

USER PERSPECTIVES ON A SUSTAINABLE COMMUNITY DEVELOPMENT PROJECT:  
ASSESSING THE IMPACT OF EMPOWER PLAYGROUND'S PLAY SYSTEMS ON THE  
PEDIATORKOPE ISLAND IN GHANA

by

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Dedicated to the Children of Peditorkope Island

## TABLE OF CONTENTS

LIST OF TABLES .....	vi
LIST OF FIGURES .....	vii
ABSTRACT .....	viii
LIST OF ABBREVIATIONS USED .....	ix
ACKNOWLEDGMENTS .....	x
CHAPTER 1: INTRODUCTION .....	1
1.1 Statement of the Research Problem .....	1
1.2 Purpose of the Study .....	6
1.3 Research Question.....	8
1.4 Research Methodology .....	8
1.5 Thesis Outline .....	10
CHAPTER 2: THEORETICAL FRAMEWORK .....	12
2.1 Background .....	12
2.2 Capability Approach .....	12
2.3 Critique of the Capability Approach .....	17
CHAPTER 3: LITERATURE REVIEW .....	20
3.1 Technology Society and Development .....	20
3.1.1 The Role of Technology in our Society.....	20
3.1.2 Technology and Development.....	26
3.1.3 Appropriate Technology and Development.....	30
3.2 Objects in Development .....	34
3.2.1 Unchartered Play: The Soccket and Pulse.....	35
3.2.2 Challenges and Problems .....	38
3.2.3 Play Pumps.....	39
3.2.4 Challenges and Problems .....	41
3.3 Understanding Development Aid .....	45
3.4 Conclusion .....	55
CHAPTER 4: CASE STUDY OF EPI's WORK IN GHANA .....	56
4.1 Brief History of Ghana.....	56

4.2 Empower Playgrounds Incorporated .....	59
4.3 Pediatorkope Island.....	62
CHAPTER 5: RESEARCH FINDINGS .....	65
5.1 Summary of Findings .....	65
5.2 Appreciation and Support for the Project.....	65
5.3 Impact on Students Performance .....	66
5.4. Factors that Influence the Use of the Merry-go-round and Swings .....	67
5.5 Users versus Beneficiaries .....	68
5.6 Challenges with Distributed Lamps .....	70
5.7. Play as Punishment.....	71
5.8 Lack of Monitoring and Evaluation.....	72
5.9 Inadequate Staffing.....	73
5.10. Stakeholder Demands and Interactions.....	74
5.11 Diversity in Play.....	75
CHAPTER 6: DISCUSSION .....	77
6.1 Overview .....	77
6.2 Using Technology to Expand Children’s Capability.....	77
6.2.1 Ama’s Story .....	78
6.2.2 Sen’s Interpretation .....	81
6.3 Determining Successes and Challenges of EPI’S Project .....	83
6.3.1 Successes .....	83
6.3.2 Challenges.....	87
6.3.2.1 The Complexity of Play .....	87
6.3.2.2 Problems with the Distribution of Lamps .....	91
6.3.2.3 Challenges with Effective Monitoring and Evaluation .....	94
6.3.2.4 Impact on the Academic Performance of Students .....	96
6.3.2.5 Technological Objects in Development - Challenges .....	101
6.3.2.6 Broader Challenges to Education on Pediatorkope Island .....	104
6.3.2.7 Gender Issues .....	107

CHAPTER 7: CONCLUSIONS AND RECOMMENDATIONS FUTURE .....	109
7.1 Overview and Findings .....	109
7.2 Recommendations .....	114
7.3 Conclusion.....	118
REFERENCES.....	120
APPENDIX A Interview Questions .....	132
APPENDIX B The Soccket and the Pulse by Unchartered Play .....	135
APPENDIX C Play Pumps by Play Pumps international .....	136
APPENDIX D Merry-go-round and Swings o the Pediatorokope Island .....	137
APPENDIX E Lamps distributed by EPI on the Pediatorokope Island .....	138

## **LIST OF TABLES**

Table 1:	This table provides a breakdown of student population figures at the Pediatorkope Basic School for the 2014/2015 academic year ..... 106
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## LIST OF FIGURES

Figure 1	Map of Ghana .....	57
Figure 2	Map of the Pediatorkope Island Area .....	63

## **ABSTRACT**

Ghana has challenges with providing reliable access to electricity for its citizens. Sporadic power outages mean that for many hours during the day, households, businesses and industries have limited or no access to electricity. This study assesses the impact of a technology-oriented development project by Empower Playgrounds Inc. for school children who lack access to electricity on the Peditorkope Island in Ghana. Through interviews, focus group discussion and participant observation with children and other stakeholders, the impact, successes and challenges of EPI's project were measured using Sen's capability approach as a framework. Findings suggest that not all students received full benefits and although the project has some successes, there were challenges with lamp distribution and a lack of effective monitoring and evaluation. This research provides some insight into social contexts in which technology embedded projects function and document ways in which development projects targeted at children can provide maximum benefits.



## **LIST OF ABBREVIATIONS USED**

AU	African Union
EPI	Empower Playgrounds Incorporated
ICT	Information Communication Technology
IFI	International Financial Institutions
IMF	International Monetary Fund
LED	Light Emitting Diode
MDG	Millennium Development Goals
MGR	Merry-Go-Round
NGO	Non-Governmental Organization
OECD	Organization for Economic Cooperation and Development
OLPC	One Laptop Per Child Programme
UN	United Nations
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Education Fund
VALCO	Volta Aluminium Company
WTO	World Trade Organization

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# CHAPTER ONE: INTRODUCTION

## 1.1 Statement of the Research Problem

In 1957, when Ghana gained its independence from the British, it faced the task of handling its own affairs for the first time. 59 years later, while Ghana has emerged as a middle-income country with a growing economy (UNDP, n.d), this process has not been without major failings in the past such as coup d'états, major economic downturns due to poor policies and corruption, and a stagnant energy sector plagued by decades of crises. Ghana is located on a continent that boasts of vast energy resources such as solar, geothermal and wind energy; however, blackouts are a predominant characteristic of its energy sector, which has failed to provide constant and reliable access to electricity for citizens, industries and businesses (Mellersh, 2015). This situation has had a negative impact on social and economic development since energy access and energy security issues influence socio economic development of any country (Gyamfi, Modjinou, & Djordjevic, 2014) According to Ackah, Ahali, Graham and Adam (2014) most of Ghana's electricity is derived from thermal and hydro sources; however, options for the production of solar power has received a lot of attention and consideration. Currently, Ghana derives most of its electricity from hydro sources including the Akosombo, Kpong and Bui dams, although it is particularly reliant on the Akosombo dam which single handedly generates 915MW to 1020MW of power (Ackah et al., 2014). The Bui dam and Kpong hydro projects generate 400 and 160 MW respectively (Ackah et al., 2014). In total, ~56 % of Ghana's electricity needs are generated from hydro, ~42% from thermal and 2.5 % from solar; it should be noted that solar power is currently

the only option under existing renewable energy policies (Energy Commission, 2015).

With its reliance on hydropower, shortfalls in rainfall affect the water level in dam reservoirs, which in turn, affects the amount of power produced and made available to citizens. The National Energy Statistics from 2005-2014, published by the Energy Commission of Ghana put total energy generation at 12,962.8GWh and consumption at 10,695.9GWh (Energy Commission, 2015). Taking at face value, these statistics support the notion that at peak consumption, Ghana should have excess power even when demand is at its highest however, this is not the reality consumer's face. It is clear that these figures reflect a disