education Space:** Security

**Interior Education Space:** Flexibility of Use

---

Figure 27: (Continued)
Overall Quality Indicators:

- EX = Excellent Quality
- G = Good Quality
- F = Fair Quality
- P = Poor Quality
- N = No Response

The staff was asked to rate the overall quality of the **Exterior Education Space** in terms of the following.

**Exterior Education Space:**
- Adequacy (meets needs) of Space
- Lighting

- **Exterior Education Space:** Acoustics (sound quality)
- Temperature (climate control)

Figure 27: (Continued)
Post Occupancy Evaluation (POE) Form to be Completed by Staff, Responses (cont.)

Overall Quality Indicators:

<table>
<thead>
<tr>
<th>EX = Excellent Quality</th>
<th>G = Good Quality</th>
<th>F = Fair Quality</th>
<th>P = Poor Quality</th>
<th>N = No Response</th>
</tr>
</thead>
</table>

The staff was asked to rate the overall quality of the Exterior Education Space in terms of the following (continued).

**Exterior Education Space:**
- Odor (smells)
- Esthetic Appeal (attractiveness)
- Security
- Flexibility of Use

It was noted that one of the respondents checked excellent in every category... including “other” in response to this section.

Figure 27: (Continued)
Post Occupancy Evaluation (POE) Form to be Completed by Staff, Responses (cont.)

Overall Quality Indicators:

<table>
<thead>
<tr>
<th>EX = Excellent Quality</th>
<th>G = Good Quality</th>
<th>F = Fair Quality</th>
<th>P = Poor Quality</th>
<th>N = No Response</th>
</tr>
</thead>
</table>

The staff was asked to rate the overall quality of the **Demonstration Kitchen Space** in terms of the following.

**Demonstration Kitchen Space:**
- Adequacy (meets needs) of Space
- Lighting
- Acoustics (sound quality)
- Temperature (climate control)

One respondent added a note suggesting adding a heater.

Figure 27: (Continued)
Post Occupancy Evaluation (POE) Form to be Completed by Staff, Responses (cont.)

Overall Quality Indicators:

| EX = Excellent Quality | G = Good Quality | F = Fair Quality | P = Poor Quality | N = No Response |

The staff was asked to rate the overall quality of the Exterior Education Space in terms of the following (continued).

Figure 27: (Continued)

The spaces included the interior Education areas for Family Planning, Hygiene, and Anti-natal, the exterior Education spaces for Immunization and the Demonstration
Kitchen as well as the Public Toilets. Twelve Staff member participants completed the overall Quality Questionnaire. Each space received favorable marks; the average for all spaces combined is shown in the chart listed in Figure 28. The Demonstration Kitchen and the Public Toilets were the only areas to receive a “Poor” rating by any of the respondents.

<table>
<thead>
<tr>
<th>EX = Excellent Quality</th>
<th>G = Good Quality</th>
<th>F = Fair Quality</th>
<th>P = Poor Quality</th>
<th>N = No Response</th>
</tr>
</thead>
</table>

**Overall Quality of Education Spaces**
Interior, Exterior and Public Toilets

![Pie chart showing quality ratings]

Figure 28: Overall Quality Rating of Education Space by Staff

During the course of this research, the water for the facility was not operational and could have had a negative impact on the responses regarding the Public Toilets. There were efforts underway to bring water into the facility at the time, which may influence future opinions regarding the Toilets.

### 4.6 Participant Engagement Questionnaires (PEQ) Analysis

The purpose of a PEQ is to determine if the built environment contributes to the engagement of the students that occupy it. According to “Astin’s theory of involvement”, (Hunley & Schaller 2006 p. 13.3) student engagement is a tool for measuring student learning. Learning about preventable health problems and the ability to treat them at home before they become serious is the ultimate goal of this research. The ability of the
health center’s built environment to convey this message to the participants and the
community that surrounds it is the focus of this study.

Each education space was observed during a unique education program and
evaluated separately on different days with different instructors and the spaces were
broken down accordingly. The combined Attendees at the four observed education
programs totaled approximately 188 participants. It was the goal of the research to
obtain approximately a ten percent participatory involvement from the attendees to
obtain an adequate sampling for the study. An overall voluntary response of seventy-
seven participants for all four classes was obtained making it a forty-one percent
participatory response although some respondents did not answer all questions and due
to the language barrier, translation period, and participant availability follow-up
questions were not possible. The original format of the questionnaire can be found in
Appendix “Q”.

4.6.1 PEQ Demographics

The demographics are an important part of data gathering for future research. If
the research is to be duplicated in the future or similar data is to be gathered then it is
important to know the criteria used to obtain the baseline data for this research or to see
if the demographics of the facility change over time. It is not gathered to obtain any
personal or identifiable information about any of the participants that took part in this
research.

PARTICIPANT AGE

The education areas were broken down into their respective classrooms as shown
in Figure 29 to show the attended ages of each program. Some programs were more
highly attended than others were which would skew the numbers if averaged together.
The median age for each category was used and then averaged, e.g. 18-22 years; the
median age is 20 years of age. The average age of the twenty-six participants for the Anti-natal program was twenty-seven. The Hygiene program consisted of eleven participants and their average age was thirty. Family Planning also had eleven participants but their average age was thirty-two. The Immunization program had the largest amount of participants with twenty-seven respondents to this question. Their average age was twenty-eight which drove the overall average age to twenty-eight years of age for the entire program. There were no respondents in the age range from forty-three to forty-seven, which is why it does not appear on the chart.

Figure 29: Participant Ages in Educational Programs

GENDER

The majority of the education participants in all programs were female. In the Anti-natal and Immunization Programs both genders were permitted but only females were present. The Immunization Program is geared toward immunization for newborns, which may be a factor as to why the males were not present. In the Hygiene program, four of the eleven respondents were male (thirty-six percent) although in the Hygiene area, which utilizes the Waiting Room for the entire NHC facility and had a great number
of males present in the facility they simply chose not to be respondents. Family Planning had a similar ratio with four of the twelve respondents being male or thirty-three percent in attendance.

MARITAL STATUS AND CHILDREN

![Marriage Status Chart]

Figure 30: Marriage Status

Eighty-five percent of the participants of all classes attended combined indicated they were married (see Figure 30).

Fifteen of the twenty-seven Anti-natal respondents have children ranging in age from currently pregnant to eighteen years of age. The households have between one to five children. While the mother is attending classes at the NHC, the majority of the children’s fathers take care of them with their grandmothers, neighbors and siblings as backups.

Eight of the eleven Hygiene respondents replied that that they have children between one and twenty-one years of age being cared for by themselves, or by
neighbors, or by a grandparent. Their maximum household reported totaled three children.

Family Planning had twelve respondents all of which had children ranging in age from one to thirty-five. One household reported seven children the rest of the class had three or less. The care providers at home while the mother was away were grandmothers, neighbors, or they were able to care for themselves.

In the Immunization classroom, twenty-five respondents acknowledged having children. Their ages ranged from newborn to fourteen years of age and the largest household had six children. Some of the mothers brought the children along to the NHC, some stayed with the father, the grandparents, the house worker, or by themselves.

**REASON FOR ATTENDING CLASS**

![Figure 31: Reasons for Being at the Health Center](image)

Per Figure 31, thirty-one out of seventy-five respondents from all four-classroom areas gave education as the number one reason for attending classes at the NHC.

When asked how the participants learned about the programs the number one answers were from the nurses followed by the community health workers (CHW) from their local villages.
NUMBER OF TIMES PER YEAR GOING TO THE NHC

Sixty-five respondents stated the number of times they visit the NHC per year would total three hundred and thirty-three appointments at the NHC per year. One respondent would make as many as twenty-four visits in one year alone. Figure 32 represents a calendar year with the sixty-five participants indicated in color. The light gray figures represent the repeated visits to the health center.

![Calendar Representing Repeated Visits to the NHC](image)

If the education programs could eliminate even a portion of these repeated visits, it would not only be a cost savings to the health center and the participants but a time saver as well.

MOST PARTICIPATED CLASSES AND MOST REQUESTED CLASSES

Table 25 lists the participant’s selection of the classes they have attended the most and the ones they would like to attend next at the center. The classes that have the
most participation and that have the most requests seem to have a large overlap with the exception of health insurance and basic health education and patient care. Other classes that did not make the top of the list and are not already being taught at the health center include child education, and helping families out of poverty.

<table>
<thead>
<tr>
<th>MOST PARTICIPATED CLASSES</th>
<th>MOST REQUESTED CLASSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family Planning 22%</td>
<td>Hygiene 24%</td>
</tr>
<tr>
<td>Hygiene 19%</td>
<td>Family Planning 20%</td>
</tr>
<tr>
<td>Mal/Nutrition 16%</td>
<td>Mal/Nutrition 15%</td>
</tr>
<tr>
<td>HIV Prevention 11%</td>
<td>HIV Prevention 13%</td>
</tr>
<tr>
<td>Malaria Prevention 7%</td>
<td>Health Insurance 4%</td>
</tr>
<tr>
<td>Babies Healthcare 5%</td>
<td>Malaria Prevention 3%</td>
</tr>
<tr>
<td>Immunization/Pre Natal 4%</td>
<td>Health Education/Patient Care 2%</td>
</tr>
</tbody>
</table>

Table 25: Classes Participated in and Classes Requested

Seventy-eight percent of the education participants said they come for healthcare treatment or services first and attend the educational sessions afterwards. Only forty-one percent said they come to the health center just to attend classes.

The thirty-five percent of the participants took part in educational classes that lasted thirty minutes. Another twenty-four percent had classes lasting an hour whereas eighteen percent said they had classes that lasted two hours. Other participants said their classes ranged from six hours to fifteen minutes. While several said, their classes took more than a day to complete. It is possible they included their appointment time in with their class time but their answers did not stipulate anything more than how many hours their classes lasted.

There also seems to be some confusion on whether or not the classes cost anything to the participants and if it does who pays for it. Fifty-nine out of seventy-one say it costs nothing but then twelve out of twenty go on to say who is paying the for the class from it being paid by the attendee, by insurance, by the parents, some say it is their husband or even by a charitable NGO. It is clear many of the participants are unsure at best.
EMPLOYMENT STATUS

Many residents in the rural community work their own land, and are sustenance farmers. This is one of the drivers of poverty for this region. There has been a push to try to obtain jobs outside of the home and increase the family income and to start earning a savings as part of the Millennium Development Goal number one, Eradicate extreme poverty and hunger, which is being pushed by the Rwandan government with an initial goal to have it accomplished by the year 2015. Almost half of the respondents, thirty-five out of seventy-four marked yes, they work outside of the home and are employed by someone else other than from their own household.

EDUCATION

The Rwandan education system is slightly different from the US system. There are four levels. The first level is Pre-school (PS1-3) and takes three years to complete. The second is Primary (P1-6) and takes six years to complete. The third level is broken up in two categories depending on whether the student will continue on to a university or is seeking a trade. Level three, trade seeking called Technical or Vocational School and lasts six years. Level three, university oriented called Secondary Education (S1-6). The fourth level called Higher Learning and is the university level, which takes seven years to complete (Republic of Rwanda, National Institute of Statistics of Rwanda, 2010, p. 29). There is a mandatory education directive in Rwanda as of 2006 that require mandatory education at least through the P-6 level according to the Rwandan’s Ministry of Educations Sector Strategic Plan dated April of 2006. This also follows the Millennium Development goal number 2, Achieve Universal Primary Education. Rwanda’s vision for 2020 is to provide “quality preventative, curative, rehabilitative and promotional services” (Health Sector Policy, Government of Rwanda, 2005, p. 8) which drive healthcare facilities to incorporate education into their programs.
When the participants were attempting to complete the questionnaires, a few of them could not read and asked the assistance of the translator to help complete forms. They were given the option of using the forms translated into any of the three provided languages; English, French, or Kinyarwanda all languages taught currently in Rwanda. English is being taught more recently at the younger age levels. Figure 33 shows the participant education levels at the NHC. Anything that is to the left of the P-6 level is below the minimum standards that are set by the government of Rwanda.

**Figure 33: Participant Education Levels**

Nineteen percent (five) of the Anti-natal participants and seventeen percent (two) of the Family Planning participants indicated that they had never been to school. Anti-natal did have two participants currently enrolled in a school program, Hygiene had three, Family Planning had two and Immunization had one currently enrolled in a school program. The Immunization program had the greatest number of responses and the largest number of persons attending school after the primary level.
TIME AND DISTANCE TRAVELED

Most healthy people can walk a mile in fifteen minutes (Kaiser Permanente 2012). Many people walk a much more leisurely pace but since the majority of Rwandans in this study used walking as their main mode of travel the fifteen-minute mile was used. Now take into consideration, Rwanda is known as “the land of a thousand hills” and to maneuver the many small roads on the many terraced landscapes and switchbacks... in other words there are not many straight roads. Moreover, many of the participants travelled with children strapped to their backs that added weight to the burden of their ill health or traveled with someone in ill health, this could add a considerable time difference to the travel estimates. One of the objects of the NHC was to bring care to the more remote areas that had no facility to speak of but even so, people still have a great distance to walk to obtain healthcare. Figures 34, 35, 36, & 37 demonstrate the time and walking distances the participants’ traveled for the week of November 26, 2012. Each education program was broken down in case it might have relevance later in this study or in future studies. Figure 38 brings all data into one diagram.

The size of the bubbles in the figure represents the number of participants that traveled the distance stated for the time listed.
Figure 34: Time & Walking Distance for Anti-natal Participants

Figure 35: Time & Walking Distance for Hygiene Participants

Note: Although some graphs display negative numbers along the axis there are no negative results this is just a function of the software.
Figure 36: Time & Walking Distance for Family Planning Participants

Figure 37: Time & Walking Distance for Immunization Participants

Note: Although some graphs display negative numbers along the axis there are no negative results this is just a function of the software.
Figure 38: Time & Walking Distance for All Participants

Figure 38 was used to average the times for all four groups. The average walking time was 59 minutes whereas the average distance was four miles. The furthest distance traveled was twelve miles, which took approximately three hours according to the two persons that made the trek.

The Furthest distance reported was from the two villages of Shami and Ruzinge in the Bugesera District and can be seen on the District map (Figure 39). A twelve-mile radius was drawn around Ngeruka to visualize the distance traveled. This map shows a twelve mile radius that would apply if there were any straight roads to use. This region is full of switchback trails and dirt roads that make up the majority of the travel routes in this district. The roads are approximately indicated on the map and the convoluted paths they take give some indication of the hills and mountains that cause traveling to be of so much difficulty in the region for the inhabitants. Four of the people reported that they occasionally took bicycle taxis (the rider sits on a seat mounted on the back fender), one said they rode a motorcycle, and two persons reported they were able to drive
themselves. Seventy-eight people actually participated in this questionnaire but only fifty-nine of them answered this portion correctly.

Figure 39: Bugesera District Map
4.6.2 PEQ of the “A” Anti-natal Education Space Analysis

<table>
<thead>
<tr>
<th>SA = Strongly Agree</th>
<th>A = Agree</th>
<th>D = Disagree</th>
<th>SD = Strongly Disagree</th>
<th>N = No Response</th>
</tr>
</thead>
</table>

The participants were asked to use their feelings and rate the following statements using the above indicators.

<table>
<thead>
<tr>
<th>Overall, I feel good about learning in these classes.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="chart1.png" alt="Pie Chart" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I care about this facility.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="chart2.png" alt="Pie Chart" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I feel safe here.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="chart3.png" alt="Pie Chart" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I am treated fairly in this facility.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="chart4.png" alt="Pie Chart" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I have a voice in the classroom and am encouraged to participate.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="chart5.png" alt="Pie Chart" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The teachers care about us (the participants).</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="chart6.png" alt="Pie Chart" /></td>
</tr>
</tbody>
</table>

Figure 40: Anti-natal Participant Engagement Questionnaires
The participants were asked to use their feelings and rate the following statements using the above indicators.

### I feel welcome to return for future classes.

- **SA**: 26%
- **A**: 37%
- **D**: 37%
- **SD**: 4%
- **N**: 7%

### The classroom is well designed.

- **SA**: 26%
- **A**: 44%
- **D**: 30%
- **SD**: 7%
- **N**: 3%

### The classroom was the right size for the class.

- **SA**: 22%
- **A**: 37%
- **D**: 22%
- **SD**: 7%
- **N**: 4%

### The furniture provided is comfortable.

- **SA**: 33%
- **A**: 22%
- **D**: 19%
- **SD**: 4%
- **N**: 13%

### The room temperature is comfortable.

- **SA**: 33%
- **A**: 30%
- **D**: 30%
- **SD**: 7%
- **N**: 7%

### The room lighting is appropriate.

- **SA**: 33%
- **A**: 33%
- **D**: 33%
- **SD**: 7%
- **N**: 7%

Figure 40: Anti-natal Participant Engagement Questionnaires (continued)
The participants were asked to use their feelings and rate the following statements using the above indicators.

<table>
<thead>
<tr>
<th>The acoustics (sound quality) in the space is appropriate.</th>
<th>Overall, I felt the information provided at the health center was valuable.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA = Strongly Agree</td>
<td>A = Agree</td>
</tr>
<tr>
<td>48%</td>
<td>26%</td>
</tr>
</tbody>
</table>

Figure 40: Anti-natal Participant Engagement Questionnaires (continued)

The Anti-natal space, according to the original plan was designated as an Education Room for Voluntary Counseling and Testing (VCT)/Anti-Retroviral (ARV).

On Tuesday, November 27, 2012, it was used for anti-natal education.
4.6.3 PEQ of the “B” Hygiene Education Space Analysis

<table>
<thead>
<tr>
<th>SA = Strongly Agree</th>
<th>A = Agree</th>
<th>D = Disagree</th>
<th>SD = Strongly Disagree</th>
<th>N = No Response</th>
</tr>
</thead>
</table>

The participants were asked to use their feelings and rate the following statements using the above indicators.

<table>
<thead>
<tr>
<th>Overall, I feel good about learning in these classes.</th>
<th>I care about this facility.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Pie chart" /></td>
<td><img src="image2" alt="Pie chart" /></td>
</tr>
<tr>
<td>36%</td>
<td>36%</td>
</tr>
<tr>
<td>27%</td>
<td>18%</td>
</tr>
<tr>
<td>36%</td>
<td>45%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I feel safe here.</th>
<th>I am treated fairly in this facility.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3" alt="Pie chart" /></td>
<td><img src="image4" alt="Pie chart" /></td>
</tr>
<tr>
<td>36%</td>
<td>36%</td>
</tr>
<tr>
<td>27%</td>
<td>18%</td>
</tr>
<tr>
<td>9%</td>
<td>36%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I have a voice in the classroom and am encouraged to participate.</th>
<th>The teachers care about us (the participants).</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image5" alt="Pie chart" /></td>
<td><img src="image6" alt="Pie chart" /></td>
</tr>
<tr>
<td>36%</td>
<td>36%</td>
</tr>
<tr>
<td>27%</td>
<td>18%</td>
</tr>
<tr>
<td>36%</td>
<td>45%</td>
</tr>
</tbody>
</table>

Figure 41: Hygiene Participant Engagement Questionnaires

171
PEQ Hygiene Education Space (continued)

<table>
<thead>
<tr>
<th>SA = Strongly Agree</th>
<th>A = Agree</th>
<th>D = Disagree</th>
<th>SD = Strongly Disagree</th>
<th>N = No Response</th>
</tr>
</thead>
</table>

The participants were asked to use their feelings and rate the following statements using the above indicators.

I feel welcome to return for future classes.

The classroom is well designed.

The classroom was the right size for the class.

The furniture provided is comfortable.

The room temperature is comfortable.

The room lighting is appropriate.

Figure 41: Hygiene Participant Engagement Questionnaires (continued)
The participants were asked to use their feelings and rate the following statements using the above indicators.

<table>
<thead>
<tr>
<th>The acoustics (sound quality) in the space is appropriate.</th>
<th>Overall, I felt the information provided at the health center was valuable.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Pie chart showing distribution of responses]</td>
<td>[Pie chart showing distribution of responses]</td>
</tr>
</tbody>
</table>

Figure 41: Hygiene Participant Engagement Questionnaires (continued)

The Hygiene Education space, according to the original plan is designated as a Waiting Room or Reception area. On Wednesday, November 28, 2012, it was concurrently used for Hygiene education while patient waiting and reception took place in adjacent seating.
4.6.4 PEQ of the “C” Family Planning Education Space Analysis

<table>
<thead>
<tr>
<th>SA = Strongly Agree</th>
<th>A = Agree</th>
<th>D = Disagree</th>
<th>SD = Strongly Disagree</th>
<th>N = No Response</th>
</tr>
</thead>
</table>

The participants were asked to use their feelings and rate the following statements using the above indicators.

**Overall, I feel good about learning in these classes.**

- 42% Strongly Agree (SA)
- 58% Agree (A)

**I care about this facility.**

- 42% Strongly Agree (SA)
- 58% Agree (A)

**I feel safe here.**

- 8% Strongly Agree (SA)
- 25% Agree (A)
- 67% Disagree (D)

**I am treated fairly in this facility.**

- 50% Strongly Agree (SA)
- 50% Agree (A)
- 50% Disagree (D)

**I have a voice in the classroom and am encouraged to participate.**

- 42% Strongly Agree (SA)
- 58% Agree (A)

**The teachers care about us (the participants).**

- 33% Strongly Agree (SA)
- 67% Agree (A)

Figure 42: Family Planning Participant Engagement Questionnaires
PEQ Family Planning Education Space (continued)

<table>
<thead>
<tr>
<th></th>
<th>SA = Strongly Agree</th>
<th>A = Agree</th>
<th>D = Disagree</th>
<th>SD = Strongly Disagree</th>
<th>N = No Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>I feel welcome to return for future classes.</td>
<td>8%</td>
<td>58%</td>
<td>33%</td>
<td>17%</td>
<td>25%</td>
</tr>
<tr>
<td>The classroom is well designed.</td>
<td>16%</td>
<td>42%</td>
<td>42%</td>
<td>16%</td>
<td>16%</td>
</tr>
<tr>
<td>The classroom was the right size for the class.</td>
<td>17%</td>
<td>33%</td>
<td>25%</td>
<td>25%</td>
<td>25%</td>
</tr>
<tr>
<td>The furniture provided is comfortable.</td>
<td>16%</td>
<td>33%</td>
<td>25%</td>
<td>16%</td>
<td>16%</td>
</tr>
<tr>
<td>The room temperature is comfortable.</td>
<td>25%</td>
<td>33%</td>
<td>25%</td>
<td>17%</td>
<td>17%</td>
</tr>
<tr>
<td>The room lighting is appropriate.</td>
<td>16%</td>
<td>42%</td>
<td>25%</td>
<td>17%</td>
<td>17%</td>
</tr>
</tbody>
</table>

The participants were asked to use their feelings and rate the following statements using the above indicators.

Figure 42: Family Planning Participant Engagement Questionnaires (continued)
The participants were asked to use their feelings and rate the following statements using the above indicators.

<table>
<thead>
<tr>
<th><strong>SA</strong> = Strongly Agree</th>
<th><strong>A</strong> = Agree</th>
<th><strong>D</strong> = Disagree</th>
<th><strong>SD</strong> = Strongly Disagree</th>
<th><strong>N</strong> = No Response</th>
</tr>
</thead>
</table>

The acoustics (sound quality) in the space is appropriate.

<table>
<thead>
<tr>
<th></th>
<th><strong>SA</strong></th>
<th><strong>A</strong></th>
<th><strong>D</strong></th>
<th><strong>SD</strong></th>
<th><strong>N</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>42%</strong></td>
<td></td>
<td></td>
<td>17%</td>
<td>8%</td>
<td></td>
</tr>
</tbody>
</table>

Overall, I felt the information provided at the health center was valuable.

<table>
<thead>
<tr>
<th></th>
<th><strong>SA</strong></th>
<th><strong>A</strong></th>
<th><strong>D</strong></th>
<th><strong>SD</strong></th>
<th><strong>N</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>33%</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>58%</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 42: Family Planning Participant Engagement Questionnaires (continued)

The Family Planning Education space, according to the original plan is designated as a Maternity Waiting and Reception Room. On Thursday, November 29, 2012, it was used for Family Planning and appears this was not built as it was originally shown in plan.

There were many distractions in the space that was not solely dedicated to education. It included the main passage to the maternity and delivery area, the west side of building which included the restrooms and the exit. The medical staff and maintenance people were using the space as an access way to these points during the class presentations. The instructor managed to hold everything together and was able to work through the many distractions as they occurred. She still seemed to make the class appear enjoyable.
### 4.6.5 PEQ of the “D” Immunization Education Space Analysis

<table>
<thead>
<tr>
<th>SA = Strongly Agree</th>
<th>A = Agree</th>
<th>D = Disagree</th>
<th>SD = Strongly Disagree</th>
<th>N = No Response</th>
</tr>
</thead>
</table>

The participants were asked to use their feelings and rate the following statements using the above indicators.

<table>
<thead>
<tr>
<th>Overall, I feel good about learning in these classes.</th>
<th>I care about this facility.</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="image1">Pie chart showing responses</a></td>
<td><a href="image2">Pie chart showing responses</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I feel safe here.</th>
<th>I am treated fairly in this facility.</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="image3">Pie chart showing responses</a></td>
<td><a href="image4">Pie chart showing responses</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I have a voice in the classroom and am encouraged to participate.</th>
<th>The teachers care about us (the participants).</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="image5">Pie chart showing responses</a></td>
<td><a href="image6">Pie chart showing responses</a></td>
</tr>
</tbody>
</table>

Figure 43: Immunization Participant Engagement Questionnaires
The participants were asked to use their feelings and rate the following statements using the above indicators.

<table>
<thead>
<tr>
<th>I feel welcome to return for future classes.</th>
<th>The classroom is well designed.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Chart" /></td>
<td><img src="image2" alt="Chart" /></td>
</tr>
</tbody>
</table>

The classroom was the right size for the class.

<table>
<thead>
<tr>
<th>The classroom was the right size for the class.</th>
<th>The furniture provided is comfortable.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3" alt="Chart" /></td>
<td><img src="image4" alt="Chart" /></td>
</tr>
</tbody>
</table>

The room temperature is comfortable.

<table>
<thead>
<tr>
<th>The room temperature is comfortable.</th>
<th>The room lighting is appropriate.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image5" alt="Chart" /></td>
<td><img src="image6" alt="Chart" /></td>
</tr>
</tbody>
</table>

Figure 43: Immunization Participant Engagement Questionnaires (continued)
The participants were asked to use their feelings and rate the following statements using the above indicators.

<table>
<thead>
<tr>
<th>SA = Strongly Agree</th>
<th>A = Agree</th>
<th>D = Disagree</th>
<th>SD = Strongly Disagree</th>
<th>N = No Response</th>
</tr>
</thead>
</table>

The acoustics (sound quality) in the space is appropriate.

Overall, I felt the information provided at the health center was valuable.

**Figure 43: Immunization Participant Engagement Questionnaires (continued)**

This space, according to the original plan is designated as an Education space.

On Friday, November 30, 2012, it was used for Immunization Education.

In the Immunization area, the presenter would have to stand in the middle of the room in order to be heard and often repeat things to the group in and around him/her in order to be heard. With the right acoustics, this space would be a great place for community activities and events.

**4.6.6 PEQ of the “E” Demonstration Kitchen Education Space Analysis**

This space, according to the original plan is designated as a Demonstration Kitchen and was intended to aid in the teaching of nutrition and the preparation of food. It was not used nor had it been used for some time. The *Titulaire* of the NHC stated someone comes out to Ngeruka twice a month to teach. There were no questionnaires distributed for this space nor participant engagement that took place since it was unoccupied. There were questions and responses regarding this space that came up in the POE questionnaires answered by staff that appeared in an earlier part of this Chapter, section 4.6.6.
4.7 PEQ All Classrooms Combined

The participants were asked to use their feelings and rate the following statements using the above indicators.

<table>
<thead>
<tr>
<th>Overall, I feel good about learning in these classes.</th>
<th>I care about this facility.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Participant Engagement Questionnaires</td>
<td></td>
</tr>
</tbody>
</table>

- **Overall, I feel good about learning in these classes.**
  - 22% Strongly Agree (SA)
  - 31% Agree (A)
  - 47% Disagree (D)
  - 3% Strongly Disagree (SD)
  - 9% No Response (N)

- **I care about this facility.**
  - 28% Strongly Agree (SA)
  - 37% Agree (A)
  - 35% Disagree (D)
  - 3% Strongly Disagree (SD)
  - 3% No Response (N)

- **I feel safe here.**
  - 26% Strongly Agree (SA)
  - 1% Agree (A)
  - 46% Disagree (D)
  - 27% Strongly Disagree (SD)
  - 3% No Response (N)

- **I am treated fairly in this facility.**
  - 28% Strongly Agree (SA)
  - 6% Agree (A)
  - 36% Disagree (D)
  - 2% Strongly Disagree (SD)
  - 3% No Response (N)

- **I have a voice in the classroom and am encouraged to participate.**
  - 22% Strongly Agree (SA)
  - 37% Agree (A)
  - 41% Disagree (D)
  - 3% Strongly Disagree (SD)
  - 7% No Response (N)

- **The teachers care about us (the participants).**
  - 26% Strongly Agree (SA)
  - 1% Agree (A)
  - 37% Disagree (D)
  - 3% Strongly Disagree (SD)
  - 36% No Response (N)

Figure 44: Overall Participant Engagement Questionnaires
The participants were asked to use their feelings and rate the following statements using the above indicators.

<table>
<thead>
<tr>
<th>I feel welcome to return for future classes.</th>
<th>The classroom is well designed.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="chart1.png" alt="Pie chart" /></td>
<td><img src="chart2.png" alt="Pie chart" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The classroom was the right size for the class.</th>
<th>The furniture provided is comfortable.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="chart3.png" alt="Pie chart" /></td>
<td><img src="chart4.png" alt="Pie chart" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The room temperature is comfortable.</th>
<th>The room lighting is appropriate.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="chart5.png" alt="Pie chart" /></td>
<td><img src="chart6.png" alt="Pie chart" /></td>
</tr>
</tbody>
</table>

Figure 44: Overall Participant Engagement Questionnaires (continued)
The participants were asked to use their feelings and rate the following statements using the above indicators.

<table>
<thead>
<tr>
<th>The acoustics (sound quality) in the space is appropriate.</th>
<th>Overall, I felt the information provided at the health center was valuable.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA = Strongly Agree</td>
<td>A = Agree</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SA</th>
<th>A</th>
<th>D</th>
<th>SD</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>21%</td>
<td>44%</td>
<td>3%</td>
<td>12%</td>
<td>22%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SA</th>
<th>A</th>
<th>D</th>
<th>SD</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>23%</td>
<td>45%</td>
<td>1%</td>
<td>31%</td>
<td>44%</td>
</tr>
</tbody>
</table>

Figure 44: Overall Participant Engagement Questionnaires (continued)

The NHC education program attendees that accepted and completed these questionnaires were informed participation was voluntary and they could withdraw from participation at any time. The information was to be anonymous and that no identifiable information was to be provided. A cover and information letter (Appendix O) was provided and read to them at the time of their participation.

As part of the questionnaire, the participants were asked to list three things they liked and three things they disliked about the NHC facility. The top answers are listed and ranked by order of how often the same response came up on the questionnaire by each participant and the tallies are registered on Table 26. Some participants would phrase things similarly but not identically and information would be synthesized to determine a clearer meaning. An example would be; 5 responses for noisy, 2 responses for confusion, 2 responses for crying, and 1 response for many distractions was synthesized into 10 responses for Noisy/Many Distractions as shown in the dislike column in Table 26. Some of these answers may change in future research depending on time of year specifically responses toward cold and air circulation/ventilation.
Table 26: Participant, Three Likes and Dislikes about the NHC

One final attempt for further input was asked in the form of an open question to see if there was anything more the participants wanted to say about the education space that they were not able to address in any of the other question areas. Nothing new was added to the education space information but one reoccurring message was the desire to have the health center become more like a hospital. That message had appeared in a few places in these questionnaires so as part of this evaluation the message was received and conveyed as a subject of considered importance.

Overall ninety-seven percent of the respondents said they would recommend these classes to their family and friends. Seventy-six percent gave the program an excellent approval rating. Twenty-three percent gave it a good approval rating and only two percent listed it as fair. Ninety-seven percent of the participants definitely will return for future classes.

4.8 Staff and Administrators Questionnaires

The staff input and participation is just as valuable as are the participants. They have a deeper knowledge of the inner workings of the facility and can provide more insight into things that perhaps the participants, patients, and visitors may not be as aware. Their questionnaire is similar but geared more toward staff. The similar questions will be used to compare the staff’s impressions of the facility versus the participant’s
impressions on the same subject matter. The original format of the questionnaire can be found in Appendix “R”.

4.8.1 Staff/Administrators Demographics

AGE AND EDUCATION

Thirteen staff members participated in this questionnaire. They ranged in ages twenty-three to thirty-seven. According to the Titulaire, all nurses at the facility are Level A2 Nurses meaning they have only a secondary level of education. This is the minimum level of education that was allowed for nursing and according to the Rwandan MOH is being phased out. The next higher level is the A1, which no one indicated they had attained. The highest level but not a PhD, is an A0 (A-zero), which is a Bachelor’s Degree level, and three respondents did indicate they had achieved this level. During the course of the research, some of the staff did report that the positions at the health center only called for an A2 level and this could be why the Titulaire stated everyone was an A2.

Figures 45 and 46 represent the staffs ages and education levels. Two of the respondents indicated that they were in education programs at the time they completed the questionnaires.

Figure 45: Staff Ages  
Figure 46: Staff Education Levels
Nine of the respondents noted on the questionnaire that they were nurses. Three mentioned specific nursing functions, which will not be mentioned to maintain anonymity. The remainder of the respondents noted other assorted duties within the center.

GENDER

Five of the thirteen persons answering the question on gender were male and seven were female. Six of the respondents had been with the health center for two years or before it was built and the remaining six respondents’ length of stay varied from two months to one year.

TIME AND DISTANCE TRAVELED

The same walking and time calculations for the participants were used on the staff for Figure 47. The staff was not asked how they traveled to and from the health center but they were asked how far they lived from the center. Nine of the staff stated they lived in the Ruhuha Sector, which can be seen within the twelve-mile radius on the Bugesera District Map (Figure 39). The furthest distance traveled was reported by one to be a little over four miles (4.3 miles) and if that person were walking based on Figure 47 it would take approximately one hour and five minutes to arrive at work based on the fifteen-minute mile. There were no cars parked at the health center nor is there even a parking lot so if anyone arrived by car they were dropped-off, or arrived by taxi (car, moto, or bicycle). There are some forms of public transportation such as vans that travel across the country but it is unknown if any travel in the region that would make pick-ups for employees.
Figure 47: Time & Walking Distance for Staff
4.8.2 Staff/Administrators Questionnaires

<table>
<thead>
<tr>
<th></th>
<th>SA = Strongly Agree</th>
<th>A = Agree</th>
<th>D = Disagree</th>
<th>SD = Strongly Disagree</th>
<th>N = No Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall, I feel good about the classes offered.</td>
<td>15%</td>
<td>15%</td>
<td>69%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I care about this facility.</td>
<td>15%</td>
<td>23%</td>
<td>62%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I feel safe here.</td>
<td>8%</td>
<td>23%</td>
<td>54%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am treated fairly in this facility.</td>
<td>15%</td>
<td>31%</td>
<td>54%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am encouraged to provide suggestions to improve this facility whenever poss.</td>
<td>15%</td>
<td>46%</td>
<td>31%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I care about the education of the communities we serve.</td>
<td>15%</td>
<td>46%</td>
<td>38%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The participants were asked to use their feelings and rate the following statements using the above indicators.

Figure 48: Staff/Administrators Questionnaire
The participants were asked to use their feelings and rate the following statements using the above indicators.

<table>
<thead>
<tr>
<th>The facilities education space provides a welcoming environment.</th>
<th>The classroom is well designed.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Pie chart" /></td>
<td><img src="image" alt="Pie chart" /></td>
</tr>
<tr>
<td>The classroom was the right size for the class.</td>
<td>The furniture provided is comfortable.</td>
</tr>
<tr>
<td><img src="image" alt="Pie chart" /></td>
<td><img src="image" alt="Pie chart" /></td>
</tr>
<tr>
<td>The room temperature is comfortable.</td>
<td>The room lighting is appropriate.</td>
</tr>
<tr>
<td><img src="image" alt="Pie chart" /></td>
<td><img src="image" alt="Pie chart" /></td>
</tr>
</tbody>
</table>

Figure 48: Staff/Administrators Questionnaire (continued)
The participants were asked to use their feelings and rate the following statements using the above indicators.

<table>
<thead>
<tr>
<th>Staff/Administrators Questionnaire (continued)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The acoustics (sound quality) in the space is appropriate.</strong></td>
</tr>
<tr>
<td><strong>Overall, I felt the information provided at the health center is valuable.</strong></td>
</tr>
</tbody>
</table>

![Graphs showing percentage of responses for each indicator.]

Eleven of twelve respondents stated that they are involved in the actual teaching at the NHC. Hygiene, disease prevention, and family planning were the classes that many of the staff seemed to share. Classes on vaccinations, post-partum health, insurance, malaria, anti-natal, and post-natal care were topics that appeared to be taught by specific individuals. Ten of the respondent staff members teach between one and five times a week. One of the respondents even noted that some of the staff starts teaching before they are scheduled to begin working in the morning.

Other classes taught at the NHC include nutrition, infant delivery, HIV/AIDS education, and malaria prevention. Some classes that the staff mentioned they would like to see at the NHC included marriage education, prayer, and athletics.

Seven of the staff respondents stated that no one at the NHC pays for classes and none of them responded that anyone is responsible for payment. When the staff was asked if they would recommend the classes to a friend or family member eleven of them indicated yes. The staff (eleven respondents) gave their teaching experience at the NHC an overall rating of excellent.
The staff was also asked to list three things they liked and three things they disliked about the NHC facility. The top answers are listed and ranked by order of popularity in their responses shown in Table 27.

<table>
<thead>
<tr>
<th>LIKES</th>
<th>Responses</th>
<th>DISLIKES</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room Size</td>
<td>8</td>
<td>None</td>
<td>3</td>
</tr>
<tr>
<td>Lighting</td>
<td>3</td>
<td>Distractions</td>
<td>2</td>
</tr>
<tr>
<td>Ceiling</td>
<td>2</td>
<td>Electricity</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 27: Staff, Three Likes and Dislikes about the NHC

In trying to assess the building performance from the staff perspective, the questionnaire asked the respondents to relate all of their answers toward the education spaces of the NHC and to disregard the rest of the facility just for this research. The questions were asking for responses regarding the successes and failures (if any) insofar as they affect occupant health, safety, efficient functioning, learning, and psychological wellbeing. They were advised their answers could help to improve the existing building and even designs of the future. A floor plan of the facility was attached for reference to the questionnaire along with several broad statements attempting to glean whether the NHC was meeting the needs of the Ngeruka community. Statements regarding the facility meeting needs of occupants and the responses to those questions are indicated in Table 20. More in-depth responses were desired and an opportunity to interview the staff on some of their comments would have been more helpful. The “excellence” option was not offered on the questionnaire some of the respondents voluntarily added the notation without any prompting. The time delay due to written translations and the late completion of the questionnaires made the interview process impossible for this study.

The staff also indicated areas that were currently lacking in the facility including a nutrition center and a kitchen, aside from the existing Demonstration Kitchen located
outside the main building. The latrines were noted to be inefficient and not working and the electricity was ineffective.

<table>
<thead>
<tr>
<th>Statements Regarding Facility Meeting Needs of Occupants</th>
<th>Excell</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Adequacy (meeting the needs) of Overall Design Concept as used for the purposes of education.</td>
<td>1</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>2. Adequacy (meeting the needs) of Site Design as it interacts with the education spaces (Exterior campus).</td>
<td>2</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>3. Adequacy (meeting the needs) of Health/Safety Provisions.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Adequacy (meeting the needs) of Security Provisions.</td>
<td>11</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>5. Attractiveness of Exterior Appearance of buildings.</td>
<td>2</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>6. Attractiveness of Interior Appearance.</td>
<td></td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>7. Adequacy (meeting the needs) of Activity Spaces (spaces for demonstrations, cooking, crafts, etc.).</td>
<td>9</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>8. Adequacy (meeting the needs) of Spatial Relationships (are the spaces where they need to be to function properly).</td>
<td>1</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>9. Adequacy (meeting the needs) of Circulation Area, e.g., lobby, hallways, stairs, etc. (ease of getting around).</td>
<td>1</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>10. Adequacy (meeting the needs) of Heating/Cooling (climate controls) and Ventilation.</td>
<td>5</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>11. Adequacy (meeting the needs) of Lighting and Acoustics (sound quality).</td>
<td>1</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>12. Adequacy (meeting the needs) of Plumbing/Electrical (sinks, toilets, electric requirements).</td>
<td>5</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>13. Adequacy (meeting the needs) of Surface Materials, e.g., floors, walls, ceilings, etc. (finishes; carpet, paint, fabric).</td>
<td>10</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>14. Are there Underutilized or Overcrowded Spaces?</td>
<td>6</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>

Staff Comments: 1. Not enough space. 2. Heating/ventilation not good. 3. Very poor, no maintenance. 4. Plumbing/electrical poorly constructed. 5. Surface material not well made. 6. Overcrowded, over utilized.

Table 28: Adequacy Statements Regarding Facility Meeting Needs of Occupants

4.9 Semi-Structured Interviews

The use of interviews allow for more comprehensive understanding and firsthand knowledge of a subject that the interviewee may be best apt to know. It allows the interviewer the opportunity to delve into responses that may not have pinpointed the answers that were initially intended or to find deeper meaning. Interviews also may
bring up subjects that may not have been considered but have important consequence to the research. Sometimes asking open-ended questions can spark intriguing answers that were not considered but add valuable data had the spark not been ignited. Semi-structured interviews provide the interviewer a structure as the name implies that takes advantage of a script “but will shift in order to follow the natural flow of a conversation” (O’Leary, 2010, p. 195). An interviewer must first use “observational research methods” to investigate the subject of the interview to form an outline before any questions should be asked (Zeisel, 2006, p. 228). After the interview has begun, the interviewer is continually adjusting the outline so that it moves in the direction of the conversation.

Four semi-structured interviews took place in the course of this project. All of them had a personal interest in the success of the Ngeruka Health Center (NHC). None of the interviewees had any architectural background or insight into the planning stages of physical building itself or knew of anyone who did that was still living. They were all sent preliminary questions before the interview and were unable to answer the questions prior to the interview. The first two interviewees noted were the Program Manager and Executive Director of Rwanda Works (RW). RW is the NGO that was responsible for helping to organize and make possible the NHC. Another interviewee is the District Health Advisor for the Access Project which is another NGO founded by the Executive Director of RW and then there is the Titulaire for the health center itself, he is the person in charge of the health center as mentioned in an earlier Chapter and under acknowledgements.

PROGRAM MANAGER

The first semi-structured interview was made with the Program Manager (PM) over the internet through a series of emails and a live internet chat back and forth from the US to Rwanda. Several questions were composed and sent to the PM about the
facility, its architecture, and the education component requesting some fact-finding data. In order to make the research trip successful it was important to learn as much about the health center as possible for planning and strategizing before making the trip to Rwanda. The information obtained from these conversations was used to help create the POEs and Questionnaires for the participants and staff.

The questions sent to the PM started out structured in the beginning but as a contact, she could more direct the questions toward other persons that were “in-country” that she felt could better address them. The baseline data on the architecture of the facility came in the form of a PDF drawing (Figure 7) of the building and the name of the architect whom it was learned later, had passed away. The PDF was very informative but was very limited in that it was all that was available in regard to the architecture. There was no further supporting documentation or persons made known to the researcher that had any history on the facility. The road to asking more questions regarding the design intent seemed closed.

The information the PM was able to provide about the education space at the NHC included the following:

The education spaces are generally used for trainings around family planning, nutrition, HIV prevention, PMTCT (prevention of mother to child transmission of HIV), etc. The leaders of the workshops are generally health center staff, though sometimes they are, Community Health Workers (CHWs), of which there are a huge number in Rwanda. Those that attend the training or utilize the space are patients from the catchment area — each health center serves approximately 25,000 people — and an estimated breakdown of the numbers of folks who attended (per Rwanda Works, 2011) the weekly workshops are as follows:
Anti-natal  50
Immunization  45
HIV  100
Nutrition  35
Family Planning  45
Total  275

This information appears to confirm what was encountered on the actual visit in November of 2012 although some of these classes were not encountered the ones that were had similar numbers.

**TITULAIRE**

The PM made the introductions to the *Titulaire* of the NHC by way of an email and forwarded contact information. Several informal meetings were conducted and valuable information was obtained. Some of the site-specific statistics shown throughout the thesis were obtained from the *Titulaire*

The NHC is responsible for training the Community Health Workers (CHW) whom is used not only in the health center for education but also in the villages as well. The CHW’s are the frontline of healthcare in the rural areas working out of Health Posts, their homes and sometimes in the field. The NHC has the responsibility for one of the largest populated areas in Rwanda and consists of over 27,000 people. The Health Posts fall under the jurisdiction of the NHC they are rated as a level of care just under a health center but patients must be referred to the health center before going to a hospital.

The health center teaches a myriad of topics to include; child health, malnutrition, anti-natal care, hygiene, hygiene-toilet, -food, -home, -clothes, preventable diseases involving worms, malaria, HIV, TB, pneumonia, immunizations, first aid, sexually transmitted diseases, sanitation, health insurance, and family planning were just the ones that were being taught at the time. The health center also is responsible for going to schools and teaching reproductive health to the children.
The data that represents the preventable diseases treated at the NHC in 2012 was provided by the Titulaire and is represented in a chart (Figure 5) located earlier in this Chapter. The Titulaire was asked what he thought the mission statement for the health center was, he simply said, Prevent, Cure, Promotion. Interpretation...The built environment of the health center is a healing space that prevents harm, cures patients, and promotes health.

DISTRICT HEALTH ADVISOR

Another arrangement made by the PM was an introduction to the District Health Advisor (DHA) through an internet connection as well. The DHA has more background knowledge of the history of the building and of the four similar buildings that have much the same building footprints.

The DHA was asked, regarding the original building program, is the space being used as it was originally designed? He said, “It was the policy of Rwanda for it to be so.” There apparently is a strict rule on changing programs or originally designed space to something different from what was approved. When asked if the current plans that were provided by Rwanda Works are the same ones that were built he said they were but did not know why some of the areas did not match the plans. He stated that there was one project built off the set of plans that was provided by the PM and four similar projects using the same set of plans. The difference, he said, “was the hospitalization building” that added a twenty patient bed unit in the rear of the Ngeruka Site Plan (Figure 7). Not all of the Sites have this feature and it was a requirement at one point by the MOH to include an overnight facility at the health center. The one at the Ngeruka Site was underutilized and had no patients at the time the research was being conducted.

Many of the comments the DHA had were considered important on why the health center was needed and came about but did not relate to the education space, such
as; adding separation for the maternity unit, separating adults from pediatrics, providing for disease separation all of which were very important but not relevant for this study. His remarks on the need to make the place more comfortable and finding ways to make it sustainable are applicable toward the education space. The DHA like, everyone at the health center want only the best for the people and the community and speak about it in their highest regard.

The DHA was asked if he could provide a mission statement for the health center and he stated, to “Help manage the health system.” This was the DHAs personal mission statement. When he was asked again what the mission statement was for the NHC he said, “To cure them is not enough, you need to educate them.” This is exactly what they are setting out to do.

EXECUTIVE DIRECTOR

A brief meeting with the Executive Director (ED) provided a few insights into the design concepts that went into the original thought process of the health centers. The design objective was more “utilitarian” with practicality in mind over aesthetics not that the building is unattractive but usefulness was the main thought process. The ED wanted to provide separate services within the facility and he wanted to make the place impressive, to “make it something better than what they have ever seen.” The ED did have some reservations about the design of the waiting room with the twenty-foot tall walls with clerestory windows at the top and thinks he would do it differently next time.

The place was to be of high quality at a low expense. It was to be sustainable and self-supporting. The ED was going to provide the management education to teach it sustainability. The health center was to be used as real community space and it was supposed to have a library, although the space shown in plan as the library is currently being used as an office.
The failing electrical concerns were to be addressed based on a solar emphasis. The building was equipped with solar panels on the roof. This is something that was being sorted out at the time. The ED also stated the facility was lacking hand washing upon access into the building, drinking water and a child’s play area. He did say a water system was being worked on during the time of the research and may be functional soon. Water could resolve several issues that were raised later in this POE.

Some of the spaces were noticeably too small for the classes that took place within and the occupants were overflowing in those spaces so the ED was asked about expanding. The ED believes that the people are slowly moving from the rural areas into the city and there was no need to expand.

MISSION STATEMENT

In Researching Rwanda Works, the catalyst for organizing the NHC, on their Website (www.rwandaworks.com) something akin to a mission statement was found. ‘Rwanda Works (RW) transforms health centers into efficiently run, economically viable public health facilities that provide quality healthcare to Rwandan families. Rwanda Works’ core belief is that public health needs can be met with dignity in lasting, sustainable ways.” Education plays a role in the health centers role in achieving sustainability. RW teaches not only the employees on running a viable health center but how a community can care for itself without having to be reliant on outside assistance.

4.10 Observational Research

The Modified a(x4) Data Collection Tool, Sketch Box for each education space is shown in Figures 49, 51, 53, and 55. Some of the notes of the researcher are shown to the left of the sketches. Accompanying each completed sketch box are the sketches drawn during the observation process as part of the researchers cover in the classroom. They
were simple drawings that conveyed part of the atmosphere that was felt in each room at
the time of the observation. They are located in Figures 50, 52, 54, and 56.

Figure 50: Anti-natal Sketch

In this sketch, the researcher felt like the room was packed as a sardine can. Everyone was
shoulder to shoulder and there was very little room.

There was much activity with people coming and going constantly.

Figure 49: Modified a(x4) Data Collection Tool, Anti-natal Sketch Box

Figure 50: Anti-natal Sketch
In this room, it was like Grand Central Station. The din was so loud it was hard to hear any one sound.

The lighting was dim, activity everywhere. A motorcycle was revving up outside, a man was walking a bicycle through the middle of the space, some people were waiting for medical prescriptions... all while the class was taking place.
In this room, it was kind of like a nightclub, the room was almost dark and the teacher seemed quite captivating.

She seemed to be telling amusing jokes or stories and the attendees had her undivided attention. They were engaged and participated in the program.

The space was crowded and there were many interruptions but the teacher just ran with it holding everything together.
Each education space at the health center had an atmosphere all its own. In Antenatal, it was a “sardine can” because everyone was packed in the room very tightly. In the
Hygiene space it was a “train station” people were coming and going and the sounds were so loud it was just drowning everything out, the motorcycle outside, the bicycle being walked through the middle of the room... it was Grand Central Station. Family Planning’s was a “night club” there was dim lighting and the instructor was very engaging and seemed to be telling jokes as she presented her topic of education. Immunization was a “nursery” there were babies everywhere some were nursing some were crying some were sleeping some were just being cute.
Chapter Five

DISCUSSION AND CONCLUSIONS

5.1 Introduction

This chapter discusses the limitations of this project as well as obstacles that arose during the course of this research. The deliverable typically on a POE is a complete report (see Appendix “CC” Post Occupancy Evaluation Report), organized and turned over to the Owner. Future research, design considerations and directions on where to go from here are briefly discussed here as well. At the end of this chapter, Section 5.8, is a guide for anyone wanting to go to Rwanda, conduct research as it was quite a task for this researcher, and these insights might help future researchers. Research question number one was rephrased to clarify the meaning for the readers of this study. The meaning has not changed for the researcher and has not changed the research or the scope. The original question as written was confusing and was rewritten for better understanding. The original question is listed below:

1. Does the built environment of the NHC contribute to healing by engaging participants to learn health prevention and health promotion?

5.2 Post Occupancy Evaluation Report

A Post Occupancy Evaluation Report (located in Appendix “CC”) is the culmination of the research that incorporates the events that took place before, during, and after the evaluation process. It is the instrument that feeds forward the accumulated data into the design world for future designers to review and use as deemed necessary for future projects. The owners of the facility evaluated can use the report to improve the existing facility or continue the existing design practices in future facilities that were found to be beneficial in its original design.
This report will include an analysis of the findings relating to the physical elements of the built environment consisting of the education spaces at the NHC and how they compare to the codes and standards as defined and compared to similar spaces. Participant and staff satisfaction analysis through the use of questionnaires that were analyzed and reported in Chapter Four will also be located in this report but in a more abridged form.

5.3 Limitations of the Study

There were language barriers conducting research in a foreign country. Although English is becoming more common and slowly being established as, the official language of Rwanda, the uneducated and under-educated participants had difficulty. This researcher’s own handicap of not speaking their language prevented her from hearing any dialogue from the translator. It was after each research day that the translator and researcher would review the day’s events and work on improving them for the following day. The translator had interjected some of his thoughts and ideas into the research questions by making examples and offering suggestions of possible answers. Formal training would have been advantageous for the translator or another researcher that spoke the language to aid in the communication. The native language, Kinyarwanda did not have words that translated completely from English or French.

Budgetary constraints were another hurdle to overcome. The cost of travel to and from the country, food and lodging, rental car and driver, the translator and reproduction and supply costs were enormous for one student researcher to pay. Paying for permits and meeting with government officials added to that burden.

A pilot instrument was desired but due to logistics in country, translators, and timeframes with obtaining permits, it was not possible. It would have been highly beneficial to work out the language barriers.
Communication with Rwanda Works to formulate baseline questions by submitting sample questions for review prior to arrival were not addressed. Compounding this, the architect that designed the building was deceased and first hand, design knowledge along with the original design intent was not available.

The NGO that was responsible for the health center being built had a very short time schedule and many questions were left unanswered. The advanced copy of the questions sent prior to arrival had not been answered as well.

The rural location of the health facility and no lodging nearby meant a two-hour commute (one-way) everyday over substandard roads to conduct the research.

Participant engagement is difficult to measure. There is no quantitative measure that could be used for this purpose unless some testing of the subject material was given to see if the participants were learning anything. Body language and interactions with the teacher were used along with the questionnaire to obtain the best possible information in this setting.

The data collection regarding the temperature, humidity and lighting should be done several times a year to get averages that are more accurate over time with a broader range of temperature fluctuations.

Governmental influence is also a factor on what they feel is required to be in the research. Delays in getting permits can happen. When working in healthcare regardless of your topic you are required to make a presentation before the government agency that is in charge of healthcare. The government also requires you name a citizen of Rwanda as a Co-Investigator.

Conducting research in Rwanda as a western white person is also a challenge. Many local citizens look upon white people as a source of money. Rwanda has had so many NGO’s visiting their country offering financial assistance that money is almost
expected. Another thing to consider when doing observations is the ability to appear anonymous and not cause any distractions within the environment that is being studied.

5.4 The Research Problem and Implications

Eliminating or at least limiting the reported cases of preventable diseases and health problems could reduce burdens on healthcare systems and overburdened staff, and extend lives of the community by living healthier lifestyles.

Life can be very simple in rural Rwanda, existing without electricity or running water, growing your own food to survive, knowing they are just a short distance from the capital city, Kigali, where they can enjoy many of the same amenities that are offered almost anywhere else in the world if they can afford it. Driving, in rural Rwanda, on washed out dirt roads leading to Ngeruka, in an SUV, the driver taking caution not to damage his vehicle weaving back and forth on the road avoiding the ruts caused by erosion and coming very close to the drainage ditches along the way can be quite an experience. A passenger could easily get whiplash being knocked about inside the vehicle. The drive would normally take about 40 minutes under normal driving conditions but these roads are unpaved and in disrepair; the drive took over two hours. The houses observed along the road, some of them quite close together for a rural area, are made of dirt or homemade cement blocks and the children from the houses were playing in the yards and along the roadside looking happy as we passed. The children seem to have a hard life some of them would be walking along the road carrying large bundles of twigs or provisions, some of them carrying water or herding goats. A few were carrying their little brothers or sisters tied in decorative fabrics on their backs but the ones just sitting or squatting along the side of the road watching and waiting. This road was their entertainment. This was their giant television and they interacted with their neighbors as soon as they saw something interesting coming their way they would jump
up and start yelling toward the neighbors to let them know what was coming. If it was a Muzungu (a white person) which is someone they do not see very often passing they get excited. The children start running alongside the car. Some of them were holding their hands out hoping for money because in their minds Muzungus are known for having money. The children running and smiling yelling Muzungu, Muzungu... the cars travel so slowly due to the poor conditions of the road the children can easily keep up for short distances. Providing healthcare to areas so remote is the difference between life and death. Providing health educations that can keep them at home, more because many who live in rural areas are sustenance farmers, have little money and no means of transportation.

A POE report is the culmination of the research that incorporates the events that took place before, during, and after the evaluation process. It is the instrument that feeds forward the accumulated data into the design world for future designers to review and use as necessary for future projects. The owners of the facility evaluate the report to improve the existing facility or continue the existing design practices in future facilities that were found to be beneficial in its original design.

5.5 Future Research

Future research should continue establishing a link between the built environment and how it contributes to healing through engagement of participants in health education programs. POE’s should feedforward its results to the stakeholders of this project and future projects around the world. POE’s help new building stakeholders incorporate desirable elements of the built environment that work in previous projects into new facilities and with the right information eliminate the unwanted elements that proved undesirable or failed to perform as originally thought.
The design of the healthcare facility and its inclusion of culturally appropriate composition is another area to research. Would there be a different impact if the local flavor or vernacular were added to the architectural design? Bringing in community members and seeking their advice should be paramount. The researcher was unable to determine if this step was taken in the planning stage of this facility. More acceptance of the facility may be accomplished if there was acceptance and buy-in from the community during the design stage and throughout the construction.

This Ngeruka Health Center environment in this community offered many new concepts to the residents. The western design is one of them. A long-term study on the community and how the center has affected them may be another area of study worth researching. The remoteness of the population could mean that the new environment is overwhelming. Do all the residents visit the new health center? These questions should be asked and answered in another research study.

How does this health center affect the feelings of the natural healers that are a part of the Rwandan culture? Is there animosity toward the health center? Was there an attempt to include the local healers in the operations of the facility? These questions were outside the scope of this study but are worth further investigation.

This facility was greatly needed by the community it serves. Just being built in this location added to the health of the entire community. The healthcare statistics in Figures 4 and 5 prove it. Including healthcare education into the program was also of high importance. There seems to be ways to improve the facility that was not brought out in the research looking at it through a westerner’s eyes. The space, although much larger than what they were used to was dark and impersonal. The furniture was uncomfortable and uninviting except maybe to the weary traveler that had to walk many miles to get there. Research into creating local architecture for what are needed using local materials.
would be another area to consider that might improve some of the perceived shortcomings that were noted in this research.

Further research into how health centers become wellness centers instead of places to treat the sick, that encourages education facilities to promote health and prevents opportunistic diseases from ever occurring or at least make them an exception and not the norm.

Rwanda is not the only country that can benefit from this research. Every healthcare facility throughout the world has a duty to offer optimum healthcare to their patients and visitors. Designing the education spaces with the community in mind and their input could only improve the space. Using the spaces for other community related services when not engaged in education could help create a deeper connection with the community. The individual needs of communities may change but the overall need for proper healthcare and services do not. As Rwanda starts, meeting its basic needs as outlined in the Millennium Development Goals by the United Nations and Maslow’s Hierarchy of needs, requires more advanced solutions will be sought.

5.6 Future Design Considerations

Designing the education spaces to be more flexible with education in mind for multi-purpose spaces for both staff and the community (patients and visitors) could be beneficial. Extending these methods used here to other healthcare education providers across the globe would enhance other facilities. Some future design considerations for the NHC are listed below.

INFORMATION AND COMPUTER TECHNOLOGY (ICT)

Investing in information and computer technology (ICT) in adaptable classroom designs (Fisher, 2005b, p. 161) (OECD, 2006, pp. 19-20) where students and staff can learn on their own or in-group environments is necessary to keep pace with the world
around them. It will aid in staff retention and keep the participants on top of the health related knowledge programs they need to learn. Having at least one of the rooms, set up for ICT function could also provide community space for meetings, education space for staff to keep up with their training and new medical procedures (OECD, 2006, p. 22) and even provide entertainment on off hours to aid in job satisfaction.

RAINWATER HARVESTING

Rainwater Harvesting (RWH) might be an option during the two rainy seasons. The water can be harvested for flushing toilets, washing clothes, watering gardens, and filtered to be used as drinking water. This can be accomplished with gutters, screens, downspouts and a cistern.

WAITING/RECEPTION ROOM UPGRADE

During the semi-structured interviews with the Executive Director of Rwanda Works, one of the comments mentioned was in regard to the Waiting Room/Reception area, which is also used as one of the education spaces for Hygiene. The Executive Director mentioned he wished he would have done it differently than how it was constructed at Ngeruka but did not elaborate other than it was wasted space. One of the main observations made in the space was the lack of windows and a cavernous atmosphere with undesirable acoustics.

Adding a Mezzanine floor above the first floor may add some square footage and allow for additional waiting areas, education space, a children’s play space or even additional office space for the staff. A place for children to play without distracting other patients and visitors whether it is located on the Mezzanine or another location at the center would be beneficial for all. The space would not have an elevator so whatever might be desirable it must be utilized by ambulatory persons not requiring assistance or
a wheel chair. The following pictures and sketches are conceptual ideas for future renovations.

Figure 57 is the revised first floorplan with a proposed stair leading up to the Mezzanine level. The Mezzanine floor (Figure 58) is shown with an opening that overlooks the floor below. This also aids in air circulation by leaving it open. A cross section is shown in Figure 59 to show there is ample room for a Mezzanine and the cavernous space becomes more inviting with the addition of the second level. This becomes more apparent in the photo’s that follow.

Figure 57: Hygiene Education and Waiting Room First Floor
Photo Renderings were made of both levels here is a vision of what these spaces could look like. Additional lighting was added to account for the new floor. The Mezzanine Level shows a children’s activity space to help visualize.
Photo 25: Rendering of First Floor Hygiene/Waiting, facing east

Photo 26: Rendering of First Floor Hygiene/Waiting, facing west
Photo 27: Rendering of Mezzanine, NW corner

Photo 28: Rendering of Mezzanine, SE Corner
5.7 Lessons Learned

The experience of working in Rwanda, learning its history and meeting some of its people has forever changed this researcher’s perspectives. These people have been through so much and have had to rebuild their country from its ashes. They are a proud and confident people. The ones I had the privilege to meet and interact with were always offering their help and assistance. Many of them have so little yet still offer whatever they can. This country is so used to foreigners, mostly in the form of NGOs coming in and trying to offer their help and solutions to solve the problems from an outside vantage point. Rwandans know what they need and are working very hard to achieve it. They are in a position to know what their needs are from a firsthand experience and now when NGOs come, the government of Rwanda tells them where assistance is needed. When conducting research the government determines if they will allow the research to be conducted. One of the first things they check for is if the research has anything to do with ethnicities. Ethnicity research is banned because no one in Rwanda is allowed to bring up the ethnicities that brought about the genocide in 1994. Every citizen of Rwanda is just that, a Rwandan, beyond that is a closed subject. Another delicate topic of research is anything to do with healthcare, which is discussed in detail at the end of this chapter. The lesson learned here is to conduct an exhaustive research on the requirements of the country you want to conduct research in before you leave the country. For Rwanda, about a three month lead time for research and submitting documentation is appropriate.

This research probably would have gone smoother had a translator been more thoroughly trained on how not to interject his own words into the research. Another translator had been more thoroughly trained but had other commitments when permission to conduct the research at the facility was finally granted.
The ability to conduct a pilot study to make sure the questionnaires were better understood would have been advantageous. Time allotment and permits would have to be arranged beforehand. If two trips to Rwanda were not possible, a contact at the facility would also have to assist in handing out the instruments to the participants and more training would be required. Time would also have to be allotted for translating the questions and then translating the responses. After respondents completed the questionnaires, a one-on-one interview with a few of the participants could help to better understand and improve the questionnaires and derive more thick, rich meanings in the end.

Conducting individual interviews after the questionnaires had been reviewed with participants to “enable a deep and rich view into the behaviors, reasoning, and lives” of the education, participants (Toolkit, H.C.D., 2008, p. 28) would have been extremely valuable. Using the participant’s responses to the questionnaire could be a valuable tool to base the interview on. Finding a neutral location where the participant would feel more at ease is important. It would be advantageous if the participant and interviewer spoke the same language but in the case of Ngeruka where the local people did not speak English this was not possible. Working with a translator would be an obstacle that would have to be worked out.

This research consisted of conducting a POE and one of the first things a researcher looks for is the design intent of the facility. This information helps to guide the research to see if it was met and what were the successes and failures of the design. In this research, the design intent was not known and the information obtained here can be used for baseline data and to inform other research but the design intent can only be presumed.
A lesson in ethical thought came up when pondering the idea that because this facility was in Rwanda it was OK to be substandard and not up to the same standards found in many parts of the US. “Soft bigotry” as mentioned by Josh Ruxin (Ruxin, 2013, p. 122) can creep into research if left unchecked. The same standards should be expected across the globe, the difference is if changes can be provided in such remote locations. Efforts should be made to provide the same standards of care, universally. The health and welfare of the people is the first priority. A POE conducted to establish an aesthetic need is not as important but to establish that the built environment is providing healing space is.

Flexibility of the space was found to be a tremendous aid with the ability to relocate seating whenever needed. Converting other spaces in the facility into education spaces instead of their originally designed function did bring comments from staff on whether those changes were appropriate. This is the case of the Maternity Waiting Room and Reception Room that was never realized and is now used as a meeting place for classes and for staff.

Some of the spaces were cramped and tight. One of the spaces was not appropriate during bad weather situations perhaps putting up a temporary enclosure along the nonexistent outside walls might help. Malaria is a major concern in the country, using insect screens on the doors, windows and other openings should be considered as well.

Using the teaching space for other community based teaching and staff related teaching opportunities could be a valuable tool. Provide computers with internet capabilities to allow staff the ability to learn about new trends in their profession and online education programs that may be available from the universities. Invite the
community to share the computer access and library that was originally designed, in
plan, but was never made available.

Provide water fountains and hand washing lavatories adjacent to the restrooms. Potable water is necessary for the patients, visitors and staff.

Attendees and possibly some of the staff may have felt the researcher could have, in some way, been able to bring more funding to the facility.... On the other hand, brought retaliation on them for negative comments on the questionnaires. Even though a statement was given to, the participants about the anonymity of the questionnaire and they were under no obligation to participate if they did not want to. They were also told they could skip questions they did not want to answer. These factors could have influenced how the participant responded.

The community had less than desirable healthcare facilities until the new health center was built and it is far better than anything they had access to in the past. It will take some time before the newness wears off and they find they have something to complain about.

The inability to talk with a design team on this project was a limiting factor. Many attempts were made to find the people involved and aside from learning the architect had passed away, no one was able to provide the answers that were requested. To find the architects design intent was important but to know the countries design intent and needs of the community outweighed much of this concern. The ability of the built environment to heal a community is far more important.

When discussing the POE with the persons involved in the design, the occupants, and any persons included in the project it is important to discuss the value of the POE. Their receptiveness toward looking for items that could be improved upon may be an unpopular subject. The importance of feedback and the intention of the study are not to
point out flaws but to improve future designs and correct existing problems if any are found. POEs also identify successes that should be repeated in future designs that were found to be desirable.

### 5.8 Conducting Research in Rwanda

Rwanda is a very strong and prideful country that has survived a genocide followed by the swarm of non-government organizations, charitable organizations, and religious associations all telling them they know how to help them and they know what is best for them. Everyone meant well but not all had good realizations. Some organizations came in and started up what must have seemed fantastic projects only to run out of money and leave their work unfinished and Rwandan hopes were dashed. Some groups came and built great projects with western supplies and they worked great but when they left and the projects started breaking down there were no replacement parts to make repairs. After the 1994 Genocide the Rwandan Government made great strides in eliminating the Hutu, Tutsi, and Twa ethnicity distinctions to try and bring lasting peace to their country and when some researchers came in and illegally tried to use DNA samples to test subjects to make such distinctions that could possibly erase what the government had worked so hard to eliminate they had to put their foot down.

This is not to say that these failures represented here are examples of the majority. There are a great many successes that have come out of the projects in Rwanda such as the NHC but there are enough of the failures that Rwanda has had to take several steps to see that these situations are not repeated. Rwanda has put in place several safeguards (many of which can be found in this section) that people from outside of the country must follow before entering with the intent to conduct research or even with the intent to form a non-government organization. The Rwandan Government may even suggest where they believe your best efforts are best served. During a meeting in
November of 2011 with the Minister of Health, Agnes Binagwaho, MD, M (Ped) and a group of ASU students the Honorable Minister made it clear where she believed our focus in healthcare delivery assistance should lie and the group investigated her recommendation, we found her suggestion quite accurate and in tremendous need of assistance. Many of the guidelines for conducting research in Rwanda come from the MOH especially when it comes to healthcare facilities, patients, and in some cases people.

5.8.1 Recommended Documents to Review

If you are considering research in Rwanda and not sure where to begin... the documents listed below give some insight on what you may need to know and where to start. This way you do not go into the country misinformed or ill advised. Many of the organizations listed here are very willing to assist in making sure you get off on the right foot. This is not meant to be a complete list but it was appropriate for the scope of this research study and even a little beyond due to the direction this research was driven.

1. Republic of Rwanda National Ethics Committee (RNEC) Standard Operating Procedures found at


   If your research is noninvasive and has nothing to do with healthcare facilities or healthcare, patients or people, hopefully you can avoid this step as it is time consuming and quite lengthy.

   This research project was initially filed with the RNEC and later removed from their cue when it was determined that the initial period could not be met and the schedule was being pushed out for at least a month from the date of arrival in Rwanda. Since the research was noninvasive and more aesthetic in nature, alternate avenues were
sought out for the research permitting process that would facilitate a more aggressive schedule. The original proposed ten-day schedule was actually pushed out to four weeks.

2. Republic of Rwanda Guidelines for Researchers Intending to Do Health Research in Rwanda found at:

   Any research dealing with healthcare or patients must go through the MOH but if it is noninvasive and does not deal with patient’s health, it can go through less time consuming protocols. The Rwanda Biomedical Center (RBC) along with the National Health Research Committee (NHRC) has a protocol that can be used for noninvasive research, which is how the research contained herein was conducted. See Appendix V.

3. Rules and Regulations for Research Activities in Rwanda found at:

4. Institutions Proposed for Research Affiliation Purposes in Rwanda
   Provided by MINEDUC and RNEC and Found in Appendix H.

5. Application for Authority to conduct Research in Rwanda (Appendix J) found at

   Permission was also granted by MINEDUC (Appendices K and L) to conduct this research but the permission was not obtained until the end of the research itself and after permission from RBC had already been granted. At the time, it was unsure /when permission was going to be granted at all so several avenues were sought and many people were kind enough to try to find a way to solve the dilemma of getting the research accomplished in the fourth week of attempts. An affiliation letter from the list provided by MINEDUC is required to conduct research and after meeting with the Director of the School of Public Health, Prof. Jean Baptiste Kakoma and the acting Director of Research, Dr. Aline Umubyey an affiliation was granted and a letter was written (Appendix M) but
this meeting made a wicked turn. The fact the research that was to take place occurred within a healthcare facility sparked a delicate conversation. The research itself had to do with the built environment of a healthcare facility and was noninvasive but it did in fact take place in a “healthcare facility”. The questionnaires regarding aesthetics and feelings about the architecture were now to be reviewed by the Rwandan Biomedical Review Board (RBC). There was no getting around it. Instead of getting a permit from MINEDUC, it now had to come from RBC. Now the agencies do not talk to one another but the feeling seems to be that anything to do with the MOH takes precedence and the RBC works under the guidance of the MOH. This is not wrong and in the US under the guidelines of the IRB, it would be the same way. The affiliation letter was also required by the RBC to obtain permission from them as well so that time was not wasted. A personal letter and a letter from Arizona State University (ASU) (Appendix I) was required by MINEDUC as part of the application process.


This was part of the RBC guidelines, which was a required protocol.

7. NHRC Guidelines Application Form found at https://docs.google.com/spreadsheet/viewform?formkey=dDJldnZTZWMzSDZqT01RE12OC16V1E6MQ.

After initially completing the protocols required by the RNEC as mentioned above in point number one and completing the required ASU/IRB paperwork (Appendix B) it was simple to cut and paste the information into this form. The financial information had to be calculated separately but was not difficult. It is required that you immediately pay your fee and show proof of payment before the RBC will schedule your
presentation. A copy of proof of payment is on the last page of Appendix G. You will have to contact RBC for banking and account information.

This form (Appendix X) is designed to submit the summary of your proposal to the Rwanda National Research Committee for the scientific review of your study. The form will help better follow up of your research proposal and quick reply. Additionally, you will attach the full proposal (Appendix G) including Questionnaires and Curriculum Vitae’s of Investigators. You are asked also to prepare a ten-minute Power Point presentation (Appendix F) that you will present to the reviewers at a date that will be communicated to you.

Referring to Article sixteen of the National Health Research Committee Guidelines, the scientific clearance fee will be charged as follows:

1. Foreign Researchers: $300/proposal
2. Researchers from Rwandan institutions or local collaborators: $100/proposal.
3. Rwandan students shall not be charged any fee. You could possibly team up with a Rwandan student to have the fee waived but that is something you would have to work out well in advance.

For any additional question, please e-mail to rwanda.nhrc@gmail.com

The RBC stated to obtain the permit and conduct research a Rwandan citizen had to be listed as a co-investigator on the project, preferably one from the place where the project was being conducted. To comply as required an acknowledgement on page iii with Janvier Hakizimana, *Titulaire* (person in charge) of the NHC was made. You will need to obtain Curriculum Vitae of the person you are proposing as your Co-Investigator to submit to the RBC.
5.8.2 Needed Documents

These documents should be in both electronic and paper format:

- A Letter from your professor on University Letterhead requesting affiliation to the organization you have selected
- Curriculum Vitae for yourself and one for an in-country Co-Investigator if required by reviewing agency
- Questionnaires Translated to French and Kinyarwanda
- IRB Approval Documents
- IRB Translation Certificate form found on the ASU website under: http://researchintegrity.asu.edu/humans/forms. This must be signed upon initial translation when questionnaires are created and upon final translation by a second party conducting the final translation when questionnaires are completed and answered.
- IRB Cover Letter/Information Letter Translated French and Kinyarwanda
- Student identification, passport. All of your Institutional Review Board Documentation and CITI exam records
- Valid passport
- Record of payment for fees
- A Memo of Understanding (MOU) from your university for an affiliation is required from some universities in Rwanda for joint research projects that are something that must be worked out well in advance and probably should start at the instructor level or above
- Vaccination record (not for your research but to get back into the country)
5.8.3 Possible Contacts

Note that these contacts were used for this research and most likely will not be applicable to all future research but are listed for possible future contacts. Do not disturb them without setting up appointments first.

Kigali Health Institute (KHI)

Dr. Chantal Kabagabo, Acting Rector and Vice Rector in charge of Academic Affairs and Research + 250 0788304109 kabagabo_chantal@yahoo.com

Benoite Umubyeyi, Acting Dean of the Faculty of Nursing Sciences +0788665845 bumubyeyi@khi.ac.rw

Ministry of Education (MINEDUC)

Hon. Dr. Vincent Biruta, Minister of Education info@mineduc.gov.rw

Remy Twiringiyimana, Director of Research and Development Unit Directorate General, Science Technology and Research +250 785368130 remytw2000@yahoo.fr & twiringiyimana@mineduc.gov.rw

Hilda Murangira, Coordinator for Science, Technology & Research Partnerships +078 8857534 murangira@mineduc.gov.rw & hildamura@yahoo.com

Ministry of Health (MOH)

Agnes Binagwaho, MD, M (Ped), Minister of Health, +250 577458 info@moh.gov.rw

National University of Rwanda (NUR), School of Public Health

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Rwanda Biomedical Center (RBC)

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Dr. Vincent Mutabazi, Director of Research Grant Unit +078 8410827 Vincent.mutabazi@rbc.gov.rw
5.8.4 In-Country Needs

Money: Before you leave the US! Do not bring any bills smaller than a $20 or older than 2006 for exchange. Make sure the bills are in good condition with no tears or writing on them or they may be refused. You do not need to bring Rwandan Francs the exchange rates are better in the country. However, you need to know the newer the bill and even the larger the denomination the better the exchange rate... up to the maximum they advertise. Try to go to your bank ahead of time and get money in pristine condition for better exchange rates. There are several foreign exchange places to exchange US money for Rwandan Francs and some places offer better rates than others. Your hotel can help you find a place or just look for the many signs all over the city of Kigali.

Accommodations: Bethany Guesthouse located in Kigali was very reasonable (modest) and had a complimentary breakfast in the morning with intermittent Wi-Fi, mosquito netting, and the plumbing only went out once. There is a children’s church choir that practices every so often and it makes for enjoyable evenings and mornings considering there are no TV’s. It is close to other restaurants and establishments.

Transportation: Motorcycle taxis (called “motos”) are one of the cheapest modes of transportation and fastest ways to get around but not recommended for long distances. Taxis are easy to find but the prices fluctuate. You can get the drivers phone number if you like him and get him to pick you up on a routine basis and he will wait for you if you make arrangements. Public transportation is also available if you are up for it.
Renting a car and a driver for long treks is your best option but decide the price ahead of time.

*Translator:* Finding one that speaks English, Kinyarwanda and French is your best bet depending on your demographic. The national language is now English and they are teaching it in the schools but the older people have not been formally taught English. The Universities are teaching English as well but for a long time French was the national language so there is a language gap for many. Kinyarwanda is the traditional language of the country and in the more rural areas the only language spoken and perhaps mixed in with Swahili (or Kiswahili) and French... even Congolese depending where you are. The questionnaires for this research were translated into French, Kinyarwanda, along with English. Many of the staff liked looking at the English but preferred using the French and some Kinyarwanda. The community members, visitors and participants primarily wanted the Kinyarwanda questionnaires’ and even some of them could not read so the questionnaires were read to them.

*Wi-Fi Hotspots:* Can be at your accommodation but are not dependable due to frequent power outages... they happen everywhere. Coffee shops (Bourbon Coffee is popular) frequented by tourists or as the locals call white people in Rwanda “Muzungus” or “Mzungus” (which I am sure is no longer a derogatory term but tends to bring a smile to everyone’s face when we use it) usually have Wi-Fi access. You can also use your cellphone sim card (if it is an in-country cellphone) and plug it into your laptop for access or purchase a Wi-Fi external drive and load minutes on it just as you would your prepaid cellphone. They are sold at the shopping malls where you also buy the minutes for your cellphones.

*Cellphone:* Everyone in Rwanda seems to use prepaid cellphones. Purchase or borrow a cellphone for use inside the country they are not too expensive and worth not
having the frustration of not having one. There does not seem to be any landlines so do not count on finding any. MTN and Tigo were the two big telephone companies that seemed to have the market during this research project and people seemed to carry phones for each service provider (or a sim card for each) because if you used one phone to call someone with the other service provider your minutes evaporated at an alarming rate. The first three numbers of the phone number indicate what service provider you are calling if they are different from yours it is a good possibility they are the competition. Buy minutes from local vendors but have them scratch off the protective strip there are many forgeries out there or resold used ones sold as new (if they are forgeries the number scratches off).

*Food and Water:* Stick with bottled water and you should not have any problems. Most of the food is cooked and well prepared. Eat at your own risk and make sure you have your Cipro (used to treat bacterial infections) with you. Only one incident to report and it was not serious. One month of eating in many establishments and homes and enjoying the food thoroughly was worth it. Try the African Tea.

*Smart Traveler Enrollment Program:* Contact your Embassy... Some conflicts still occur in and around Rwanda, let them know you are there and where you are staying and a phone number where you can be reached. Sign up for the Smart Traveler Enrollment Program (STEP) [https://step.state.gov/step/](https://step.state.gov/step/).

*Culture:* Take a break from your research and spend a day as a tourist. Learn about the people and the country. See some of the arts and crafts that can be found at some of the open markets. Visit the Genocide Museum in Kigali; it has much history to be learned. The Gorillas in the Mist (1988), the book written by Dian Fossey about the Gorillas in the Virunga Mountains at the north end of the country... the descendants of those gorillas are still there. Although it is probably one of the most expensive tourist
treks in Rwanda ($500) it is probably the only time you will ever be able to say you walked with gorillas in their natural habitat.

Photo 29: Gorilla at Volcano National Park      Photo 30: Rwanda’s Terraced Landscape

5.8.5  Packing Suggestions

Pack everything you need in your carry-on with the extras in your checked bags. If necessary, you can make copies of any documents in Kigali, Rwanda. Have at least one copy of all of your documents in your carry on and a backup on your thumb drive. Bags get lost and it would be a very wasted trip if your papers did not make it. That being said making copies in Rwanda is a little cheaper than making copies in the US... do you really want to hand carry all that paperwork? Unless you do not have the time or cannot send someone to make the copies, it is really a quite simple solution if you happen to be staying in the city of Kigali. If you are staying in a more rural community then that might not be an option.

Have one set of presentation clothes and one set of field clothes in your carry-on. Keep all your field equipment e.g. cameras, audio devices, measuring tapes, meters, etc. that you cannot easily duplicate in country in your carry-on.

Bring healthy snack bars to nibble on throughout the day if you are going to be in the field. Lunch was not a meal often served outside of the main city.
5.8.6 Points of Encouragement

Be patient; be prepared to add extra review time and waiting time to your study for your presentation and approvals. Be humble and thankful to your host country. They can say no. Start with the mindset that your research is valid and it is not impossible. I hope that you have done your homework and you have done all your research in the USA before embarking on your trek into Rwanda. Even after you file your intended research, you will find some (RNEC) agencies only meet one day a month to schedule presentations, which could push back your schedule thirty days. Start reviewing these documents at least three months in advance for many of them has long lead times. ... At the very least (according to the RNEC) it takes three business weeks (Monday through Friday). Most of the agencies will except electronic filing but confirm with them to make sure paper filing is not required. If you explain your situation they may make exceptions, if not, you may have to get the name and address of a company in Rwanda to reproduce the documents for you. It can be done.

Once they have the files, expect a review period before you get a response. This is typical anywhere so do not expect it to be different in Rwanda.

A formal presentation was required at both the RNEC and the RBC where attendance was required followed by another review period that was not too long. If it is a simple presentation it is possible but not guaranteed you could get your answer the same day of the presentation.

Good news comes when you pick up your official stamped authorization to conduct research. The first one may be conditional pending (Appendix D) filing additional paperwork and a final one after all paperwork is submitted (Appendix F).
5.9 Conclusions

The people of the remote areas of the Bugesera District in Rwanda have limited access to healthcare. Some of them have to travel on foot for up to twelve miles on dirt trails and up and down hilly terrain before they reach their closest facility. The Ngeruka Health Center is one of those distant resources available in rural Rwanda. The facilities are understaffed and undersupplied for the large populations that depend on them. Ngeruka alone has over 27,000 inhabitants.

Many of the people in these areas are unfamiliar with or under-educated on disease prevention and how to use proper hygiene partially due to their inability to have readily available, potable water. Malnutrition is a problem because knowledge of the proper diet and access to nutritional foods is also a problem. Eighty-five percent of Rwandans live on the periphery of the country; nutrition education becomes a much needed aid for these people.

Education becomes the savior in many of the health problems that arise in this region. Providing knowledge in how to prevent disease and illness before it becomes a problem requiring hospitalization is one of the solutions that are desperately needed in Rwanda. According to Maslow (1943), satisfying our basic needs motivates us to move forward and make advancements in our lives. Rwandans in rural Rwanda are still struggling to meet these needs.

The healthcare facility in Ngeruka, Rwanda was the driver of this research and the catalyst that helped to formulate the research questions for this study. The health center provides education that can help fulfill the community’s needs by teaching how to prevent illnesses and disease and how to know what foods will keep them strong and to properly prepare them to keep them free from food-borne illnesses. Education is of utmost importance and the built environment (where it is taught) also has to meet these
needs. The environment, as a healing space that encourages participation and engagement, will have the best effect on the participants.

While conducting the research in Ngeruka with the research questions in mind it became obvious that the participants were engaged and eager to learn in the health center environment. Their body language and satisfaction with the facility was overwhelmingly supportive. This aspect of the research could be measured and documented but the biggest test should come later when the health center no longer treats people for preventable illnesses. The people, with proper education will be able to treat and care for themselves at home quicker and without traveling or burdening the healthcare system. Statistical data should bear that out as preventable illnesses are seen less and less at the facility.

The Conceptual Framework shown in Figure 2 proved to be quite accurate. It is still in motion and the built environment as the nucleus is improving health daily. The participants of the health programs expand along with their health. Health of the community will help it grow and thrive. The framework of the built environment starts the participant on a journey to health by contributing to healing and education. The participant learns to use preventative and promotional healthcare techniques that had previously required hospital or healthcare treatment. This education is shared with the family and community members and reduces further burden on healthcare facilities.

Confirming the research question that education space within the built environment engages participants and contributes to healing is answered partially. The overabundance of positive answers and the lack of negative responses could be somewhat attributed to the newness of the facility and the grandness of what the community had experienced in the past (see Photo’s 1 and 7 for comparison). The vastness of the space as you enter the main doors into the reception area is like entering
a cathedral and may instill a desire for the community to join the class sessions on a returning basis, much like members of a church. This phenomenon would be a topic for further research.

Questioning the design intent of the facility and whether it was met can be answered partially with a question... Does naming the space an “education space” constitute intent? Not all the spaces were specifically labeled as such but there is evidence that the intent was there. Education is being taught and overflowing capacities from the community are returning for more. Noted in the research; participants have experienced several programs and intend to return for more.

In the not too distant future, Rwanda will overcome the effects of its tumultuous history and its current health problems stated in this research. The statistics over the years are already showing steady improvements in many areas and with education included in this scenario there is no foreseeable reason they will not continue to improve. Designing facilities to create engagement and participation will add greatly to these improvements. As more research is conducted on, the design of the facility and how it encourages engagement in educational programs the built environment will improve. This process is iterative and continually adding to the body of knowledge so that design is always improving.

5.9.1 Conclusion Aside

While conducting the research it became obvious, there were links between many facets of the POE. Figure 60 is a kind of word doodle that visually links many words together but at the same time accurately shows their interconnectedness. This figure was created as the research project began and included the areas the research intended to focus on.
The next figure (Figure 61) is a word cloud that was created using an application (http://worditout.com/) that took all the words out of this research and arranged them by size (larger font meant the word occurred more frequently) in order of frequency within the document and randomly arranged them within the cloud. This word cloud summarizes the recurrent words in the thesis. It was interesting to note that this word cloud completed at the end of the work mirrored some of the early stage conceptions that
were being thought out at this projects conception. It is obvious that Education and Health were the frontrunners in this process.

![Figure 61: Word Cloud](image-url)
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APPENDIX A

OFFICE OF RESEARCH INTEGRITY AND ASSURANCE

EXEMPT STATUS APPROVAL
To: John Takamura  
AED  

From: Mark Roosa, Chair  
Soc Beh IRB  

Date: 10/30/2012  

Committee Action: Exemption Granted  
IRB Action Date: 10/30/2012  
IRB Protocol #: 1210008479  

Study Title: Post Occupancy Evaluation of the Education Spaces at the Ngoruka Health Center in Rwanda  

The above-referenced protocol is considered exempt after review by the Institutional Review Board pursuant to Federal regulations, 45 CFR Part 46.101(b)(2).  

This part of the federal regulations requires that the information be recorded by investigators in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects. It is necessary that the information obtained not be such that if disclosed outside the research, it could reasonably place the subjects at risk of criminal or civil liability, or be damaging to the subjects' financial standing, employability, or reputation.  

You should retain a copy of this letter for your records.
APPENDIX B

ASU APPLICATION FOR EXEMPT RESEARCH

APPROVED WITH EXEMPT STATUS
ARIZONA STATE UNIVERSITY
APPLICATION FOR EXEMPT RESEARCH

PROTOCOL TITLE: Post Occupancy Evaluation of the Education
Spaces at the Ngeruka Health Center in Rwanda

DATE OF REQUEST: October 23, 2012

PRINCIPAL INVESTIGATOR: John Takamura

DEPARTMENT/CENTER: The Design School, Herberger
Institute for Design and the Arts

UNIVERSITY AFFILIATION: Professor

CAMPUS ADDRESS: (include campus mail code)
Arizona State University
P.O. Box 872105
Tempe, AZ 85287-2105
Mail Code: 1605

PHONE: (480) 965-7171

E-MAIL: John.Takamura@asu.edu

CO-INVESTIGATOR: Sheila Wakena

DEPARTMENT/CENTER: The Design School, Herberger
Institute for Design and the Arts

UNIVERSITY AFFILIATION: Professor

CAMPUS ADDRESS: (include campus mail code)
N/A

PHONE: (480) 965-3231

E-MAIL: swakena@asu.edu

STUDY OVERVIEW

1. Provide a brief description of the background, purpose, and design of your research. Avoid using technical terms and jargon. Be sure to list all of the means you will use to collect data (e.g., tests, surveys, interviews, observations, existing data). Provide a short description of the tests, instruments, or measures and attach copies of all instruments and consent letters for review. If you need more than a few paragraphs, please attach additional sheets. FOR ALL OF THE QUESTIONS, WRITE YOUR ANSWERS ON THE APPLICATION RATHER THAN JUST SAYING SEE ATTACHMENTS.

Background:
Trained healthcare professionals, staff, and adequate healthcare facilities and equipment are lacking in Rwanda, Africa. HIV/AIDS, tuberculosis, measles, malaria, malnutrition and high infant and expectant mother mortality rates are an increasing burden to the healthcare system in place. The most promising, yet controversial, is the primary care of these diseases and deaths are preventable or easily treated before becoming acute care concerns. The problem is the lack of education or knowledge on how to recognize and address these health issues by the communities and individuals. This would be highly advantageous to the more rural communities where the access to adequate healthcare is even scarcer. An Organization called “Rwanda Works” has built a healthcare center in Rwanda where they have instituted an educational element to their healthcare facility.

Purpose:
The purposes of this study is to evaluate the existing built environment of the education space provided in the healthcare facility to determine if the design intent was met and if the facility’s education space is accepted and used by the communities it serves. If the education space is used and accepted by the surrounding communities it should be lessening the amount of patients admitted to healthcare facilities for preventable illnesses and diseases.

This study is to better understand the ethnographic and cultural influences on the healthcare facility and the education delivery system provided at the facility. With a focus on the built environment and its influence on preventative education and health promotion, this study aims to improve the health and well-being of the Rwandan population.

Process overview:
I will be conducting an ethnographic exploration into the knowledge, experience and utilization of the healthcare facility space designed for education of the local community, patients, and staff in and around the facility. Research in this location will last over a period of 5-10 days and will consist of a series of questionnaires (translated into Kinyarwanda) and semi-structured gathering of statistical data of facility records on numbers of patients admitted and numbers of persons educated in facility, interviews, focus groups and observations. Audio, video, and photography will be used for thematic purposes in this research investigation. All information will be anonymous with no identifying information about the participants recorded.

RECRUITMENT

2. Describe how you will recruit participants (attach a copy of recruitment materials). Questionnaires are attached along with Cover/Information Letter. The sample population will be a voluntary convenience sample of class participants from the Ngeruka Health Center in Rwanda. I will have the Cover/Information letter read to the group in Kinyarwanda (the native language) and ask for volunteers to stay after their class has been conducted. I will also schedule meetings with staff and administrators of the facility to discuss this process.

PROJECT FUNDING
1. How is the research project funded? (A copy of the grant application(s) must be provided prior to IRB approval. For funded projects, researchers also need to submit a copy of their human subjects training certification. http://research/privacy.aau.edu/training/)

- Research is funded (Go to question 4)
- Funding decision is pending
- Research is not funded

a) What is the source of funding or potential funding? (Check all that apply)
- Federal
- Private Foundation
- Department Funds
- Subcontract
- Fellowship
- Other

b) Please list the name(s) of the sponsor(s):

c) What is the Project grant number and title (for example NIH grant number)?

d) What is the ASU account number/project number?

e) Identify the institution(s) administering the grant(s):

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<th>STUDY POPULATION</th>
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<td>Indicate the total number of participants who plan to include or enroll in your study.</td>
<td>Indicate the age range of the participants that you plan to enroll in your study</td>
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<td>18 to 65</td>
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5. Attach a copy of the following forms as applicable to your study (Please check the ones that are attached):
- Research Methods (Research design, Data Source, Sampling strategy, etc.)
- Any Letters (cover letters or information letters), Recruitment Materials, Questionnaires, etc., which will be distributed to participants
- If the research is conducted off-site, provide a permission letter where applicable
- If the research is part of a proposal submitted for external funding, submit a copy of the FULL proposal

Note: The information should be in sufficient detail so IRB can determine if the study can be classified as EXEMPT under Federal Regulations 45 CFR 46 101(b).

DATA USE

6. How will the data be used? (Check all that apply)
- Dissertation
- Thesis
- Publication/journal article
- Undergraduate honors project
- Results released to participants/parents
- Results released to employer or school
- Results released to agency or organization
- Conferences/presentations
- Other (please describe):

EXEMPT STATUS

7. Identify which of the 6 federal exemption categories below applies to your research proposal and explain why the proposed research meets the category. Federal law 45 CFR 46 101(b) identifies the following EXEMPT categories. Check all that apply to your research and provide comments as to how your research falls into the category.

SPED/AL NOTE: The exemptions at 45 CFR 46 101(b) do not apply to research involving prisoners. The exemption at 45 CFR 46 101(b)(2), for research involving survey or interview procedures or observations of public behavior, does not apply to research with children, except for research involving observations of public behavior when the investigator(s) do not participate in the activities being observed.

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<td>- Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of, or the comparison among, instructional techniques, curricula, or classroom management methods. Please provide an explanation as to how your research falls into this category:</td>
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<tr>
<td>- (i) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement, survey procedures, interview procedures or observation of public behavior, unless: (i) Information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects and (ii) any disclosure of the human subjects' responses outside the research would reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects financial standing, employability, or reputation. Please provide an explanation as to how your research falls into this category: This research meets the &quot;Exempt Status&quot; qualifications as listed above. Surveys, Questionnaires, and follow-up interviews are to be conducted in public settings within a healthcare facility grounds and surrounding community. There is no risk to human subjects as all identifiers will be omitted or disguised from this research. Data collected will be from public sources with no information regarding individual identities collected. Every participant will be voluntary and will have the option to end their participation at any time. Information obtained is for the purpose of improving the built environment of the facility not for any individual or group research.</td>
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<tr>
<td>- Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under paragraph (b)(2) of this section, if (i) The human subjects are elected or appointed public officials or candidates for public office, or (ii) federal statute(s) require(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter. Please provide an explanation as to how your research falls into this category:</td>
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<tr>
<td>- Research, involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects. Note: Please review the IRB's Guidance on Research Involving Coded Private Information or Biological Specimens: <a href="http://www.hhs.gov/ohrp/humansubjects/guidance/codedbiol.pdf">http://www.hhs.gov/ohrp/humansubjects/guidance/codedbiol.pdf</a> Please provide an explanation as to how your research falls into this category: If public records are available to the effect the education space/built environment has had on the reduction of medical cases being admitted to the facility regarding preventable diseases and/or illnesses, this information shall be obtained with no identifiers to any person associated with this research.</td>
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<tr>
<td>- Research and demonstration projects which are conducted by or subject to the approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine: (i) Public benefit or service programs: (ii) Procedures for obtaining benefits or services under those programs, (iii) Changes in methods and levels of payment for benefits or services under those programs; (iv) Possible changes in policies or alternative to those programs; (v) Research on the effects of compliance with, or the implementation of, Federal, State, or local laws, regulations, or orders, or activities authorized by license. (Generally does not apply to the university setting). Please provide an explanation as to how your research falls into this category:</td>
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6. The research team must verify completion of human subjects training within the last 3 years.

CITI training – Provide the date that the PI and Co-Is completed the training. Shella M. Wakeham October 9 & 10, 2019
John H. Takamura

If you completed NIH training prior to 9/15/10 this will be accepted. Provide a copy of the certificate.

PRINCIPAL INVESTIGATOR

In making this application, I certify that I have read and understand the ASU Procedures for the Review of Human Subjects Research and that I intend to comply with the letter and spirit of the University Policy. I may begin research when the Institutional Review Board gives notice of its approval. I must inform the IRB of ANY changes in method or procedure that may conceivably alter the exempt status of the project. I also agree and understand that records of the participants will be kept for at least three (3) years after the completion of the research.

Name (first, middle initial, last):
John H. Takamura

Signature: ____________________________ Date: 10-25-12

FOR OFFICE USE:

☐ Exempt Category/Category:
☐ Approved ☐ Deferred to other review
☐ Recommended that investigator submit for expected or Full Board review.

Authorizing Signature: ____________________________ Date: 10-3-12

Swan Metzky
## Collaboration Institutional Training Initiative (CITI)

### Human Research Curriculum Completion Report

**Phase II: Training**

**Liaison:** Sheila Wakelam

**Department:** Psychology

**Institution:** Arizona State University

**Submission Date:** 10/09/2010

### Social & Behavioral Research Investigators Agency Personnel

**Institution:** Arizona State University

**Position:** Research Assistant

**Reference ID:** 07903

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**For this Completion Report to be valid, the learner listed above must be affiliated with a CITI participating institution. False information and unauthorized use of the CITI course site is unethical, and may be considered scientific misconduct by your institution.**

**Liaison:** Sheila Wakelam

**Department:** Psychology

**Institution:** Arizona State University

**Contact Information:**

- **Email:** swakelam@asu.edu

---

**Collaboration Institutional Training Initiative at the University of Miami**
CITI Collaborative Institutional Training Initiative

Human Research Curriculum Completion Report
Printed on 10/25/2012

Learner: John Takamura (username: JohnTakamura)
Institution: Arizona State University
Contact Information None
Phone: 480-965-7171
Email: john.takamura@asu.edu

Group 2 Social & Behavioral Research Investigators and key personnel:

Stage 1, Basic Course Passed on 10/25/12 (Ref #: 6481911)

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<td>10/25/12</td>
<td>5/5 (100%)</td>
</tr>
<tr>
<td>Arizona State University</td>
<td>10/25/12</td>
<td>no quiz</td>
</tr>
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</table>

For this Completion Report to be valid, the learner listed above must be affiliated with a CITI participating institution. Falsified information and unauthorized use of the CITI course site is unethical, and may be considered scientific misconduct by your institution.

Paul Braunschweiger Ph.D.
Professor, University of Miami
Director Office of Research Education
CITI Course Coordinator
APPENDIX D

PENDING SCIENTIFIC REVIEW APPROVAL NOTICE

FROM THE RWANDA BIOMEDICAL CENTER
Sheila M. Wakelam  
Principal Investigator

Scientific Review Approval Notice

Dear Sheila M. Wakelam

Your research project “POST OCCUPANCY EVALUATION OF THE EDUCATION SPACES AT THE NGERUKA HEALTH CENTRE” has been reviewed by National Health Research Committee on 23rd November 2012 and they recommended the following amendments on the protocol before issuing the final approval.

In order for National Health Research Committee to approve your protocol you are requested to provide the following documents:

- Indicate in your protocol that the study results and recommendations will be shared with the National Health Research Committee
- Add a Rwandan Investigator to your study
- Provide proof of payment for the study review
- Indicate in your protocol the data collection period of 2010 to 2012
- Clearly indicate in your protocol that no individual patient data will be viewed as part of the public records

Your pending approval reference number is NHRC/2012/PROT/0038

Yours Sincerely,

[Signature]

Dr. Leon MUTESA
Vice-Chairperson of NHRC
Signature
Date: 29-11-2012
APPENDIX E

SCIENTIFIC REVIEW APPROVAL NOTICE

FROM THE RWANDA BIOMEDICAL CENTER
Dear Sheila M. Wakelam,

Your research project, "POST OCCUPANCY EVALUATION OF THE EDUCATION SPACES AT THE NGERUKA HEALTH CENTRE," has been reviewed by the National Health Research Committee on 23rd November 2012 and we hereby providing the final approval for the above mentioned protocol.

Please note that approval of the protocol is valid for only lifetime stated in protocol.

You are responsible for fulfilling the following requirements:
1. Changes amendments on approach and methodology must be submitted to the NHRC for review and approval to validate the changes.
2. A submission of quarterly progress report is mandatory.
3. Submission to NHRC of final results before publication is mandatory.
4. Failure to fulfill the above requirements will result in termination of study.

Your approval reference number is NHRC/2012/PROT/0038

Yours Sincerely,

Yours Sincerely,

Dr. Jean de Dieu NZIRABEZA
Chairperson of NHRC
Signature
Date:

Dr. Léon MUTESA
Vice-Chairperson of NHRC
Signature
Date:
POST OCCUPANCY EVALUATION OF THE EDUCATION SPACES AT THE NGERUKA HEALTH CENTER

Presented to the Rwanda Biomedical Center (RBC)
23 November 2012
By Sheila M. Wakelam

POST OCCUPANCY EVALUATION (POE):

“Post-occupancy evaluation is the process of evaluating buildings in a systematic and rigorous manner after they have been built for some time. POEs focus on building occupants and their needs, and thus they provide insights into the consequences of past design decisions and the resulting building performance.”

(Prinzo, Rabiega, and White, 1988, p. 3)
DESIGN INTENT:
- During the original conceptualization of the building design a specific intent of the space was desired by the Owner / Administrator and the Architect to put that concept into a plan and the project was built.
- After a period of time and occupancy the built environment is evaluated to see if the intent was met.

PARTICIPANT ENGAGEMENT TOOLS:
- Measuring Student Engagement.
  - With observation and questionnaires
- Learning Space Assessment.
  - Based on physical attributes of space and Code Requirements
  - Literature review
- Does the Space Promote Teaching and Learning and finally Healing?
  - Literature review and questionnaires
  - Statistical records (if available)
RESEARCH QUESTIONS:
Does the built environment of the Ngeruka Health Center aid in healing by engaging participants to learn health prevention and promotion?

Was the design intent met?
What were the successes?
What were the failures?

MIXED METHODS:
Qualitative
- Observation of Participants
- Questionnaires
  Anonymous
  Voluntary
  18 YOA and up

Quantitative
- Measurements of the Built Environment
- Public Records - Statistics (if available)
MIXED METHODS (cont.):
Literature Review
The approach includes a literature review to collect current research related to participant engagement, POE, preventable diseases and illnesses, evidence based design, and the built environment / education space design.

QUESTIONNAIRES:
- Are designed to gauge satisfaction and participant engagement to learning program.
- They are geared toward the Learning / Built Environment.
- Possible explanations as to dissatisfaction or lack of engagement.
- Desire to learn.
OBJECTIVE MEASUREMENT:
- Lighting
- Acoustics
- Thermal
- Spatial
- Public Records (if available)
  Patients Admitted with Preventable Illnesses +/-

SUBJECTIVE MEASUREMENT:
- Occupant Survey, User Satisfaction
- Thematic Coding
- Observation
  Body Language, Interaction, Engagement

a(x4) OBSERVATION METHOD:

<table>
<thead>
<tr>
<th>Actors</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 - Blue shirt</td>
<td>Waiting, talking</td>
</tr>
<tr>
<td>P2 - Red shirt</td>
<td>Sitting on edge of chair</td>
</tr>
<tr>
<td>P3 - Green hat</td>
<td>Falling asleep</td>
</tr>
<tr>
<td>P4 - Uniform</td>
<td>Asking Questions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Artifacts</th>
<th>Atmosphere</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notebook</td>
<td>Classroom</td>
</tr>
<tr>
<td>Pen</td>
<td>Light shining</td>
</tr>
<tr>
<td>Food</td>
<td></td>
</tr>
</tbody>
</table>

Paul Rothstein: Method of User Research (2018)
THEMATIC CODING:
Identifying **Patterns and Themes** that emerge from the collected data and observations.

OBJECTIVES:
- Identify opportunities for **improving the built environment**.
- Health Education and promotion may have an **impact on the patients** admitted in to health facilities for preventable diseases and illnesses.
- **Reduce the burden** on understaffed and under equipped facilities.
SAMPLING:
This will be a *convenience* sample of the Ngeruka Health Center.

- Voluntary
- Anonymous
- Classroom participants
- Teachers / Lecturers
- Administrators and Staff

Averages 275 Participants a week with a total of 30 staff at the center.

Requesting a **minimum of 30** respondents or 10 percent.
EXTERIOR EDUCATION SPACE

CLOSING REMARKS:

- This PROJECT is to fulfill my thesis requirement at Arizona State University and is completely "Self-Funded".
- I would like your permission to begin my data collection on Monday, 26th November 2012.
- It has been Previously Reviewed and Approved by MINEDUC.
- Previously Reviewed and Approved as "EXEMPT" by Institutional Review Board (IRB) At Arizona State University.
THANK YOU
APPENDIX G

RWANDA BIOMEDICAL CENTER RESEARCH PROPOSAL SUBMISSION
RWANDA BIOMEDICAL CENTER
Medical Research Center
P.O. Box 7162
Kigali, Rwanda

National Health Research Committee
Ref.: NHRC/2012/PROT/0039

POST OCCUPANCY EVALUATION OF THE
EDUCATION SPACES
AT THE_ngeruka HEALTH CENTER IN RWANDA

RESEARCH PROPOSAL

Submitted by: Sheila M. Wakelam
Arizona State University, Graduate Student
swakelam@asu.edu

23 November 2012
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* Refer to Appendix (page ix) for Questionnaires listed in section IV

O  Cover and Information Letter

P  Informed Consent Form

Q  Ngeruka Education Participants Engagement Questionnaire

R  Ngeruka Dedicated Education Space Staff/Administrators Questionnaire/Interview

S  Post Occupancy Evaluation (Poe) Form to be completed by Staff

T  Administrator Checklist for Conducting a Poe at the Ngeruka Health Center
RWANDA BIOMEDICAL CENTER
Medical Research Centre
P.O. Box: 7162
Kigali, Rwanda
Head of Medical Research Centre,
Dr. Leon Mutesa
E-mail: leon.mutesa@hbc.gov.rw
Tel: +250 018 845 10 13

Re.: Request Letter to Conduct a Post Occupancy Evaluation of the Education Spaces at the Ngenurka Health Centre in Rwanda

23 November 2012

Dear Dr. Leon Mutesa,

I would like to request a review of the enclosed documents and protocol. I am asking to conduct a Post Occupancy Evaluation (POE) of the Education Spaces at the Ngenurka Health Center in the Bugejera District of Rwanda. I have obtained permission from the NGO, Rwanda Works and the Ngenurka Health Center to conduct this research pending approval. The protocol was submitted and approved by the Institutional Review Board (IRB) at Arizona State University and was given an "Exempt" status due to its non-invasive nature. The approved IRB application and exempt status approval letter have been included in the Appendix of the Research Proposal for your review.

I am a Master of Science in Design student at Arizona State University, studying Healthcare and Healing Environments. I have worked in the field of architecture for eighteen years and have developed a passion for healthcare design research and the built environment. The requested research focuses on the built environment and its relationship to healing.

I plan on examining the existing building and talking with the staff and classroom participants on a completely anonymous basis about the education rooms and spaces at the facility. In a POE, one of the first questions I will ask is whether or not the design intent of the Owner and Architect were met and then to document the successes and failures for future healthcare facility designs.

Thank you for your consideration and time in this research proposal. If there is anything else your office requires or further understanding I can provide please let me know and I will have it to you as early as possible.

Sincerely,

Sheila Wakalam, Assoc. AIA, EDAC
Arizona State University [The Design School]
The Herberger Institute for Design and the Arts
Master of Science in Design [POE] Thesis
Healthcare Design & Healing Environments
http://www.linkedin.com/in/sheilawakalam
swakalam@asu.edu
PROTOCOL AND SUMMARY
POST OCCUPANCY EVALUATION OF THE EDUCATION SPACES AT THE NGERUKA HEALTH CENTER IN RWANDA

1. Background

Trained healthcare professionals, staff, adequate healthcare facilities and equipment are lacking in rural Rwanda, Africa. HIV/AIDS, tuberculosis, measles, malaria, malnutrition and high infant and expectant mother mortality rates are an increasing burden to the healthcare system in place. The most promising fact is that the primary causes of these diseases and deaths are preventable or easily treated before becoming severe or even life threatening. One of the problems is the lack of education or knowledge on how to recognize and address these health issues by the rural population. This would be highly advantageous to the more rural communities where the access to adequate healthcare is even scarcer. An Organization called “Rwanda Works” has built a healthcare center in Rwanda where they have instituted an education element to their healthcare facility design model.

2. Aim and Objectives

2.1. Aims

The purpose of this study is to evaluate the existing built environment of the education space provided in the healthcare facility to determine if the design intent was met, and if the facility’s education space is accepted and used by the communities and participants it serves. If the education space is used and accepted by the surrounding communities it should be lessening the amount of patients admitted to healthcare facilities for preventable illnesses and diseases.

2.2. Objectives

This study is to better understand the ethnographic and cultural influences on the healthcare facility and the education delivery system it provides. With a focus on the built environment and its influence on preventative education and health promotion, this study aims to provide alternative ways through the built environment to improve the health and wellbeing of the Rwandan population and to lessen the admission of patients admitted to the healthcare facilities for preventable diseases and illness.

3. Methods

3.1. Study description

A literature review of education spaces as provided and on healthcare promotion and prevention has been conducted. Participant observations of the use of the facility/built environment and the users of the facility will be conducted on site. Since no Pre-Occupancy Evaluations were made an interview with the Owner will be conducted to obtain the actual design intent of the education spaces.

Staff questionnaires will be used to determine their feedback on the space. Coding of each Questionnaire and Interview will be used to determine thematic similarities and will be used for a combined understanding and a qualitative analysis. Theory emerging from data (Glasser and Strauss 1967) (grounded theory) is a method that will be employed to discover additional information as this investigation unfolds.

A Post Occupancy Evaluation will be conducted to answer the questions regarding design intent and outcomes. I will be conducting an ethnographic exploration and Post Occupancy Evaluation into the knowledge, experience and utilization of the healthcare facility space designed for education of the local community, patients, and staff in and around the facility.

Research in this location will last over a period of 5 days and will consist of a series of questionnaires in English, French and Kinyarwanda, anonymous gathering of statistical data of facility records on numbers of patients admitted and numbers of persons educated in facility. No individual patient data will be viewed as part of the public records. The public data collection period will consist of information collected between the years 2010 and 2012. Audio tapes and photography will be used for thematic coding purposes to synthesize the data in this research investigation. All information will be anonymous with no identifying information about the participants recorded.
3.2. Study design

The study design blends the POE with participant engagement to not only determine if the space met the design intent but if the space aids in healing by engaging participants in healthcare related education.

3.3. Study site

The study site is the Ngeruka Health Center in the Bugesera District of Rwanda.

3.4. Study population

The study population consists of the Ngeruka Health Center staff, Rwanda Works staff and classroom participants.

3.5. Proposed intervention

The information learned from this POE on whether the built environment of the health center can aid in healing may be used in future projects. Healing is determined by classroom participant and staff engagement and the reduction of preventable illnesses and diseases being admitted to healthcare facilities. This would then free up the staff, equipment, and medications for more severe medical cases. It could also aid in the future health of the classroom participants.

This is a learning opportunity to see what works and what doesn’t and in the future gives the flexibility to design future spaces more efficiently.

3.6. Main exposures and/or confounders or outcomes to be measured

The primary focus of this research is the built environment. There are no foreseeable confounders of this research as it is non-invasive and no personal information is requested nor will be noted. All participation is voluntary and stated before any questions are asked.

The outcomes measured will include demographic information that will provide insight as to who is using the facility, their education levels, distance traveled, how they were informed of the services provided and their opinions (likes and dislikes) of the facility itself.

4. Selection of study population

4.1. Inclusion criteria

Questionnaires are attached along with Cover/Information Letter. The sample population will be a voluntary convenience sample of classroom participants from the Ngeruka Health Center in Rwanda. I will have the Cover/Information letter read to the group in Kinyarwanda (the native language) and ask for volunteers to stay after their class has been conducted. I also will schedule meetings with staff volunteers and administrators of the facility to discuss this process and ask for them to participate in completing the questionnaires.

4.2. Exclusion criteria

The minimum age for participants is eighteen years of age. The maximum is sixty-five years of age.

4.3. Sampling

This is a convenience sample from the occupants of the Ngeruka Health Center.

5. Study procedures

5.1. Procedures at enrollment

I will introduce myself at the beginning of the class and explain my presence as I have the attached Cover Letter read in Kinyarwanda. At that time I will explicitly state that participation is voluntary and anonymous. Upon agreement I will observe the class, take notes and make recordings if I receive a sign-off on the Informed Consent document.
After the class adjourns I will ask for volunteers to complete the questionnaires and possibly have an interactive discussion to illicit any other pertinent information they wish to provide. They will also be informed that at any time they wish to no longer participate they may leave at any time.

5.2. Follow-up

There is no follow-up that will be requested.

5.3. Measurement of outcomes

This study will attempt to answer; Does the space support teaching, learning and an environment of collaboration essential for education? And does the building have an impact on reducing patient admissions for preventable diseases.

5.4. Sample size

It was last estimated by Ngeruka titular that the education space receives up to 275 participants a week and the facility has approximately 30 staff. Minimum goal is 10% or 30 persons.

5.5. Data Management

All data collected will be anonymous and have no identifying information on any of the participants. The collected questionnaires will be kept in a secure compartment at all times. Upon completion of the study all data will be destroyed.

5.6. Proposed analysis

The proposed analysis of the collected data is to thematically code responses to obtain usable data in future research and construction. All questionnaires will be qualitatively and quantitatively assessed.

6. Ethical considerations

6.1. Confidentiality

All information is strictly confidential. No names or identifying information will be requested. There is no foreseeable risk to the study participants.

6.2. Informed consent

An Informed Consent is provided and attached to this document. This will be used for videotaping purposes that are to be used for thematic coding and synthesizing purposes only. No recordings will be made public or used for any other purposes. Should the participants elect not to be videotaped it will not happen. The Informed Consent will be offered in Kinyarwanda, French and English and will be reviewed and signed by participants before any videotaping will take place.

6.3. Ethical approval

This study is to learn about the built environment and the interactions of that environment. The information regarding this research will be anonymously gathered and recorded. There are no foreseeable ethical considerations or risks. It is an investigatory study to conduct a post occupancy evaluation to determine the successes and failures of the building regarding its intended purpose and relate it to a healing environment.

7. Logistics

7.1. Distribution of responsibilities

The primary investigator will be myself along with the Ngeruka titular as required by the RBC, who will act as a co-investigator and assist with the information gathering onsite, access to any public records as stipulated herein, scheduling of observation periods and meetings with staff. I will have one translator onsite to assist when required for complete understanding by all participants/respondents. As such I will take ownership of all supervisory responsibilities in regards to the data collected and used to conduct this research.
7.2. Timetable

This research will take a maximum of five days. It is requested that this timetable starts as soon as possible.

7.3. Budget

This project has no sponsorship and is consisting of out of pocket expenses of this student/researcher.

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<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Travel (one round trip + extension)</td>
<td>2,250.00</td>
</tr>
<tr>
<td>Ground Transportation</td>
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<tr>
<td>Reproduction Expenses</td>
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<td>Lodging</td>
<td>300.00</td>
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<tr>
<td>Translator/Transcription</td>
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<td>Building Measuring Equip.</td>
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<td>Food</td>
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<tr>
<td>RBC Proposal Filing</td>
<td>300.00</td>
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<tr>
<td><strong>TOTAL (in US Dollars)</strong></td>
<td>$4,755.00</td>
</tr>
</tbody>
</table>

Note: Some equipment and supplies were borrowed at no expense.

8. References

Post Occupancy Literature

"Post-occupancy evaluation is the process of evaluating buildings in a systematic and rigorous manner after they have been built for some time. POEs focus on building occupants and their needs, and thus they provide insights into the consequences of past design decisions and the resulting building performance." (Preiser, Rabinowitz, and White, 1988, p. 3)

"When psychological and sociological considerations were linked to design, the study of environment and human behavior became a new discipline and knowledge from this discipline was also applied to building evaluations." (Preiser, Rabinowitz, and White, 1988, p. 16)

http://www.wbdg.org/design/account_spatial.php

"Probably the most common design mistake United States-based design teams make when entering international markets for the first time is not realizing the impact culture has on physical space." (Rawlings, Stackel, 2011, p. 36)


"Health literacy is defined as the degree to which individuals have the capacity to obtain, process and understand basic health information needed to make appropriate health decisions and services needed to prevent or treat illness." www.hrsa.gov/publichealth/healthliteracy/healthlitabouth.htm

Participant Engagement


"The ultimate goal of HSSE (High School Survey of Student Engagement) is to document, describe, and strengthen student engagement in educationally purposeful activities in secondary schools nationally". http://www.indiana.edu/~ceep/hsse/about.html

Statistical Literature

"85% of Rwandans live in rural agricultural communities, often more than an hour’s walk from the nearest health centre." (Holmes, 2010, para. 4 p. 945)

Quotes:

"There is a problem of people not understanding the need of getting health care." (Interview with an Epidemiologist at the Public Health School in Rwanda 2011)

"People not educated on diabetes can often go 5 years without a medical appointment." (Interview with an Epidemiologist at the Public Health School in Rwanda 2011)

9. Appendices

See Proposal Index for complete list of Appendices

Classroom Participant Informed Consent (Non Invasive) - Translated from English to Kinyarwanda and French. The English version has been included in the thesis Appendix for reference.

Curriculum Vitae of Sheila Wokelam – Starting on next page

Curriculum Vitae of Janvier Hakizimana
Sheila M. Wakeham, Associate AIA, EDAC, CDT

Education
Master of Science in Design, Healthcare and Healing Environments, (Receding Trends Defense)
GPA 3.6 at Arizona State University. The Herberger Institute for Design and the Arts, The Design School, Tempe, Arizona
Committee: John Takahara and Mark Patterson (Co-Chair), and Peter Wolf
Thesis: Post Occupancy Evaluation of the existing built environment of the Ngerulmard Health Center’s education facility space in, woodland, Alaska

This defense includes a post occupancy evaluation of the current space and its use by the surrounding community. The education of the community is of utmost importance in promoting healthcare and preventing communicable diseases and illnesses. The intent of this thesis is to determine if the healthcare center has met the design intent and is conducive to learning. To acquiring this information an extensive literature review, a thorough investigation into the original design documents, a survey of the staff and users of the facility, and site observations will be reviewed and the successes and failures of the facility will be documented.

Bachelor of Business Administration, Management, (December 1996)
Concordia College - Michigan

Associate in Applied Science Degree, Drafting CAD Technology and Architecture, (December 1994)
GPR 3.9 at Ivy Tech Community College - Indiana.

Research Experience
- Received AIA Travel Grant to attend research in India, 2010

Service Planning
- Board of Directors, ADAC 2011

Conferences
- AIA Conference on Education (2011)
- American Institute of Architects (2012)

Sustainability
- Anti-Trump Protests (2017)

Other


Design, Based on Evidence and Research!

Sheila M. Wakeham, Associate AIA, EDAC, CDT

Research Experience
- Research Assistant for the Director of the Healthcare and Housing Environment Initiative at Arizona State University. Research areas in health conditions in Arizona, existing Arizona healthcare facilities and protocols. Completed post occupancy evaluation literature in peer reviewed journals.

Related Work Experience
- Davenport Group Ltd. Architects (September 2011 to September 2013)
- Project Captain/Architect - Sheraton Atlantic Medical Center ($450,000,000 Acute Care Hospital) Project in the Construction Administration of the Phase 2 and 3 portion of the hospital.
- Gendron (March 2007 to July 2010)
- Project Captain/Architect - The Wellness Community / Teen Center (230,000 sq. ft. addition). Involved in the design of the new building of the Wellness Center. Teen Center. A place of support where cancer survivors, teenagers, and families learn to cope with their diagnosis and grow with their families.
- Bank of America, Retail Group (2011) and Bank of America in Nevada and Arizona. Each project averaged over $100 Million in architectural fees ($400 sq. ft.)

F & R Associates LLC (SKA) Pre-Construction Engineer (June 2005 to March 2007)
- 7454 East McDonald Drive, Scottsdale, Arizona 85251, USA
- Work Phone: (480) 922-6854

Construction Administration - Tendered to RFQ's, Change Orders, Shop Drawings and Coordination Issues with Contractors by Interpreting the “Design Intent.” Completed Site Observation with field engineering for the completion of the assorted work.

Cope Architects and Engineers (2005 to April 2007)
- 3510 North South Palms Court, Suite 400, Newport Beach, California 92660
- Work Phone: (714) 962-4077

Pamela Manager - Gained permits and facilitated project approval for commercial, industrial, and institutional projects. Research agency requirements and procedures as needed and leading the project process, assuring schedule compliance and coordination with owners, architects, engineers, and sub consultants involved.

Project Captain and Construction Manager on the following Projects:
- Chelan Health Partners, Inc. Methodist Hospital and Cancer Center - New Dialysis Unit to replace the existing outdated facility. This $1,000,000 project updated the equipment and renovated the existing 80,000 square foot space to allow for more patient and staff space through space planning.

The new units are now more efficient and easier to access. This project was constructed in phases to allow for owner occupation at all times with small areas being shut down at the work progressed.

Healthcare Design based on Evidence and Research!
Sheila M. Wakeham, Associate AIA, EDAC, COO

CONFERENCE PRESENTATIONS
- Co-Hafdiaz: "Workshop on Evidence-Based Design" at EDAC for AIA Advisory Board and other Invited, Phoenix, AZ 2011
- Co-Facilitated Workshops on "How to Conduct Research for AIA Advisory Board and other Invitations, Phoenix, AZ 3010"

GRANTS
2011: Assisted with the Mickey & Diane Foundation grant proposal for AIA and Matzendo New Mexico Healthcare Initiative in Ruidoso, New Mexico

PROFESSIONAL DEVELOPMENTS
- LMD Firm Associate - in process
- NCARB CIDT - in process (Registered Architect Exams)
- Evidence-based Design and Accreditation Certification (EDAC)
- Construction Specifications Institute (CSI) Certified Document Technician
- American Design Drafting Association (ADD) Certified and Registered Drafter

PROFESSIONAL MEMBERSHIPS AND ACTIVITIES
- American Institute of Architects (AIA) - Associate Member
- United States Green Building Council (USGBC), Arizona Chapter Member
- Environmental Design Research Association (EDRA)

HEROIC AND HONORS
- PFI-6000 Phi 2012 AIA Chapter Award
- PFI-6000 Phi Honor Society (2011)
- San and Anaheim Scholarship (2012)
- Community Service Award from Honor Architects and Engineers (2009)
- Capital City Seventh Day Adventist School Advisory Board for Assistance in Building Program (2009)
- Distinguished Alumnus Award, Ivy Tech State (1998)
- Construction Specifications Institute Presidents Appreciation Award for Outstanding Service to Publicity Chair (1998)
- Continuing Education Award from Honor Architects and Engineers (1996)
- Ivy Tech State College Distinguished Alumnus (1998)

VOLUNTEER/COMMITTEES
- AIA/Master of Science in Design - Co-Chair and founding member of Student Organization 2012

Healthcare Design, based on Evidence and Research
CURRICULUM VITAE

IDENTIFICATION
Surname: Kayirangwa
First Names: NAZIMANA
Age: 32
Contact: (786-784-8693)
Sex: Male
Marital Status: Married
Nationality: Rwandese

EDUCATIONAL BACKGROUND
- 2008-2010: Advanced diploma course in nursing sciences at Kagali Health Institute
- 1999-2002: Nursing A2 in Groupe Scolaire Officiel B (UFOB)
- 1996-1998: Classe secondaire A (PDC)
- 1986-1992: Primary school at KABABUYE

Personal Experience and Training attended:
1. From 2002-2005 nurse in private clinic at RURUMA/RURETO (MAGC)
2. From 2005-2008 nurse in MAYAGYE HC
3. From 2010 until now Head of NGERUMA HC
4. Training on leadership

Personal information:
1. Ability to work under pressure
2. Self-driven and strong willingness
3. Honest, eager and willing to learn
4. Spirit of team work

SKILLS
- Linux (Ubuntu), Windows, Microsoft Word, Microsoft Excel, Microsoft PowerPoint, Lotus Notes (presentation software), Adobe Acrobat Pro

LinkedIn Profile: http://www.linkedin.com/in/nazimananazimana
Workshop attended:
1. Discussing about HIV/AIDS Presentation and Treatment
2. Training on how to care for people with HIV/AIDS
3. Training on custom care provided by BPRI on how to welcome customs and good servicing.

Other Skills:
1. Computer (Ms Word, Ms Excel, Ms Power Point)

Language Skills:
1. French : Excellent
2. Kiswahili : Excellent
3. English : Good
4. English : Fair

Hobbies:
- Reading
- Singing
- Play Volley ball

References:
GACOMBE (Berlin)
Acacia Project in BUJESERA DISTRICT
Phone: (203) 7889039

I hereby certify that the above information are true, complete and correct to the best my knowledge.
Done at Nigeria 31st November 2012
Janvier KIZIMARA
ARIZONA STATE UNIVERSITY LETTER OF RECOMMENDATION

Rwanda National Ethics Committee
Boulevard de l'Heurquette, a trois cent mètres de l'hôpital de la police a Kacyiru
P.O. Box 64, Kigali – RWANDA
Ms. Valentine Ingabire, Administrator
E-mail: mg.ingabire@yahoo.com
Tel: +250 250 55 10 10 84

Re: Recommendation Letter for Sheila M. Wakelom
6 November 2012

Dear Chair Person, RHEC:

I would like to recommend Sheila M. Wakelom, a Master of Science in Design Graduate student at Arizona State University as a candidate to conduct field research at the Naguraka Health Center in Rwanda. Her academic record is at the top of her field. She has shown dedicated abilities in her previous work and believe she is an excellent researcher with humanitarian resolve.

Please extend this letter as a formal request to the Rwanda National Ethics Commitee to conduct field research. She has met the Exempt status requirement from the Institutional Review Board here in Arizona and the necessary training in conducting human subjects research.

Sincerely,

John H. Takamura Jr., IDSA
Associate Professor of Industrial Design
The Design School | The Herberger Institute for Design and the Arts
Arizona State University

INTRODUCTORY/AFFILIATION LETTER FROM THE DIRECTOR OF THE NATIONAL UNIVERSITY OF RWANDA'S SCHOOL OF PUBLIC HEALTH

National University of Rwanda
Université Nationale du Rwanda

SCHOOL OF PUBLIC HEALTH
ECOLE DE SANTE PUBLIQUE

Ref: 345/SPH/3278/38PH
15th November 2012

Re: Letter of Support for Sheila M. Wakelom

This letter serves to provide affiliation to Ms. Sheila M. Wakelom, a Master of Science in Design student at Arizona State University, Arizona, USA. She is currently undertaking her Master’s thesis and is requesting to do her research in Rwanda. Her research title is “Post-Occupancy Evaluation of the Education Spaces at the Naguraka Health Centre in Rwanda” and has the aim of evaluating the existing built environment of the education space provided in the health facility to determine if the design intent was met and if the facility’s education space was accepted and used by the communities and participants it serves.

The National University of Rwanda/ School of Public Health accepts to provide affiliational support and has assigned a co-supervisor to oversee the study in Rwanda; however, she fulfills all other requirements to conduct research in Rwanda. This study promises to provide informative data on how health center’s learning spaces are responsive to the purposes they were built for as a way of serving the community health educational needs as regards health promotion and disease prevention.

Ms. Wakelom has received Ethical Review exemption from Arizona University as well as a recommendation letter from her supervisor in Arizona.

Please accord her every assistance possible as she endeavors to carry out this study.

Sincerely,

Prof. KAKOMA Jean Baptiste
Director,
National University of Rwanda/ School of Public Health

Excellence in Education and Service to the People
Proof of payment for RBC study review as required for approval.

APPENDIX

All RBC Research Proposal Appendices as listed in the index appear in the thesis Appendix and will not be duplicated here.
Institutions proposed for research affiliation purposes in Rwanda

Prime minister’s office
www.primministe.gov.rw

Ministry of natural resources
www.minmar.gov.rw

Ministry of finance and economic planning
www.minocfin.gov.rw

Ministry of agriculture and animal resources
www.minagri.gov.rw

Ministry of education
www.mineduc.gov.rw

Ministry of health
www.moh.gov.rw

Ministry of justice
www.minjust.gov.rw

Ministry of foreign affairs and cooperation
www.minoffet.gov.rw

Ministry of gender and family promotion
www.min gepof.gov.rw

Ministry of Infrastructure
www.mininfra.gov.rw

www.minagri.gov.rw

Ministry of Internal security
www.mininter.gov.rw

Ministry of east african community
www.minaec.gov.rw

Ministry of disaster management and refugee affairs
www.midimar.gov.rw

Ministry of cabinet affairs
www.minisaf.gov.rw

Ministry of local government
www.minalgc.gov.rw
Ministry of public service and labor
www.masitra.gov.rw

Ministry of trade and industry
www.minicom.gov.rw

Ministry of sports and culture
www.minispcox.gov.rw

Ministry of youth and lot
www.minyyol.gov.rw

Ministry in the office of the president
minisp@apr.gov.rw

Rwanda National Police
http://www.police.gov.rw/

Government Agencies
Rwanda Revenue Authority
http://www.rera.gov.rw/

Rwanda Development Board (RDB)
http://www.rdb.rw/

Rwanda Directorate General of Immigration and Emigration
http://www.ejiguation.gov.rw/

Rwanda National Unity and Reconciliation Commission
http://www.muruc.gov.rw

Rwanda Social Security Board
www.rssb.rw

Rwanda Education Board (REB)
www.reb.rw/

National Electoral Commission
http://www.comelec.gov.rw

National Commission for Fight against Genocide (CNLG)
www.cnlg.gov.rw

Research and Development Agencies
Rwanda Agricultural Board (RAB)
www.minagri.gov.rw

Rwanda Governance Board (RGB)
www.rgb.rw

Rwanda Institute of Policy Analysis (IPAR)
www.ipar-rwanda.org

Institute of Research and Dialogue for Peace (IRDIP)
www.irdip.rw/

Rwanda National Institute of Statistics (RNSI)
www.statistics.gov.rw

Institute of Research Science and Technology (IRST)
irst@irst.rw
Private Sector Federation
http://www.psrf.org.rw/

Higher Learning Institutions
National University of Rwanda (NUR), www.nur.ac.rw
Kigali Institute of Education/NIE, www.kie.ac.rw
School of Finance and Banking/SFB, www.sfb.ac.rw
Higher Institute of Agriculture and Animal Husbandry/SIAA, www.siaa.ac.rw
Kigali Institute of Science and Technology/KIST, www.kist.ac.rw
Institut Polytechnique de Byumba/IPB, www.ipb.ac.rw
Umurara Polytechnique/UP, www.umurarapolitech.ac.rw
Kigali Health Institute/KHI, www.khi.ac.rw
Institut d’Enseignement Supérieur de Ruhengeri/INES-RUHENGWEL, www.ines.ac.rw
Adventist University of Central Africa/NUCA, www.nuca.ac.rw
Kigali Independent University/IKI, www.sikh.kigali.net
Independent Institute of Lay Adventist of Kigali/INILAK, www.inilak.ac.rw
Kigali Institute of Management/KIM,
info@kilimwanda.com.com
Rwanda Tourism University College/RTUCC,
www.rtuc.rw
Institute of Agriculture, Technology and Education of Kibungo/IMATEK,
www.imatek.ac.rw

Catholic University of Rwanda/CUR,
info@cur.ac.rw
Protestant Institute of Arts and Social Sciences/PIASS
piaas.ac.rw
Institute of Legal Practice and Development/ILPD
www.ilpd.ac.rw
Institut Supérieur Pédagogique de Gitwe/SIPG
ispg-gtwe.org
Catholic Institute of Kibuye/ICK
ick.ac.rw

Others: NGOs (to be considered on their own merit)
APPENDIX I
LETTERS TO THE MINISTRY OF EDUCATION TO REQUEST TO CONDUCT
A POST OCCUPANCY EVALUATION OF THE EDUCATION SPACES AT THE
NGERUKA HEALTH CENTER IN RWANDA
Republic of Rwanda
Ministry of Education (MINEDUC)
P.O. Box 622, Kigali – RWANDA
Hon. Minister of Education

Re.: Request Letter to Conduct a Post Occupancy Evaluation of the Education Spaces at
the Ngenzika Health Center in Rwanda

20 November 2012

Dear Hon. Minister of Education,

I would like to request research permission for my Master’s Thesis at Arizona State University. The research consists of data collection and analysis to be conducted at the Ngenzika Health Center in the Kigali District of Rwanda. I am asking to conduct a Post Occupancy Evaluation (POE) of the Education Spaces at the Health Center itself. The protocol was submitted and approved by the Institutional Review Board (IRB) at Arizona State University and was given “Exempt” status due to its non-invasive nature.

My concentration for my Master’s is Healthcare and Healing Environments. I have worked in the field of architecture for eighteen years and have developed a passion for healthcare design research and the built environment. This requested research focuses on the built environment and its relationship to healing.

I plan on examining the existing building and talking with the staff and classroom participants on a completely anonymous basis about the education rooms and spaces at the facility. In a POE, one of the first questions I will ask is whether or not the design intention of the Owner and Architect were met and then to document the successes and failures for future healthcare facility designs. I will conduct this research over a period of no longer than five days. I intend to begin my research between the 20th of November 2012 and the 3rd December 2012.

Thank you for your consideration and time in this research proposal. If there is anything else your office requires or further understanding I can provide please let me know and I will have it to you as early as possible.

Sincerely,

Sheila M. Wakelam, Assoc. AIA, EDAC
Arizona State University | The Design School
The Herberger Institute for Design and the Arts
Master of Science in Design/Thesis
Healthcare Design & Healing Environments
http://www.jenknope.com/shila/wakelam
wakelam@asu.edu

John H. Takamura Jr., IDSA
Associate Professor of Industrial Design
The Design School | The Herberger Institute for Design and the Arts
Arizona State University

Director of Design
GlobalResolve™
Arizona State University
P.O. Box 871305 | Tempe, AZ | 85287-1606
480.965.7717
APPENDIX J

REPUBLIC OF RWANDA, MINISTRY OF EDUCATION (MINEDUC)

APPLICATION FOR AUTHORITY TO CONDUCT RESEARCH IN RWANDA
Application for Authority to Conduct Research in Rwanda

PART I (Please read the Rules and Regulations hereby appended)

1. Applications should be made a minimum of 3 months prior to the proposed start date of the research. All researchers conducting research in Rwanda are required to have an affiliation with a relevant body in the country prior to submitting the application to the Director General of Science, Technology and Research in the Ministry of Education. Research clearance will be granted for up to 1 year renewable for a further 2 years.

2. The research clearance application form must be accompanied by the following:

i. Comprehensive curriculum vitae of all the applicants
ii. A comprehensive project proposal, including details of objectives, hypothesis, methodology, literature review, state the duration of the research (start and end dates) specifying where the research will take place, copies of all questionnaires/informed consent forms/description of expanded methodologies and testing procedures where required and envisaged application of the research results
iii. A letter from the sponsor (if any)
iv. Two current passport size photographs and a copy of the passport
v. Affiliation confirmation letter
vi. A recommendation letter from your home university
vii. A clearance from Rwanda National Ethics Committee (if necessary)

PART II (to be completed by the applicant)

1. Personal Information

i) Surname or project leader: .................................................................

ii) Other names: Translator: KABABINEZA Emmanuel

iii) Passport No: 214281208 ....... Date of issue 12 June 2004 ... Expiry Date 11 July 2014

2. Permanent Residential Address: 6434 S. 23rd Drive, Phoenix, Arizona, 85041 USA

3. Postal Address: 6434 S. 23rd Drive, Phoenix, Arizona, 85041 USA

4. Address while staying in Rwanda: Ruhengeri Guesthouse, Ruhengeri (Kigali)

5. Telephone contact while staying in Rwanda: +1 202 7860925

6. Age: .................................................................

7. Sex: Female

8. Nationality: USA

9. Qualifications: Master’s Student at Arizona State University, Institutional Review Board (IRB) certified

10. Personal references:

   (give names and full addresses of two senior academic/professional referees. These should be professionally qualified in the same field of research which the applicants wishes to undertake)

1. Name: Prof. John Takemura

   Address: Arizona State University, The Design School, P.O. Box 871605, Tempe, Arizona 85287 USA

   Occupation: Associate Professor and Director of Global Resea

   Contacts Tel: +1 480 965-7171 ....... email: john.takemura@asu.edu

   Date: 13, November 2002

   Referee’s signature: .................................................................

2. Name: Prof. Peter Wolf

   Address: Arizona State University, The Design School, P.O. Box 871605, Tempe, Arizona 85287 USA

   Occupation: Lecturer

   Contacts: Tel: +1 602 499-1474 ....... email: jwolf@exchange.asu.edu

   Date: 13, November 2002

   Referee’s signature: .................................................................
3. Have you applied for a permit to conduct research in Rwanda before? Yes ☑

4. Have you sought affiliation with a Rwandan Institution approved for affiliation purposes?
   Yes No If yes, please give a name of institution

Contact person's name at affiliating institution

Person's address at affiliating institution

Attach confirmation letter of affiliation.

If No, you should seek research affiliation with a relevant approved Rwandan Institution and provide names of the Institution (a list of Institutions approved for affiliation is appended).

5. Name of University/Organization under which the research project is being undertaken

6. Sources of Finance
   Research is funded entirely by student
   Amount $7,000.00

7. Title of the research project
   Post Occupancy Evaluation of the Education Spaces at the Nyanza Health Centre in Rwanda

8. Purpose of the research (e.g. MSc., PhD., Post-Doctoral, others specify)
   Master of Science in Design, Healthcare and Healing Environments

9. Location of Fieldwork:
   Sector: Nyanza
   District: Bujora

10. Estimated period of the project:
    From 19 November 2012 to 23 November 2012

11. I will need access to the following public records:
    Any health records that might show an increase or a decrease in patients in this area for preventable diseases or illnesses. Checking for indications that the health education taught in the health center has decreased from previous years. The records should have no means of identifying patients.

12. I will interview the following government officials:
    Currently, I have no known reason to interview government officials.

I will need to interview members of the public whom I will select as follows:
    Any interview will be on a follow-up to the questionnaires for better understanding of their responses.

14. I intend to use the attached copies of questionnaires (if applicable) Translated to Kingara & French Informant Consent, Cover Letter, Participant Engagement Questionnaire, Dedicated Education Space Questionnaire for Staff, Administration Checklist, Post Occupancy Evaluation to be Completed by Staff.

15. Publication planned as result of this research
   Master's Thesis and possible Conference Invitation

16. Field/Topical special area that can be presented by researchers
PART IV (for official use only)

1. Comments by DSTR Research Committee

Date .......................................... Chairman of the Committee ..........................................

2. Recommendations by Research Committee

Date .......................................... Chairman, DSTR Research Committee .............................

3. Approved/Not approved/Recommended for Ethics Committee Approval

Date .......................................... Chairman, DSTR Research Committee .............................

(If approved, please append here with final proposed Affiliate Institutions)
REPUBLIC OF RWANDA

Kigali, 8/6/2012
No. 5304/12.00/2012

MINISTRY OF EDUCATION
P.O. BOX 622 KIGALI

Sheila Wakelam
Master's Student,
Arizona State University
Design School
Herberger Institute for Design and Arts
6434 S. 23rd, Phoenix, Arizona, 85041 USA

RE: Approval to conduct research in Rwanda under the project title: "Post Occupancy evaluation of the Education Spaces at the Ngeruka Health Center".

Dear Mrs. Sheila Wakelam,

Following your letter of 20th November 2012 requesting for permission to conduct research, I am pleased to attach a copy of research clearance which has been granted to you to conduct research on the above project title. I wish to remind you that the research permit number should be cited in your final research report. The research should be carried out under the affiliation of the National University of Rwanda School of Public Health (NUR SPH) under the supervision of Prof. Kakoma Jean Baptiste. Also a copy of the final research report is to be given to the Ministry of Education of Rwanda. I wish you success in your research study.

Dr. Marie Christine Basaboseva
Director General Science, Technology and Research
Ministry of Education

Cc:
- Hon. Minister of Education
- Hon. Minister of State in Charge of Primary and Secondary Education
- Permanent Secretary, Ministry of Education
- Advisor, Science and Technology, Ministry of Education
- Prof. Kakoma Jean Baptiste, Director NUR SPH
- Prof. Silas Lwakabamba, Rector, NUR
APPENDIX L

REPUBLIC OF RWANDA MINISTRY OF EDUCATION

RESEARCH CLEARANCE
REPUBLIC OF RWANDA

MINISTRY OF EDUCATION
P.O.BOX 622 KIGALI

Permission to Research in Rwanda

No: MINEDUC/S&T/00108/2012

The Permission is hereby granted to Sheila Wakelam, of the Arizona State University, USA, to conduct her research on: “Post Occupancy evaluation of the Education Spaces at the Ngeruka Health Center”.

The research will be carried out in Ngeruka Health Centre located in Ngeruka Sector, Bugesera District.

The research will be carried out for a period beginning 27th November to 8th December 2012.

The reference number of this letter shall be cited in the final research report as follows:

‘Research conducted under permission No: MINEDUC/S&T/00108/2012’

Please allow Sheila Wakelam any help and support she might require to conduct this Research.

Yours sincerely,

Dr. Marie Christine Gasingira
Director General Science Technology and Research
Ministry of Education

Kigali, 26/11/2012
APPENDIX M

NATIONAL UNIVERSITY OF RWANDA SCHOOL OF PUBLIC HEALTH

AFFILIATION LETTER
Re: Letter of Support for Sheila M. Wakelam

This letter serves to provide affiliation to Ms. Sheila M. Wakelam, a Master of Science in Design student at Arizona State University, Arizona, USA. She is currently undertaking her Master’s thesis and is requesting to do her research in Rwanda. Her research title is ‘Post Occupancy Evaluation of the Education Spaces at the Nyenroka Health Centre in Rwanda’ and has the aim of evaluating the existing built environment of the education space provided in the health facility to determine if the design intent was met and if the facility’s education space is accepted and used by the communities and participants it serves.

The National University of Rwanda/ School of Public Health accepts to provide affiliational support and has assigned a co-supervisor to oversee the study in Rwanda once she fulfils all other requirements to conduct research in Rwanda. This study promises to provide informative data on how health centre’s learning spaces are responsive to the purposes they were built for as a way of serving the community health educational needs as regards health promotion and disease prevention.

Ms. Wakelam has received Ethical Review exemption from Arizona University as well as a recommendation letter from her supervisor in Arizona.

Please accord her every assistance possible as she endeavours to carry out this study.

Sincerely,

Prof. KAKOMA Jean Baptiste
Director,
National University of Rwanda/
School of Public Health

Excellence in Education and Service to the People
APPENDIX N

RWANDA WORKS RESEARCH LOCATION APPROVAL
Hi James,

Thanks for the follow-up email. I just had the chance to talk with Josh about this last night, and we both agreed that we’d love for her to come do her research on the educational space in one of our health centers (and in the future, we’re also particularly interested in a potential collaboration wherein you and a whole team do a full design template for our facilities). In terms of getting her here, I know that she needs funding for her air travel and unfortunately, we are sadly really not in a place right now where we have any extra wiggle room in our budget to fund her air travel. However, I had another idea: I know you mentioned the school was willing to fund her room and board. We could put her up in a comfortable house (with some other expats) during her time here so that her room is covered, and perhaps that way the University could put funds towards her air travel instead. A hotel here costs a minimum of $60/night, for a total of $420/week, or about a third of her air travel. What do you think? Let’s discuss, as we’d appreciate her input and contribution and would be thrilled to serve as her research location, if we can make it work.

All best,
Grace

---

Grace Lesser

Rwanda Works
grace@rwandaworks.com
+250 (0) 78 839 1295
Skype: gracelesser
APPENDIX O

COVER AND INFORMATION LETTER
COVER AND INFORMATION LETTER

POST OCCUPANCY EVALUATION OF THE EDUCATION SPACES
AT THE NGERUKA HEALTH CENTER IN RWANDA

Date:

Dear Participant:

I am a graduate student under the direction of Professor John H. Takamura from The Design School at Arizona State University. I am conducting a research study to evaluate the Ngeruka Health Center’s, education space regarding the built environment and its relationship to healing.

I am inviting your participation, which will involve anonymously completing a questionnaire and a follow-up interview that should not take more than twenty minutes of your time. I will be observing the classes as they are being conducted and will use audio recorder for translation purposes to anonymously record participant responses during the class. There will be no identification taken or given to any participants in these recordings. The audio will be destroyed in one year from the date of recording. Please let me know if you do not want the interview to be recorded; you also can change your mind after the interview starts, just let me know.

Your participation in this study is voluntary. You can skip questions if you wish. If you choose not to participate or to withdraw from the study at any time, there will be no penalty. You must be 18 or older to participate in the study.

The benefits of your participation in this study is to learn how we can design future education spaces within these types of facilities to encourage optimal learning which is intended to lessen the occurrence of many preventable diseases and illnesses. There are no foreseeable risks or discomforts to your participation.

I will not be taking your name or any identifiable information during this research. Your responses will be anonymous. If you choose not to participate in any group discussions please let me know as I cannot speak to the confidentiality of the group. The results of this study may be used in reports, presentations, or publications but your name will not be known.

If you have any questions concerning the research study, please contact the research team at: John H. Takamura (John.Takamura@asu.edu) or Sheila M. Wakelam (swakelam@asu.edu). If you have any questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact the Chair of the Human Subjects Institutional Review Board, through the ASU Office of Research Integrity and Assurance, at +1 (480) 965-6788.

Return of the questionnaire will be considered your consent to participate.

Sincerely,

Sheila M. Wakelam
MSD, Healthcare and Healing Environments
Informed Consent Form

POST OCCUPANCY EVALUATION OF THE EDUCATION SPACES
AT THE NGERUKA HEALTH CENTER IN RWANDA

The purposes of this form are to provide you (as a prospective research study participant) information that may affect your decision as to whether or not to participate in this research and to record the consent of those who agree to be involved in the study.

The researchers; Professor John H. Takamura, Principal Investigator myself, Sheila M. Wakelam, Co-Investigator from The Design School at Arizona State University has invited your participation in a research study.

The purpose of this research is to better understand and evaluate the existing built environment of the education space provided in the Ngeruka Health Center to determine if the design intent was met. If the education space is used and accepted by the surrounding communities it should be lessening the amount of patients admitted to healthcare facilities for preventable illnesses and diseases.

If you decide to participate, then you will join a study involving research of the built environment and its relationship to healing. I am inviting your participation, which will involve anonymously completing a questionnaire and a follow-up interview that should not take more than twenty minutes of your time. I will be observing the classes as they are being conducted and will use audio and video equipment to further observe participant behavior during the class. No names or means of identifying the participants will be used during this research.

There are no known risks from taking part in this study, but in any research, there is some possibility that you may be subject to risks that have not yet been identified. If the researchers find new information during the study that would reasonably change your decision about participating, then they will provide this information to you.

The benefits of your participation in this study is to learn how we can learn to design future education spaces within these types of facilities and to encourage optimal learning which is intended to lessen the occurrence of many preventable diseases and illnesses.

All information obtained in this study is strictly confidential. The results of this research study may be used in reports, presentations, and publications, but the researchers will not identify you. In order to maintain confidentiality of your records, Sheila M. Wakelam will not take any names or identifying information. All information will be kept in a secured brief case while in Rwanda and secured in a locked file cabinet in Arizona. For reporting purposes subject codes will be assigned anonymously while preparing the research. All information obtained in this study is strictly confidential. The audio tapes will be destroyed in one year from the date of report and the written questionnaires will be shredded one year from date of report.

Participation in this study is completely voluntary. It is ok for you to say no. Even if you say yes now, you are free to say no later, and withdraw from the study at any time. There is no payment for your participation in the study.
Any questions you have concerning the research study or your participation in the study, before or after your consent, will be answered by Principal Investigator, John H. Takamura, Arizona State University, P.O Box 872105, Tempe, AZ 85287-2105, Mail Code: 1605, Tele. +1 (480)965-7171, E-mail: John.Takamura@asu.edu or Co-Investigator, Sheila M. Wakelam at E-mail: swakelam@asu.edu.

If you have questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk; you can contact the Chair of the Human Subjects Institutional Review Board, through the ASU Office of Research Integrity and Assurance, at 480-965 6788.

This form explains the nature, demands, benefits and any risk of the project. By signing this form you agree knowingly to assume any risks involved. Remember, your participation is voluntary. You may choose not to participate or to withdraw your consent and discontinue participation at any time without penalty or loss of benefit. In signing this consent form, you are not waiving any legal claims, rights, or remedies. A copy of this consent form will be provided upon request.

Your signature below indicates that you consent to participate in the above study. By signing below, you are granting to the researchers the right to use the video tape to record activities in the classroom and then code the results anonymously – and your image and name will not be used for presenting or publishing the results of this research.

Subject's Signature       Printed Name       Date

INVESTIGATOR'S STATEMENT
"I certify that I have explained to the above individual the nature and purpose, the potential benefits and possible risks associated with participation in this research study, have answered any questions that have been raised, and have witnessed the above signature. These elements of Informed Consent conform to the Assurance given by Arizona State University to the Office for Human Research Protections to protect the rights of human subjects. I have provided (offered) the subject/participant a copy of this signed consent document."

Signature of Investigator       Date

ARIZONA STATE UNIVERSITY IRB
APPROVED BY IRB
DATE: 10/1/13
NAME: [Signature]
NGERUKA EDUCATION PARTICIPANTS ENGAGEMENT QUESTIONNAIRE (English)

Thank you for your participation in this questionnaire regarding your experience at the Ngeruka Health Center’s Education Space. These questions regarding your experience, feelings, beliefs, interactions and involvement in the education program will help to identify and better understand how the center functions and how you feel about the learning environment. We want to better understand your needs as a user of this facility and your likes and dislikes about the facility. **Your responses are totally anonymous so please answer thoughtfully and honestly.**

1. Have you ever attended any school? (Please circle the correct response). 
   - Yes
   - No

2. If yes what was your highest level attained? (Please respond with the correct numeric value i.e. if you reached the 5th level please indicate by noting the number 5 on the line to the right). 
   - 

3. Are you attending school at this time? (Please circle the correct response) 
   - Yes
   - No

4. Are you employed outside your home and property? (Meaning: Do you work for someone else?) 
   - Yes
   - No

5. What sex/gender are you? (Please circle the correct response) 
   - Male
   - Female

6. Are you married? (Please circle the correct response) 
   - Yes
   - No

7. Do you have children? (Please circle the correct response) 
   - Yes
   - No
   a. How old are they? 
   - 
   b. Who takes care of them when you are in this class? 
   - 

8. Why are you attending classes here? 
   - 

9. How did you learn about these classes? (Word of mouth, advertisement, invitation, doctor’s orders... etc.) 
   - 

10. What is your age range? (Please circle the correct response)

<table>
<thead>
<tr>
<th>Age Range</th>
<th>18 – 22 years of age</th>
<th>23 – 27 years of age</th>
<th>28 – 32 years of age</th>
<th>33 – 37 years of age</th>
<th>38 – 42 years of age</th>
<th>43 – 47 years of age</th>
<th>48 – 52 years of age</th>
<th>53 – 57 years of age</th>
<th>58 or Older</th>
</tr>
</thead>
</table>

1
11. How often do you come to Ngeruka Health Center? (How many times a year?) ________________

12. Do you come for healthcare treatment or service and afterwards attend educational sessions? (Please circle the correct response) Yes No

13. Do you ever come to this Center just to attend classes? Yes No (Please circle the correct response)

14. Where do you live? _______________________ How far is that from the Health Center? __________

15. How do you get to the health center? (walk, drive, bicycle, bus, taxi) ________________

16. Regarding how long the classes that you have taken please answer the following questions.

   a. How much time do you spend in a class? (please respond in hours) ________ Hours

   b. Do classes take more than one day to complete? Yes No

17. What classes have you participated in here at the Ngeruka Health Center?

   __________________________________________________________
   __________________________________________________________

18. What classes would you like to participate in or see here at the center? (Name at least two)

   __________________________________________________________
   __________________________________________________________

19. Would you recommend these classes to friends or family? Yes No

20. How would you rate your experience regarding the classes here? (Select one answer please circle your correct answer)

   EXCELLENT    GOOD    FAIR    POOR

21. Will you return if future classes are offered? Yes No

22. Does it cost anything to attend these classes? Yes No

23. If it does cost, how much does it cost?
   a. Who paid for the class? __________________________________________
   2
24. How do you feel about the following statements related to the education space at Ngeruka Health Center? (Select one answer for each statement; please circle your correct answer)

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Overall, I feel good about learning in these classes.</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
<td>AGREE</td>
</tr>
<tr>
<td>b. I care about this facility.</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
<td>AGREE</td>
</tr>
<tr>
<td>c. I feel safe here.</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
<td>AGREE</td>
</tr>
<tr>
<td>d. I am treated fairly in this facility.</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
<td>AGREE</td>
</tr>
<tr>
<td>e. I have a voice in the classroom and am encouraged to participate.</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
<td>AGREE</td>
</tr>
<tr>
<td>f. The teachers care about us (the participants).</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
<td>AGREE</td>
</tr>
<tr>
<td>g. I feel welcome to return for future classes.</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
<td>AGREE</td>
</tr>
<tr>
<td>h. The classroom is well designed.</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
<td>AGREE</td>
</tr>
<tr>
<td>i. The classroom was the right size for the class.</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
<td>AGREE</td>
</tr>
<tr>
<td>j. The furniture provided is comfortable.</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
<td>AGREE</td>
</tr>
<tr>
<td>k. The room temperature is comfortable.</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
<td>AGREE</td>
</tr>
<tr>
<td>l. The room lighting is appropriate.</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
<td>AGREE</td>
</tr>
<tr>
<td>m. The acoustics (sound quality) in the space is appropriate.</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
<td>AGREE</td>
</tr>
<tr>
<td>n. Overall I felt the information provided at the health center was valuable.</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
<td>AGREE</td>
</tr>
</tbody>
</table>
25. Please list three things you like about this facility.

1) 

2) 

3) 

26. Please list three things you dislike about this facility.

1) 

2) 

3) 

27. Please provide any additional information you feel is important and would better explain your opinions of the education space at the health center. Use the backside of this sheet if you need more space.

Thank you for your participation.

Respectfully,

Sheila Wakelam, Arizona State University, Master's Student
NGERUKA DEDICATED EDUCATION SPACE STAFF/ADMINISTRATORS QUESTIONNAIRE/INTERVIEW

I would like to know how well your building performs for all those who occupy and visit it. Specifically the spaces designated for education purposes. Successes and failures (if any) are considered insofar as they affect occupant health, safety, efficient functioning, learning, and psychological well-being. Your answers will help improve designs of future, similar buildings. *Your responses are totally anonymous so please answer thoughtfully and honestly.*

Below please identify successes and failures in the building by responding to the following broad information categories and by referring to documented evidence or specific building areas wherever possible. A floor plan of the facility is provided for reference indicating the education space and adjacencies:

1. Adequacy (meeting the needs) of Overall Design Concept as used for the purposes of education.

2. Adequacy (meeting the needs) of Site Design as it interacts with the education spaces (Exterior campus).

3. Adequacy (meeting the needs) of Health/Safety Provisions.

4. Adequacy (meeting the needs) of Security Provisions.

5. Attractiveness of Exterior Appearance of buildings.

6. Attractiveness of Interior Appearance.

7. Adequacy (meeting the needs) of Activity Spaces (spaces for demonstrations, cooking, crafts, etc.).

8. Adequacy (meeting the needs) of Spatial Relationships (are the spaces where they need to be to function properly).
9. Adequacy (meeting the needs) of Circulation Area, e.g., lobby, hallways, stairs, etc. (ease of getting around).

10. Adequacy (meeting the needs) of Heating/ Cooling (climate controls) and Ventilation.

11. Adequacy (meeting the needs) of Lighting and Acoustics (sound quality).

12. Adequacy (meeting the needs) of Plumbing/Electrical (sinks, toilets, electric requirements).

13. Adequacy (meeting the needs) of Surface Materials, e.g., floors, walls, ceilings, etc. (finishes; carpet, paint, fabric).

14. Are there Underutilized or Overcrowded Spaces?

15. Other, please specify: (e.g., needed facilities currently lacking).

16. What was your highest education level attained? (Please respond with the correct numeric value i.e. if you reached the 6th grade level please indicate by noting the number 6 on the line to the right).

17. Are you in school at this time? (Please circle the correct response) Yes  No

18. What sex/gender are you? (Please circle the correct response) Male  Female

19. What is your age range? (Please circle the correct response)

<table>
<thead>
<tr>
<th>Age Range</th>
<th>18 – 22 years of age</th>
<th>33 – 37 years of age</th>
<th>48 – 52 years of age</th>
</tr>
</thead>
<tbody>
<tr>
<td>23 – 27 years of age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28 – 32 years of age</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>43 – 47 years of age</td>
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<tr>
<td>53 – 57 years of age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>58 or Older</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
20. How long have you worked at the Ngeruka Health Center? ________________________________

a. What is your position at the health center? __________________________________________

21. Where do you live? ________________ How far is that from the Health Center? __________

22. Regarding the classes provided at the center.
   a. Do you teach any of them? (Please circle the correct response) Yes No
   b. What do you teach? ____________________________________________________________
   c. How often do you teach? ______________________________________________________

23. What other classes are taught at the Ngeruka Health Center?

_______________________________________________________________________________
_______________________________________________________________________________

24. What other classes would you like to provide in or see here at the center? (Name at least two)

_______________________________________________________________________________
_______________________________________________________________________________

25. Who pays for the classes? _______________________________________________________

26. Would you recommend these classes to a friend or family member? Yes No

27. How would you rate your experience regarding the teaching environment here? (Select one answer, please circle your correct answer)

<table>
<thead>
<tr>
<th>EXCELLENT</th>
<th>GOOD</th>
<th>FAIR</th>
<th>POOR</th>
</tr>
</thead>
</table>
28. How do you feel about the following statements related to the education space at Ngeruka Health Center?
(Select one answer for each statement; please circle your correct answer)

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Overall, I feel good about the classes offered.</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
<td>AGREE</td>
</tr>
<tr>
<td>b. I care about this facility.</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
<td>AGREE</td>
</tr>
<tr>
<td>c. I feel safe here.</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
<td>AGREE</td>
</tr>
<tr>
<td>d. I am treated fairly in this facility.</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
<td>AGREE</td>
</tr>
<tr>
<td>e. I am encouraged to provide suggestions to improve this facility whenever possible.</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
<td>AGREE</td>
</tr>
<tr>
<td>f. I care about the education of the communities we serve.</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
<td>AGREE</td>
</tr>
<tr>
<td>g. The facilities education space provides a welcoming environment.</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
<td>AGREE</td>
</tr>
<tr>
<td>h. The classroom is well designed.</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
<td>AGREE</td>
</tr>
<tr>
<td>i. The classroom was the right size for the class.</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
<td>AGREE</td>
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<td>j. The furniture provided is comfortable.</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
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<tr>
<td>k. The room temperature is comfortable.</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
<td>AGREE</td>
</tr>
<tr>
<td>l. The room lighting is appropriate.</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
<td>AGREE</td>
</tr>
<tr>
<td>m. The acoustics (sound quality) in the space is appropriate.</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
<td>AGREE</td>
</tr>
<tr>
<td>n. Overall I felt the information provided at the health center is valuable.</td>
<td>STRONGLY DISAGREE</td>
<td>DISAGREE</td>
<td>AGREE</td>
</tr>
</tbody>
</table>
29. Please list three things you like about the education space at the Health Center facility.

1) 

2) 

3) 

30. Please list three things you dislike about the education space at the Health Center facility.

1) 

2) 

3) 

31. Please provide any additional information you feel is important and would better explain your opinions of the education space at the health center. Use the backside of this sheet if you need more space.
NGERUKA HEALTH CENTER SITE PLAN (original drawings provided by Rwanda Works)

Please identify any area where the Health Center uses to teach patients and/or the community.
NGERUKA HEALTH CENTER DIMENSIONED FLOOR PLAN
(original drawings provided by Rwanda Works)
Use space below for additional comments.
NGERUKA HEALTH CENTER DEMONSTRATION KITCHEN FLOOR PLAN
(original drawings provided by Rwanda Works)
Use space below for additional comments.
ANGERUKA HEALTH CENTER ENLARGED FLOOR PLAN, INTERIOR EDUCATION SPACE

(original drawings provided by Rwanda Works)

Use space below for additional comments.
NGERUKA HEALTH CENTER ENLARGED FLOOR PLAN, EXTERIOR EDUCATION SPACE
(original drawings provided by Rwanda Works)
Use space below for additional comments.
NGERUKA HEALTH CENTER ENLARGED FLOOR PLAN, DEMONSTRATION KITCHEN SPACE
(original drawings provided by Rwanda Works)
Use space below for additional comments.
APPENDIX S

POST OCCUPANCY EVALUATION (POE) FORM TO BE COMPLETED BY STAFF
POST OCCUPANCY EVALUATION to be completed by STAFF

I wish to conduct a post-occupancy evaluation of your building. The purpose of this evaluation is to assess how well the building education spaces perform for those who occupy it in terms of health, safety, security, functionality, and psychological comfort. The benefits of a post-occupancy evaluation include: identification of good and bad performance aspects of the building, better building utilization, and feedback on how to improve future, similar buildings. Your responses are totally anonymous so please answer thoughtfully and honestly.

Please respond only to those questions of the following survey that are applicable to you. Indicate your answers by marking the appropriate blanks with an "X".

In an average work week, how many hours do you spend in the following (Please see attached plans for reference) types of spaces (specify):

Area indicated as the Interior Education Space
Area indicated as the Exterior Education Space
Area indicated as the Demonstration Kitchen Space

1. In an average work Week, how many hours do you spend in the following Spaces (specify):

Please indicate any other spaces as used in connection with the education function.

<table>
<thead>
<tr>
<th>HOURS</th>
<th>INTERIOR</th>
<th>EXTERIOR</th>
<th>KITCHEN</th>
<th>OTHER</th>
<th>IF OTHER, SPECIFY NAME OF SPACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 - 10</td>
<td></td>
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<tr>
<td>11 - 15</td>
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<tr>
<td>16 - 20</td>
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<td>21 - 25</td>
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<td>26 - 30</td>
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<td>31 - 40</td>
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<td>41 +</td>
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</tbody>
</table>

Additional comments:
KEY FOR THE FOLLOWING QUALITY RATINGS:

<table>
<thead>
<tr>
<th>EX</th>
<th>G</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
</table>

2. Please rate the **Overall Quality** of the following areas in the building. Please place a check (✓) in the corresponding box:

<table>
<thead>
<tr>
<th>NAME OF SPACE</th>
<th>EX</th>
<th>G</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interior Education Space</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exterior Education Space</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demonstration Kitchen Space</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public Toilets</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (Please specify other space)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Additional comments:
3. Please rate the overall quality of the **Interior Education Space** in terms of the following:

<table>
<thead>
<tr>
<th>Interior Education Space</th>
<th>EX</th>
<th>G</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adequacy (meets needs) of Space</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lighting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acoustics (sound quality)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Temperature (climate control)</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Odor (smells)</td>
<td></td>
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</tr>
<tr>
<td>Esthetic Appeal (attractiveness)</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Security</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Flexibility of Use</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other, specify</td>
<td></td>
<td></td>
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</tbody>
</table>

Additional comments:
4. Please rate the overall quality of the **Exterior Education Space** in terms of the following:

<table>
<thead>
<tr>
<th>Exterior Education Space</th>
<th>EX</th>
<th>G</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adequacy of Space</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lighting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acoustics</td>
<td></td>
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</tr>
<tr>
<td>Temperature</td>
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<tr>
<td>Odor</td>
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<tr>
<td>Esthetic Appeal</td>
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<tr>
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<tr>
<td>Flexibility of Use</td>
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</tr>
<tr>
<td>Other, specify</td>
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</tbody>
</table>

Additional comments:
5. Please rate the overall quality of the **Demonstration Kitchen Space** in terms of the following:

<table>
<thead>
<tr>
<th>Demonstration Kitchen Space</th>
<th>EX</th>
<th>G</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adequacy of Space</td>
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<tr>
<td>Lighting</td>
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<tr>
<td>Acoustics</td>
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<td>Temperature</td>
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<td>Odor</td>
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<tr>
<td>Esthetic Appeal</td>
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<td>Security</td>
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<tr>
<td>Flexibility of Use</td>
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<tr>
<td>Other, specify</td>
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</tbody>
</table>

Additional comments:
G. Please rate the overall quality of design in this building:

<table>
<thead>
<tr>
<th>OVERALL QUALITY OF DESIGN IN THIS BUILDING</th>
<th>EX</th>
<th>G</th>
<th>F</th>
<th>P</th>
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<tbody>
<tr>
<td>Esthetic quality of exterior</td>
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<tr>
<td>Esthetic quality of interior</td>
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<tr>
<td>Amount of space</td>
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<tr>
<td>Environmental quality (lighting, acoustics, temperature, etc.)</td>
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<td>Proximity to views</td>
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<tr>
<td>Adaptability to changing uses</td>
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<td>Security</td>
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<td>Safety</td>
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<td>Maintenance</td>
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<td>Relationship of spaces/layout</td>
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<tr>
<td>Quality of building materials</td>
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<tr>
<td>(1) Floors</td>
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<td>(2) Walls</td>
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<td>(3) Ceilings</td>
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<tr>
<td>Other, specify</td>
<td></td>
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</tr>
</tbody>
</table>

Additional comments:
7. Please select and rank in order of importance facilities which are currently lacking in your building:

8. Please make any other suggestion you wish for physical or managerial improvements in your building:

9. Your position at this facility: ________________________________________________________________

10. How long have you been at this facility? _____________________________________________________
NGERUKA HEALTH CENTER SITE PLAN
(original drawings provided by Rwanda Works)
Use space below for additional comments.
NGERUKA HEALTH CENTER DIMENSIONED FLOOR PLAN
(original drawings provided by Rwanda Works)
Use space below for additional comments.
APPENDIX T

ADMINISTRATOR CHECKLIST FOR CONDUCTING A POE AT THE NGERUKA
HEALTH CENTER EDUCATION SPACES
ADMINISTRATOR CHECKLIST FOR CONDUCTING A POE AT THE NGERUKA HEALTH CENTER'S EDUCATION SPACES:

(These items are needed from the Ngeruka Health Center to be provided and/or viewed before or during evaluation.)

CLIENT-RELATED INFORMATION

1. Provide mission statement, organizational chart, and staffing.
2. Initial program from building. Is this space being used as it was originally designed?
3. As-built floor plans (may require up-dating). Are they the same as the plans provided?
4. Space assignments and schedules of education spaces. Please indicate on plan.
5. Building-related accident reports that occurred in relationship to Education spaces.
6. Records of theft, vandalism, and security problems as it relates to education spaces.
7. Maintenance/repair records as it relates to education spaces.
8. Any other feedback concerning the building which may be on record.

BUILDING TYPE-RELATED INFORMATION

1. How many buildings were based off of this design?
   a. Were there changes made from previous designs?
   b. If so, what were they?

HEALTH-RELATED INFORMATION

1. Is there access to any health records that would indicate the utilization of the education space is having an impact on preventable diseases and illnesses in the community?
2. Can I have access to the statistical information if available?
APPENDIX U

TRANSLATION CERTIFICATES

INDUSTRIAL REVIEW BOARD (IRB)
Translation Certification Form
Institutional Review Board (IRB)

PROTOCOL TITLE: Post Occupancy Evaluation of the Education Spaces at the Nguni Health Center in Timothy

IRB NUMBER: 1210006479

PRINCIPAL INVESTIGATOR: John H. Takamama

LANGUAGE OF TRANSLATED DOCUMENTS: French

TYPE OF SUBMISSION

☐ The initial submission of the following forms (Cover Letter/Information Letter, Informed Consent, Occupancy Survey Form/Staff), Post Occupancy Evaluation (POE) Checklist for Admin/Staff, POE Instrument for Participant Engagement, POE Instrument for Staff,

☐ The modification of the following forms that have been approved. (Please list forms)

☐ Other (Please describe and list forms)

CERTIFICATION OF TRANSLATION

I certify that I have performed the translation of the following documents (list here..) for the referenced project.

Printed Name of Translator: Dominique Cerf
Signature of Translator: ___________________________ Date: 6/6/2012

CERTIFICATION OF BACK-TRANSLATION

I certify that I have performed the back-translation of the following documents (list here..) for the referenced project. Please note that it is preferable if the back-translation is done by someone who is not part of the research team.

Printed Name of Back-Translator: Nkosinza Frederick
Signature of Back-Translator: ___________________________ Date: 3/30/2012

IRB NOTE: The translation and back-translation should be done by two different people.

Revision 12/10
APPENDIX V

REPUBLIC OF RWANDA, MINISTRY OF HEALTH (MOH)

GUIDELINES FOR RESEARCHERS INTENDING TO DO

HEALTH RESEARCH IN RWANDA
Republic of Rwanda
Ministry of Health

Guidelines for Researchers Intending to Do Health Research in Rwanda

February 2012

List of Abbreviations
HSRP – Health Sector Research Policy
IRB – Institutional Review Board
MoH – Ministry of Health
MOU – Memorandum of Understanding
NISR – National Institute of Statistics of Rwanda
REIC – Rwanda National Ethics Committee
SOPs – Standard Operating Procedures
SRG – Scientific Review Committee

I. Introduction

Research is widely acknowledged to play an important role in the socioeconomic development of a nation. Health research is particularly important because it allows for evidence-based decision-making that improves health outcomes. The Government of Rwanda has recently created the Health Sector Research Policy (HSRP), in order to outline a vision for effective and efficient health research in Rwanda.

In accordance with the Ministry of Health's (MoH) desire to facilitate health research in Rwanda, the guidelines presented here have been developed to aid investigators who want to do research with a primary aim of studying health in Rwanda. These guidelines are intended to clarify the processes, expectations, and benefits of doing health research in Rwanda. With the clarity afforded by the guidelines, it is the hope of the Ministry of Health that health research will be a smooth process for investigators, and that it will be a mutually beneficial endeavor for the investigators, the Government of Rwanda, and the communities.

II. Definition of Research

The Ministry of Health of the Government of Rwanda, defines health research as the following:

"Any activity intended to increase the stock of knowledge relating to health that can be generalized and used to draw conclusions, devise new applications, and guide decision-making."

This definition includes: a) basic scientific research relating to health, including investigation into fundamental scientific phenomena without a particular application in view; b) applied/operational research, which is generation of new knowledge with a specific practical aim; and c) experimental development, which is research intended to develop new or significantly alter and improve materials, products, systems and services. General-purpose data collection, including statistical surveys and censuses where health data are collected and the primary aim is studying health, are also considered research in the health sector.
Some activities are considered non-research in the health sector unless they are carried out for the purpose of existing research and development. If not carried out for research-related purposes, these non-research activities do not fall under the jurisdiction of these guidelines. These activities include: standardization procedures, provision of specialized health care, program evaluations (excluding impact evaluations), outbreak investigation, surveillance, and routine software development.

III. Research with Existing Data

Two main types of research are covered by this document: the collection of new data, and additional analysis of existing data. Investigators wishing to conduct health research in Rwanda that requires original data collection are welcome, as new information will help Rwanda to make more informed policy decisions and will help improve health outcomes. This has traditionally been the main form of research in Rwanda.

However, consistent with the principles outlined in the HSRP, the Ministry of Health of Rwanda is also committed to encouraging and facilitating the use of existing data to further knowledge about health in Rwanda. Doing so prevents duplication of work already completed, and thereby prevents waste of limited resources. Use of existing data also allows for meta-analyses, which may yield improved or more generalizable knowledge than single studies.

The process for carrying out research is largely the same for new data collection as for existing data analysis, and unless otherwise noted, the procedures and expectations outlined in the document apply to researchers wishing to carry out either type of research.

IV. Note on Collaborations

For researchers coming from outside of Rwanda, it is requested to have a Rwandan collaborator involved at all stages of the work with a clear repartition of responsibilities. As such, foreign investigators are requested to partner with a Rwandan researcher who is working in the field of research topic. This will help to ensure relevancy of research projects for Rwanda, facilitate the approval process (via the institutional affiliation(s) of the Rwandan collaborator or his/her knowledge of the review process), and will additionally help Rwanda build capacity for conducting research of its own. In these guidelines, references to “investigators” or “researchers” are used to refer to the collaboration of foreign and Rwandan investigators, if a foreign investigator is involved.

If any samples, including biological materials and chemicals, are to be removed from Rwanda, it is required that the collaborators develop and sign a memorandum of understanding (MOU) or other material transfer agreement (MTA) prior to initiation of data collection. Such a document will prevent confusion later on, and will strengthen proposals for review by scientific and ethics committees.

V. Process to Begin a Research Project in Rwanda

This section outlines the steps to be taken in order to begin a research project in Rwanda. Researchers should allow three months from the first submission of the proposal to final approval, though in many cases, approval may be obtained much faster. Proposals will usually receive approval for up to one year, though in some cases where more time is clearly needed for the study, a longer approval period may be issued. Note: Rwandan students through the Master’s degree will receive approval solely from their institutions of learning according to the institutional standards, with authorization and registration at the institutional level but their research questions will be authorized by the MoH program in which they are related to and then approved by MoH to assure their effectiveness.

A. Proposal Generation

The first step in doing research in Rwanda is to generate a research proposal for review. Investigators will develop a research proposal of no more than 15 pages that contains the following:

- Introduction with literature review and rationale behind research;
- Clear description of research question to be addressed;
- Specific objectives of research regarding the research question;
B. Scientific Review

Scientific Review Committees (SRCs) will be established in institutions with health research in their mandates in order to provide scientific review for proposals. After the generation of a proposal, the proposal should be submitted to the scientific review committee (SRC) of the affiliated Rwandan institution, if one exists. If the researcher is not affiliated with an institution which has an SRC, the proposal should be submitted to the SRC of the institution which supervises the original institution, or to any existing SRC which is highly relevant for the research topic. If none of these alternatives fits a given case, the researcher should submit his/her research protocol to the national research committee for review in question as well as research project from out of Rwanda.

The proposals should be submitted at least two weeks before the meeting of the SRC. Research protocols that require work or data collection nationally or for at least one whole province should be submitted to the National Institute of Statistics of Rwanda instead of another institutional SRC, pursuant to the Visa Instruction Manual found in the references. It is assumed that foreign researchers will also have proposals reviewed by their home institutions, but the additional review in Rwanda is required to ensure relevance to Rwanda.

In special cases where one given institution does not possess the scientific expertise required to review a certain proposal, the institution could seek external expertise. Additionally, for some projects initiated at the Ministry of Health or elsewhere, the Honorable Minister of Health can ask for assembly of an ad hoc SRC, either at one institution or comprising members from many institutions. All scientific review committees in Rwanda will use identical standards as defined by the Ministry of Health, consistent with international standards.

The SRC will review the proposal in a timely manner for issues including but not limited to:

- Qualifications of researchers;
- Relevance of the project and benefit to Rwanda;
- Appropriateness/ability of methodology to answer the study question;
- Conformity of proposed project to the latest international standards for research;
- Added value of knowledge after completion of the project, in Rwanda or in the world.

If the proposal is approved, the research team will receive a letter to that effect, and indicating that the team may seek ethical approval. If the proposal is not approved, the SRC will send a letter containing the strengths and weaknesses of the proposal to allow for revision and resubmission. If the research is not relevant or out of standard it may be refused.

C. Ethical Review

After receiving official confirmation of scientific approval, the proposal should be submitted with a copy of the letter of scientific approval to the Institutional Review Board (IRB), or ethics committee associated with the same institution. As with the scientific review, proposals should be submitted at least two weeks prior to the IRB meeting, and proposals that have received IRB approval internationally need to receive it in Rwanda as well. Across all institutions, the IRBs will conform to international ethical research standards and will be overseen by the Rwanda National Ethics Committee (RNEC) to ensure standardization. In especially sensitive cases, an institutional IRB may refer a
E. Ministry of Health Support to Research Teams

In addition to serving as the final registration center, the Ministry of Health will play several supporting roles to researchers. After registration, the Ministry of Health will provide additional authorization letters as needed to support ease of data collection in health facilities, villages, etc. They will also support the efforts of the research team to other government officials within the rule of law. Finally, they will provide access as needed to national level data sets to inform the study (HIS, TrueNet, etc.). These efforts are intended to facilitate and streamline the research process for research teams whose proposals have been approved.

VI. Implementation of Approved Research

Procedures for implementation of research will vary widely depending on the nature of the study, but some aspects are consistent across all types of research in the health sector.

A. Capacity-Building

Implementation of all proposals should include some aspect of capacity-building for Rwanda. This can take many shapes and forms, but it is crucial that the implementation phase of any project include the training of Rwandan personnel, or the improvements of Rwanda’s research facilities or infrastructure.

B. Monitoring for Misconduct

The Ministry of Health and its agencies reserve the right to monitor the implementation of approved proposals to ensure that the projects are being carried out in accordance with the approved protocols. It is first and foremost the responsibility of the researchers and their sponsors and sponsoring institutions to ensure that implementation occurs as described in the approved proposal. Researchers are additionally expected to submit quarterly reports to the ethics committee that approved the research. Further monitoring and inspection may be done by a body authorized by the Ministry of Health. Researchers found to be non-compliant with approved methodology will be subject to consequences, and may have their research approval terminated. Consistent with Ministry of Health monitoring is the expectation that unforeseen issues that arise during the project will be reported to the IRB or RNEC by the researcher, including but not limited to unanticipated adverse events, clear
results that may suggest the need to stop the study, a need to modify the approved methodology, or a significant change in research personnel. Such changes will not necessarily impede the research, but must be reported and will be addressed as necessary by the SRC and IRB that approved the initial proposal.

C. Availability, Use, and Publication of Data and Research Findings
Consistent with the HSSP, it is of utmost importance that data generated through research carried out in Rwanda be used to ensure maximum public benefit in Rwanda, as well as in the broader international research community. To that end, data and results from a study must be shared with the community in which the research was carried out and must be published in Rwanda. The publication in Rwanda may be done after the international one.

The Ministry of Health will maintain a registry of both datasets and research reports. To this end, datasets, data documentation, and research reports must be shared with the National institution which the PI is coming from as a co-owner of the data and MoH data warehouse within three months of the conclusion of the data collection. This will facilitate future research utilizing data previously collected, and future research wishing to build on previous work. Two years after the conclusion of data collection, the dataset can be shared by the National Institution with other researchers on written demand for secondary analysis. In case of negative answer from this institution a researcher can appeal to national research committee which will judge adequacy of the negative answer and take the final decision. In special circumstances, an MOU can be signed between the Ministry of Health and the research team or research institution, which will detail the ownership and use of data. Additionally, the investigator may send a formal request to keep data private beyond two years, with reasons detailed.

Timely publication of results in peer-reviewed academic journals is highly encouraged. Peer review helps to maintain the quality of research in Rwanda, and publication ensures that the results of research in Rwanda are recognized internationally, and can be used to influence policy and future research around the globe. In the event that the PI is foreign, it is important the Rwandan collaborator be a co-PI on any publication, consistent with the guidelines for authorship addressed in the Roles and Responsibilities of Investigators.

document. For research done in Rwanda that is initiated by a foreign PI, it is encouraged that at least four Rwandans be collaborators.

D. Renewal of Approval
Researchers who wish to extend their periods of data collection must renew the approval for the projects. The PI is required to compile a report on the work already completed, and write a letter detailing the rationale and need behind extending the data collection. If the extension is within the same research methods, these materials should be submitted to the IRB or RNEG at least one month prior to the expiration of the original approval. The IRB or RNEG will respond within one month, and renewal may be approved for up to an additional one year, except in special circumstances. At this point, a "renewal of research" form should be submitted to the Ministry of Health, if the research methods for the extension differ from those originally approved, the request for an extension must be submitted to the SRC prior to the renewal approval by IRB or RNEG, and before final renewal is registered at the Ministry of Health. This more extensive renewal process may take up to two months, so researchers should therefore plan ahead accordingly as not to have to suspend data collection.

VII. Provisions for the Transition Period
It is understood that many of the structures described above are not yet implemented, and that while they are being created, it is important to have provisions in place to guide research. These provisions will be removed from this document when all structures exist. To that end, if SRCs and IRBs do exist in an institution, researchers affiliated with those institutions should follow the protocol described above. If they do not, or a researcher is not affiliated with an institution, the following procedures should be followed:

1. Scientific review will happen in 3 ways. For projects covering at least one whole province, proposals should be submitted to RUG for scientific review. Proposals treating HIV/AIDS, Non communicable diseases, Malaria, Mental health should be submitted to HDP. All other proposals should be submitted directly to the RNEG, which will provide scientific review.
2. Ethical review will happen at the RNEC. Proposals should be submitted in accordance with the SOPs of the RNEC.

3. All proposals (approved by scientific and ethical review) will be addressed to the Honorable Minister of Health and submitted to the Ministry of Health Medical Education and Research Department. They will be registered and the PI will receive a letter of authorization from the Minister of Health to facilitate implementation of the research, as above.

VIII. Additional Resources
1. Health Sector Research Policy (HSRP), Ministry of Health website.

2. Standard Operating Procedures, Rwanda National Ethics Committee


5. Ministerial Instructions on Research, Ministry of Education
APPENDIX W

REPUBLIC OF RWANDA

RWANDA NATIONAL ETHICS COMMITTEE (RNEC)

SUBMITTAL REQUIREMENTS AND PROTOCOL FORMAT
For a thorough and complete review, all research proposals shall be submitted with the following information to NERC at least 15 (fifteen) working days before the scheduled meeting date.

- 8 copies of the request letter.
- 8 copies of the protocol and summary.
- 8 copies of the patient informed consent and the patient information sheet in English or French and Kinyarwanda.
- One copy of researcher’s CV.
- To provide Identity Card from your institution.
- Recommendation letter from your institution.
- To provide Introduction letter from Ministry of Education.
- 8 copies of CD’s (put all documents in one document).
- To provide approval from Medical Research center (MRC) if the study is a Medical Research.
- A check of an amount of 850,000 FRW (Eight hundred and fifty thousand Rwandan francs only). Research projects funded by research institutions or other international organizations or a check of 100,000 RWF (one hundred thousand Rwandan francs) Self-funded Students for their Research projects for the award of a university degree (Bachelor degree, Master degree & PhD). This amount can be paid to the following account number: Rwanda National Ethics Committee 130-10 53 298 in Cogebanque.
- The principal investigator/PI/ Co-investigator should come to present the protocol at the meeting.

GENERAL OUTLINE FOR A STUDY PROTOCOL

Study title, principal collaborators and institutions.

Summary of study – synopsis

1. Background

2. Aim and objectives
   2.1. Aims
   2.2. Objectives

3. Methods
   3.1. Study description
   3.2. Study design
   3.3. Study site
   3.4. Study population
   3.5. Proposed intervention if interventions study
   3.6. Main exposures and/or confounders or outcomes to be measured

4. Selection of study population
   4.1. Inclusion criteria
   4.2. Exclusion criteria
   4.3. Sampling
   4.4. Randomization if randomized trial

5. Study procedures
   5.1. Procedures at enrollment
   5.2. Follow-up if cohorts study or trial
   5.3. Measurement of exposures and confounders
   5.4. Measurement of outcomes
   5.5. Laboratory methods if the study has a lab component
   5.6. Sample size
   5.7. Data Management
   5.8. Proposed analysis

6. Ethical considerations
   6.1. Confidentiality
   6.2. Informed consent
   6.3. Ethical approval

7. Logistics
   7.1. Distribution of responsibilities
   7.2. Timetable
   7.3. Budget

8. References

9. Appendices
APPENDIX X

REPUBLIC OF RWANDA, RWANDA BIOMEDICAL CENTER (RBC)

NATIONAL HEALTH RESEARCH COMMITTEE

(PROTOCOL SUMMARY ONLINE SUBMISSION FORM)
National Health Research Committee (Protocol Summary Submission Form)

* Required

Protocol Title *

Protocol Summary *
maximum 300 words

Submission Date *
(d/m/y/yyyy)

Name of the Principal Investigator *
First Name, Last Name

E-mail address of the Principal Investigator *

Phone of the Principal Investigator *

Names of other Co-Investigators *
First Name(s), Last Name(s)

General/Global Objective(s) *

Specific Objectives *

Study type *
Qualitative

If other study type, specify

Study design *
Cross-sectional, cohort, Case control, Clinical trial, etc ...

https://docs.google.com/spreadsheets/viewform?formkey=EIg2MDd5d0NwU2w1b2N5c21leF82X0FzaEdGQ
Sample Size Estimation
Total sample size

Sampling design
Simple, Systematic, Cluster, Stratified, Random, Snowball, etc.

Data collection
Tools: Questionnaires, PDAs - Variables of Interest

Data Analysis
Detailed analysis procedures, statistical tests, assumptions...

Total Budget

The Funder of the study
Name of the funder. If no funder, report self-sponsored
APPENDIX Y

PERMISSION TO USE PHOTOGRAPH OF “THE OLD NGERUKA HEALTH POST”

OBTAINED FROM RWANDA WORKS
Subject: Re: Thanks for all your help
From: Grace Lesser (grace@rwandaworks.com)
To: islandcatwoman@yahoo.com;
Cc: bertin@theaccessproject.com;
Date: Thursday, December 27, 2012 6:23 PM

Dear Sheila,

Glad to hear it worked out in Rwanda and I’m sorry I never got to meet you in-country.

You can surely use the photo in your academic work; however, if you reach a point where it gets published, we would appreciate if you could seek formal approval for publication.

With regard to statistics, Bertin’s email did not change and I’m sure he will get back to you when he is back in the office in the new year (our office is closed this week). I will write him a separate note reminding him.

I’m with Access for a few months yet so no worries about emailing me directly. I’ve moved Josh to bbc here so as to cut down on his email traffic.

Best,
Grace

On 12/31/12 11:22 AM, “Sheila Waklam” <islandcatwoman@yahoo.com> wrote:

Dear Grace,

I am sorry we never were able to meet in Rwanda. I hope all is well. I am aware you were leaving Rwanda around this time so I am copying Josh as well. Thank you for all of your help while I was in Rwanda. It was a frustrating process and I am glad it ended on a positive note.

I have a request to use a photo I found on the Rwanda Works website that states it is the “old” health center that was used before the new one was built. Can you confirm if this is true and then, May I use this photo for my research paper?

On another note I have been attempting to contact Bertin for some statistics that we discussed when I met him in Kigali in the last week of November. It has been over 3 weeks and numerous unanswered emails that leads me to believe I must have the wrong email or he has recently changed it. Could you either forward this to his correct address or provide me with it and I will attempt to send it out again. He was looking into the 2011 patient statistics that were treated at Ngeruka for preventable illnesses or diseases. I obtained the 2012 statistics from January but he did not have the previous year and told me Bertin would have them. I showed Bertin the copy so he should know what I am looking for.

Old Health Post in Ngeruka, This photo was taken on November 9, 2009 using a Nikon D40.
APPENDIX Z

PERMISSION TO USE PHOTOGRAPHS OF KIGALI CONCEPTUAL MASTER PLAN, URBAN PLANNING DESIGNS PREMIER FINANCIAL HUB AND CENTRAL BUSINESS DISTRICT
Dear Marie,

I agree, she can use them as long as she credits the City and SURIANA as the source.

Thanks,

Rosie,

Liliane.

Liliane Umurerwa Mupende
Director of Urban Planning and Construction One Stop Center
City of Kigali
P.O. BOX 557?
Kigali, Rwanda

Email: lilumupende@yahoo.com
lilumupende@kigaliity.gov.rw
lilumupende@gmail.com
osco@kigaliity.gov.rw

website: www.kigaliity.gov.rw

From: Marie Elise <marie.elise@suriana.com>
Sent: Wednesday, March 20, 2013 8:59 AM
To: Umurerwa Mupende; rosie@kigaliity.gov.rw; lilumupende@gmail.com

Subject: Re: New Enquiry for mails@suriana.com

Dear Liliane,

This is the email enquiry in which a US student seeks for City approval for the use of images. Aunika’s suggestions is if she can use the images if she gives credits to both City of Kigali, Rwanda and SURIANA for the use of perspective.

Thanks

Location: United States
Name: Sheila Wakefam
Email: suriana@suriana.com

Enquiry: Re: SURIANA – Kigali Master Plan - Permission to use Renderings

Location: United States
Name: Sheila Wakefam
Email: suriana@suriana.com

Enquiry: To whom this may concern,

Location: United States
Name: Sheila Wakefam
Email: suriana@suriana.com

Enquiry: My name is Sheila Wakefam and I am working on a thesis at Arizona State University. The site of my research is located in Ngerenda, Rwanda. I was looking for some photos of traditional architecture (which there doesn’t seem to be anything other than a replication of the palace where the King/Kagame had resided). I have been to Kigali a couple of times and have many pictures of what is there now but while I was conducting my research I found some Master Planning renderings that lists of architecture and they referred me to you, SURIANA as the design... along with President, Paul Kagame. I have attached a couple of the websites where I have found these renderings... there were more and even Google has them in their image files. I think it would make sense to have the past, present and future mentioned in my thesis and I believe your plans can provide me with the proposed future of architecture in Rwanda.

Location: United States
Name: Sheila Wakefam
Email: suriana@suriana.com

Enquiry: I am writing a small section about the culture and the vernacular of their architecture... again not something that is apparent within the country or through research but as I am researching healthcare facilities, it is strongly suggested that they are designed within the context of the local culture to make them more acceptable to the communities they serve. My research has taken me to a remote village where the healthcare facility was built in a western style purposely to give them something far different than anything they had in the past. Anyway it is a very long story but I wanted to give you a little background in order to make my request...

Location: United States
Name: Sheila Wakefam
Email: suriana@suriana.com

Enquiry: I am not sure once everything has been posted on the internet if I even am required to ask but as a researcher and designer I would appreciate someone asking me before using my work. I will provide credit for the work as coming from SURIANA but I would like your permission to use a couple of your photos/renderings in my thesis. If this is acceptable how would you like me to credit your firm in my thesis? The Rwandan publication names/likes the photographs so I would use their headings to identify them and whatever you would like to include the proper credit. Please let me know if I need to contact someone in Rwanda if you no longer hold the rights to these renderings... and if you have any name in Rwanda that would be superb.

Location: United States
Name: Sheila Wakefam
Email: suriana@suriana.com
Enquiry: One last request... what was the concept or ideas that generated these images? Was any Rwandan culture or architecture infused into these drawings? If so, how?

Location: United States
Name: Sheila Wakerlam
Email: swakerlam@asu.edu


Location: United States
Name: Sheila Wakerlam
Email: swakerlam@asu.edu


Location: United States
Name: Sheila Wakerlam
Email: swakerlam@asu.edu

Enquiry: Thank you for your time and attention to my request.

If you are not the email's intended recipient, kindly inform the sender and delete it. The email may contain confidential information which should not be retained, nor disclosed to another individual.

Rendering 1: Kigali Conceptual Master Plan, Urban Planning design is the Premier Financial Hub

Rendering 2: Kigali Conceptual Master Plan, Urban Planning design is the Central Business District

APPENDIX AA

PERMISSION TO USE PHOTOGRAPH OF THE ANCIENT KING'S PALACE

IN NYANZA, RWANDA.
This is a file from the Wikimedia Commons. Information from its description page there is shown below. Commons is a freely licensed media file repository. You can help.

Summary

**Description**

**English:** The ancient King's Palace in Nyamur (Rwanda).
**Polski:** Dawny pałac królewski w Nyamur (Rwanda)

**Date**

8 May 2010

**Source**

Own work

**Author**

Ganwen

Licensing

I, the copyright holder of this work, hereby publish it under the following license:

You are free:

- to share — to copy, distribute and transmit the work
- to remix — to adapt the work

Under the following conditions:

- [attribution] — You must attribute the work in the manner specified by the author or licensor (but not in any way that suggests that they endorse you or your use of the work).

File history

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Camera model: Canon PowerShot SX10 IS
Exposure time: 1/1250 sec (0.0008 s)
F-number: f/3.5
ISO speed rating: 160
Date and time of data generation: 14:00, 30 April 2010
Lens focal length: 6 mm

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APPENDIX BB

PERMISSION TO USE

SURVEY INSTRUMENT QUESTIONS FORMAT
From: "Gonyea, Robert Michael" <rjgonyea@indiana.edu>
To: Sheila Wakelam <s Islandcatwoman@yahoo.com>
Sent: Tuesday, April 10, 2012 8:38 AM
Subject: RE: NSSE Application in Rwanda?

HI Sheila,

I don't see any reason why you'd need NSSE's permission to use any of the items in the attached survey. Good luck with your study!
Bob

Robert M. Gonyea
Associate Director, Center for Postsecondary Research
Indiana University Bloomington
Tel: 812-856-5824
Web: cpr.iub.edu
Twitter: @NSSEResearch

From: Sheila Wakelam [mailto: Islandcatwoman@yahoo.com]
Sent: Tuesday, April 10, 2012 6:17 AM
To: Gonyea, Robert Michael
Subject: Re: NSSE Application in Rwanda?

Thank you Robert,

I put together a quick instrument for my thesis that will be geared toward the participants in the classroom. Not sure how I will synthesize it once I get the data in. Here is a rough draft. Tell me if you think I need to jump through any hoops because I looked at your questionnaires first.

If you have any suggestions please let me know.

Thank you so much.

Sheila Wakelam, Assoc. AIA, EDAC, RA
Arizona State University | The Design School
The Herberger Institute for Design and the Arts
Master of Science in Design Student
Healthcare Design & Healing Environments
480-496-3231
swakelam@asu.edu

"Knowing is not enough; we must apply. Willing is not enough; we must do."
Johann Wolfgang von Goethe
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**Necessary Data of EU Education Spaces**

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Post Occupancy Evaluation Report
Nagara Health Center Education Spaces

INTRODUCTION

Purpose

The purpose of the Post Occupancy Evaluation (POE) is to assess the effectiveness of the newly constructed facility in meeting the intended objectives. The POE aims to evaluate whether the new educational facility was able to meet the needs of the intended users and to identify areas for improvement.

Methodology

The POE used a mixed-method approach to gather data from various sources, including observations, interviews, surveys, and document reviews. The data was analyzed using qualitative and quantitative methods to identify patterns and trends.

Key Findings

1. The facility was well-designed and provided a conducive learning environment.
2. Students reported positive experiences, with high satisfaction rates.
3. Teachers and staff were generally satisfied with the facilities, although some areas for improvement were identified.
4. The facility was well-integrated with the community, fostering a sense of ownership among the residents.

Conclusion

The POE results indicate that the new educational facility has met its intended objectives and has contributed positively to the community. Further improvements and modifications may be necessary to address identified areas for improvement.

Appendix

Detailed POE report with supporting data and metrics for all key findings.

Figure 1: Map of Friends

Figure 2: Photograph of the new educational facility
**Post Occupancy Evaluation Report**
Nigeria Health Center Education Spaces

**ABBREVIATIONS**
- AWP: Above Wall Plane
- BBC: Building Block Cinema
- B. Height: Basal Height
- BMS: Building Management System
- BWT: Building Water Treatment
- E. Height: End Height
- EQ: Environmental Quality
- L/B: Light/Burnout
- LTH: Light/Thermal
- M/AV: Moisture/Adverse Ventilation
- N: Natural Ventilation
- P: Participant
- P/E: Participant Engagement
- PM: Participant Observation
- PV: Pedestal

**NOMENCLATURE**
- Base Floor: The initial floor on which the primary space is located.
- Base Level: The primary level of the building.
- Base Structure: The main structural frame of the building.
- Base View: The view from the base level to the outside.
- Base Line: The line connecting the base points of the building.
- Base Point: A reference point on the base level.
- Base Plane: The horizontal plane at the base level.

**Building Environment**
- A place that fosters healing and a sense of well-being.

**Health Education**
- Teaching activities that promote health awareness and knowledge.

**Health Promotion**
- Activities that enhance the health of the community by teaching healthy habits and behaviors.

**Anti-slip**
- (Education Room)
- Slip-resistant surfaces to prevent accidental slips and falls.

**Quantitative Building Data of the MECH Education Spaces**

**Figure 3:**
- Location: Third Floor

**Table 1:** Anti-slip (Education Room) Data Table

---

*This document contains detailed information about the Post Occupancy Evaluation of Nigeria Health Center Education Spaces, including data tables, diagrams, and descriptions of various aspects such as lighting, ventilation, and building materials.*
**Immunization (Waiting Room/Laboratories)**

Immunization education is for new mothers and their infants. The space is an open, airy environment that is suitable for the noisiness of children during the rainy and winter months of the year. The space was originally designed and furnished as an education room. It is completely open on the northeast and southwest as Figure 6 and Figure 7 indicate. The trusses above make ceiling mounting points for children's toys quite a bit lower in the form of black bags.

It is a beautiful and neat space to enter, but became very small and uncomfortable on the day the class was open. The open design created a concentrated feeling in and out of the space at all times. There is no marker or visual aids in the space, and the number of students and the silent and quiet atmosphere make it difficult to hear without well-muffled audio equipment. The walls that are present are painted white and lack any form of art or artwork of any kind. They are bare and sterile. The surrounding grounds are full of green vegetation that adds color and beauty to the roof of the building and are shrubs, an additional space to study.

The floor plan is quite large with the typological features thatCoupon the periphery. This space is a permanent location for our clients and therefore should be a comfortable space.

The ventilation and lack of walls also bring up the issue. The light centering is very much consistent, and it is an interior environment, but there are no windows as a physical feature.

The immunization area is situated at the rear and east end of the facility surrounded by nature and appears to be a quiet, securing, and comfortable from a distance. During the day, it is quiet and restful and staff are there to talk and spend time in small groups getting away from the noise and crowds within the center. The rear of the building is an enclosed and is quite calming compared to the activity at the entrance.

**Demodulation Kitchen (Food Preparation)**

The Demodulation Kitchen is an area used for food preparation and food intake. This space is located at the east side of the facility, including a large table and nearby sink. The facility was never shown during the time this report was conducted. Figure 6 and Figure 7 are shown for documentation purposes of the facility space at the HEW.
SUPPLEMENTAL INFORMATION

Each room is equipped with a small rectangular blackboard or a whiteboard in the center of the room. Each of these contains a white or black surface to allow for easy erasing and writing. Additionally, there are windows and doors closed, allowing for the entry of connected users, but do not hinder the view into the room or the outside environment.

Figure 8: Perforated Booth.

The perforated booth primarily consists of a "T" shaped, 2-3 feet, 3-4 tiered booth covered in used for back support. Photo: 8 pocket holes finished panels on top for seating. The booth was secured from the floor to the floorboard in order to prevent any movement or disturbance to the booth.

The room was the most well-lit and provided a good amount of natural light to support back support.

Photo: A Typical Worker and Patient Seating.

Two separate public furniture structures, the pews, are positioned in the area for patients who were seeking an eviction strategy. The staff often uses these pews when they are not needed by patients.

Observation

There is an area of pews positioned on the roof of the facility. There were no problems with the staff or patients working on the roof with other equipment or not disturbing the area.

Potential solutions:

1. A better location for the public furniture is not currently adequate to allow for the space to be wide open or semi-open, depending on the activity. Furthermore, the space should be more limited in order to maximize the use of the space.

Daylighting and Windows

The Riverside Ministry of Infrastructure stipulates in section 3.3.1.1 that "all windows installed for the purpose of lighting, ventilation shall be made in direct view of the environment, shall be given priority for proper finished exterior, shall be placed in order to allow for the maximum amount of light." The windows were designed to be openable and have a total area of at least 12 square feet of glass windows. In addition, the windows were designed to be as wide as possible, with a maximum of 48 inches wide.

The only room that does not meet the 12 square foot requirement is the SHC in the Family Planning room. The family planning room is in a plan. The room is 12 2/3 square feet and has a total area of 65 square feet. It is the only room that is more than 12 square feet.

The majority of the windows were made of wood, and the room was not to be opened.

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The only room that does not meet the 12 square foot requirement is the SHC in the Family Planning room. The family planning room is in a plan. The room is 12 2/3 square feet and has a total area of 65 square feet. It is the only room that is more than 12 square feet.

The majority of the windows were made of wood, and the room was not to be opened.
The HVI can be represented by a weather report. The report includes the following:

- **Temperature**
  - High: 98°F (37°C)
  - Low: 65°F (18°C)

- **Humidity**
  - High: 32%
  - Low: 20%

- **Wind Speed**
  - High: 20 mph (32 km/h)
  - Low: 5 mph (8 km/h)

- **Precipitation**
  - High: 0.1 inch (2.5 mm)
  - Low: 0.05 inch (1.3 mm)

- **Sunlight**
  - High: 2000 lux
  - Low: 800 lux

- **Cloud Cover**
  - High: 80%
  - Low: 20%

The report states that the weather conditions are suitable for outdoor activities such as hiking, cycling, and picnicking.

**Table 1: Weather Conditions**

<table>
<thead>
<tr>
<th>Condition</th>
<th>High</th>
<th>Low</th>
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<tbody>
<tr>
<td>Temperature</td>
<td>98°F (37°C)</td>
<td>65°F (18°C)</td>
</tr>
<tr>
<td>Humidity</td>
<td>32%</td>
<td>20%</td>
</tr>
<tr>
<td>Wind Speed</td>
<td>20 mph (32 km/h)</td>
<td>5 mph (8 km/h)</td>
</tr>
<tr>
<td>Precipitation</td>
<td>0.1 inch (2.5 mm)</td>
<td>0.05 inch (1.3 mm)</td>
</tr>
<tr>
<td>Sunlight</td>
<td>2000 lux</td>
<td>800 lux</td>
</tr>
<tr>
<td>Cloud Cover</td>
<td>80%</td>
<td>20%</td>
</tr>
</tbody>
</table>

The report also includes a forecast for the next week, showing that the weather conditions will remain stable with minimal changes in temperature and humidity.

**Figure 2: Weather Map**

The weather map shows a high-pressure system located to the north, bringing fair weather conditions to the region.

**Figure 3: Climate Graph**

A climate graph is shown, indicating the average temperature and precipitation for the past year, with a trend line for the current month showing a slight increase in temperature.

**Figure 4: Wind Rose**

A wind rose chart is displayed, showing the predominant wind direction and speed for the region.

**Figure 5: Precipitation Map**

A precipitation map is shown, indicating the expected rainfall for the next week, with a focus on areas that have received less rain in recent months.

**Figure 6: Solar Radiation Chart**

A solar radiation chart is displayed, showing the daily solar radiation levels for the month, with peak values occurring during the afternoon.

**Figure 7: Air Quality Index**

An air quality index chart is shown, indicating the current air quality status, with a rating of 'Good' for the region.

**Figure 8: Water Quality Chart**

A water quality chart is displayed, indicating the water quality status in the region, with a rating of 'Excellent' for the month.

**Figure 9: Vegetation Index Chart**

A vegetation index chart is shown, indicating the vegetation health status, with a rating of 'High' for the region.

**Figure 10: Wildlife Impact Chart**

A wildlife impact chart is displayed, indicating the impact of human activities on wildlife, with a rating of 'Minimal' for the region.

**Figure 11: Noise Pollution Chart**

A noise pollution chart is shown, indicating the noise level in the region, with a rating of 'Low' for the month.

**Figure 12: Traffic Flow Chart**

A traffic flow chart is displayed, indicating the traffic flow in the region, with a rating of 'Slight' for the month.

**Figure 13: Energy Consumption Chart**

An energy consumption chart is shown, indicating the energy consumption in the region, with a rating of 'Low' for the month.
Acoustic

The majority of businesses and homes place value on communication, "acoustic comfort is half." Acoustic design and planning is essential p. 120 for aesthetic success. Mutes from the outside, building materials, and people can be the culprits of dissatisfaction. Control of solid sound such as the movement of people, human speech, and music has also been studied to determine the significance of control levels. Included in the acoustics of building materials are acoustical modeling and simulation. This includes the effect of material properties on the acoustic characteristics and design needs. The success of acoustic design is affected by the interaction of materials and spaces.

Figure 1: Possible Acoustic Solutions

Table 1: Possible Acoustic Solutions

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<thead>
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<th>Material</th>
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Table 2: Miscellaneous Materials

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<th>Weed Management</th>
<th>Wall Material</th>
<th>Soundproofing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
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<td>weed management</td>
<td>wall material</td>
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<tr>
<td>Material</td>
<td>vacuum</td>
<td>weed management</td>
<td>wall material</td>
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Table 3: Recommended Minimum Square Footage Requirements

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<th>Required Size</th>
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<tr>
<td>Window</td>
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</tr>
<tr>
<td>Soundproofing</td>
<td>120 sq ft</td>
</tr>
</tbody>
</table>

Table 4: Recommended Minimum Square Footage Requirements

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<th>Space</th>
<th>Required Size</th>
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</thead>
<tbody>
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<tr>
<td>Window</td>
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</tr>
<tr>
<td>Soundproofing</td>
<td>120 sq ft</td>
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</tbody>
</table>

Table 5: Recommended Minimum Square Footage Requirements

<table>
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<th>Space</th>
<th>Required Size</th>
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<td>Acoustic</td>
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</tr>
<tr>
<td>Window</td>
<td>120 sq ft</td>
</tr>
<tr>
<td>Soundproofing</td>
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Table 6: Recommended Minimum Square Footage Requirements

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<th>Space</th>
<th>Required Size</th>
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<tbody>
<tr>
<td>Acoustic</td>
<td>120 sq ft</td>
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<td>Window</td>
<td>120 sq ft</td>
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<tr>
<td>Soundproofing</td>
<td>120 sq ft</td>
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</tbody>
</table>

Table 7: Recommended Minimum Square Footage Requirements

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Table 8: Recommended Minimum Square Footage Requirements

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Table 9: Recommended Minimum Square Footage Requirements

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Table 10: Recommended Minimum Square Footage Requirements

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QUALITATIVE DATA OF THE NSC EDUCATION SPACES

Participants and Participant Engagement

The focus environment and an incentive from interacting experience is a tool for determining the quality and quantity of engagement (Gee, 2000, p. 59). A learning environment is to be encouraging and have the ability to motivate and engage students and educators (Oke, 2009, p. 48). Engagement was measured through both observation and self-report. Observational measurement of engagement was direct and not filtered through survey methods (Kidd & Funk, 2012, p. 25).

The present and respondents' goal was possible. An attendee from the education program had 17% of the educators spend 30 seconds to learn a subject and 3 and 1/2 seconds to learn the subject. The study is engaged in the NSC education program. The main purpose of the NSC is to engage the program until the end of the program. The study was the most common behavior of all the attendees.

Attendees mentioned the following: Respondents from the program had 15% of the respondents spend 30 seconds to learn the subject and 3 and 1/2 seconds to learn the subject. The study is engaged in the NSC education program. The main purpose of the NSC is to engage the program until the end of the program. The study was the most common behavior of all the attendees.

Overall Quality of Education Spaces

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Gender
The majority of the education participants in all programs were female, to the point that
half of the participants were female. In the Education program, 44 out of 88 respondents
were female, whereas in the Health Center, 41 out of 80 respondents were female.

Marital Status
Eight-five percent of the respondents indicated that they were married, while
21% indicated that they were single. Eight-five percent of the respondents indicated that
they had children, while 15% indicated that they did not have any children.

Prevalent chronic disease
The majority of the respondents indicated that they had high blood pressure,
while 21% indicated that they had diabetes. Eighty percent of the respondents indicated
that they had hypertension, while 20% indicated that they had diabetes.

Patients' views on the Health Center
The majority of the respondents indicated that they were satisfied with the
treatment they received at the Health Center, while 20% indicated that they were
unsatisfied. Eighty percent of the respondents indicated that they would recommend
the Health Center to others, while 20% indicated that they would not recommend it.

Patient satisfaction
The majority of the respondents indicated that they were satisfied with the
treatment they received at the Health Center, while 20% indicated that they were
unsatisfied. Eighty percent of the respondents indicated that they would recommend
the Health Center to others, while 20% indicated that they would not recommend it.

Post-Occupancy Evaluation Report
Ngerika Health Center Education Spaces

The total respondents indicated that they were mostly satisfied with the
buildings and the services provided. Eighty percent of the respondents indicated
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The total respondents indicated that they were mostly satisfied with the
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unsatisfied.
Overall, the majority of participants said they would recommend the clinic to their family and friends. Seventy-six percent gave the program an excellent approval rating. Twenty-three percent gave a good approval rating, and only two percent rated it as poor.

**STAFF AND ADMINISTRATIVE RESPONSES**

The staff input and participation is not valuable to the participants. They have a deeper knowledge of the inner workings of the facility and can provide more insight into things that perhaps the participants, patients, and others may not be aware of. Staff recommendations are considered extremely valuable to the participants.

**Demographics of Staff**

Twenty-two percent of the participants are staff members, which are all female. The majority of staff members are white and have some level of education. The majority of staff members are not married.

**Travel and Distance Traveled**

Using the same criteria as applied to the participants, the staff were asked how far they live from the facility. The majority of staff lived in the city, with 15% indicating they lived within the city limits. The majority of staff indicated they live within 5 miles of the facility. The majority of staff indicated they live within 5 miles of the facility.
There was also significant concern over the lack of accessible public restrooms, with many participants noting that they were not able to find accessible restrooms within the facility. This concern was also echoed by some of the participants who noted that the lack of restrooms made it difficult for them to use the facility. There was also concern over the lack of accessible seating, with many participants noting that the seating was not accessible to people with mobility impairments. In some cases, the seating was also not comfortable, with many participants noting that they were unable to sit for long periods of time due to the discomfort.

In summary, while the facility has some positive features, there are also significant concerns that need to be addressed. These concerns include the lack of accessible restrooms, seating, and outdoor areas. In order to make the facility more accessible to all members of the community, these concerns need to be addressed in a timely manner.
Conducting research in Nouakchott as a western white person is also a challenge. Many local citizens look upon white people and are acutely aware of money. Sometimes there is a sense of guilt for being there, and it is difficult to appear anonymous and not cause any distractions within the environment that is being studied.

**FUTURE UPGRADES**

Designing the education spaces to be more flexible with education in mind for multiyear use is a key for future staff and community participation that will enable the community to be engaged in the process.

**Information and Computer Technology (ICT)**

Integrating education and information technology (ICT) in adaptable classroom designs (Dahle, 2006, p. 161) (OECD, 2006, pp. 24a-25) where students and staff can learn on their own or in groups in environments that are necessary to keep pace with the world around them. It will also help to support and keep the participants on top of the health-related technologies that are available. A medical center that also has a function could also provide community space for meetings, education space for staff to keep up with their training, and new medical procedures (OECD, 2006, p. 22) and even possible entertainment and off hours to allow for staff satisfaction.

**Rainwater Harvesting (RWH)**

Rainwater harvesting (RWH) might be an option during the wet season. The site can be harvested for flushing toilets, washing clothes, washing gardens, and filling and used as drinking water. This can be accomplished with gutters, screens, downspouts, and catchments.

**Waiting/Reception Room Upgrade**

During the semi-structured interviews with the Executive Director of Bocar Works one of the comments mentioned was in regard to the Waiting Room/Reception area which is also used as one of the education spaces for Bocar. The Executive Director mentioned he wished he would have done it differently than how it was constructed at Ngurika but did not elaborate further than it was needed space. One of the main observations made in the space was the lack of windows and connective atmosphere with outside/inside amenities.

Adding a Mezzanine floor above the first floor may add some square footage and allow for additional waiting area, education space, a children’s play space or even additional office space for the staff. A place for children to play without disturbing other patients and visitors whether they are based on the Mezzanine or another location of the centre would be beneficial for all. The space would not have an elevator so whatever might be needed must be within patients not requiring assistance or a wheelchair. The following pictures and sketches are conceptual ideas for future renovations.

Figure 7 is the revised first floor plan with a proposed stair leading up to the Mezzanine level. The Mezzanine level (Figure 8) is shown with an opening that overlooks the floor.
LESSONS LEARNED

The evaluation was conducted and shared in collaboration with the tenants and future tenants in the center. The feedback from the users was used to inform the design changes. The feedback was used to ensure that the design changes were appropriate and that the users were satisfied with the changes. The evaluation process helped to determine how the users perceived the changes and what improvements were needed. The feedback was also used to inform the design process for future projects.

The feedback from the users was positive and indicated that they were satisfied with the changes. The users found the changes to be useful and appreciated the efforts made to involve them in the decision-making process. The feedback was used to inform future projects and improve the design process.

CONCLUSIONS

The feedback from the users was positive and indicated that the changes made were appreciated. The feedback was used to inform future projects and improve the design process. The feedback was also used to inform the design process for future projects.

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A Letter of Support for Hilda W. Wadura

Dear Profs. Karimio and Baptista,

I am writing to express my support for the Post Occupancy Evaluation of the Education Spaces at the National University of Rwanda (NUR). As a faculty member of the School of Public Health at the NUR, I am committed to ensuring that our facilities are designed to meet the needs of our students and community. The research being conducted by Hilda W. Wadura is an important step towards achieving this goal.

The study aims to evaluate the educational spaces at the NUR, and provide feedback on how these spaces can be improved to better meet the needs of students and faculty. This is a critical task, as the NUR is a leading institution in the region, and its success depends on the quality of its facilities.

I believe that Hilda W. Wadura's work will contribute significantly to the development of our institution, and I am confident that her findings will be of great value to the NUR.

Please accept my best wishes for the success of this important project.

Sincerely,

[Signature]

Prof. Karimio and Baptista

School of Public Health
National University of Rwanda
APPENDIX DD

“SO WHAT?” SYNOPSIS
A <100 word key point summary is being provided here to make the document more accessible to non-research practitioners and research retrieval formats.

“SO WHAT?” SYNOPSIS

The education space within the built environment of the Ngeruka Health Center in Rwanda contributes to healing by engaging participants in educational programs that promote health and reduces preventable illness. This research attempts to link healing environments with engaging environments that offer health education programs. The research took place in a rural area of Rwanda far away from hospitals and a population desperate for proper healthcare. A post occupancy evaluation (POE) with the aid of observation, semi-structured interviews, questionnaires, measurements of the built environment and an intensive literature review was used to answer the research questions.
BIOGRAPHICAL SKETCH

Sheila Wakelam was born in Indianapolis, Indiana where she graduated from Ivy Tech State College with Honors earning an Associate of Applied Science degree specializing in Architecture. She was inducted into the Phi Theta Kappa Honor Society for her achievements.

Sheila was recruited while still in school by an Architecture firm in Indiana starting as a drafts person working up to a Project Captain/Architectural Designer and then into Permit Management working closely with local, city, state and government organizations to facilitate design projects. During this time, Sheila decided to pursue a Bachelor of Business Administration degree from Northwood University majoring in Management while working full time. She again graduated with Honors achieving the distinction of cum laude.

Sheila explored the world taking in many different cultural experiences and finally returned and took up residence in Phoenix, Arizona. More recently, she had worked extensively in Healthcare Architecture in her past but her passion grew when her current employer was an exclusive Healthcare designer and planner. She decided to further her knowledge by obtaining a Master of Science in Design degree at Arizona State University majoring in Healthcare Design and Healing Environments. She graduated with highest honors and was inducted into another honor society, Phi Kappa Phi for her hard work.

Sheila Wakelam has over seventeen years of architectural experience in California, Arizona, Oregon, Nevada and Indiana. Her specialties include Architectural Research Consultant, Healthcare, Evidence-based Design, Planning, Sustainability, Construction Documents, Construction Administration, Permitting and Client Relations. She is rigorously pursuing avenues that will incorporate her predilection for Healthcare, her experiences and her knowledge.

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sheilawakelam@gmail.com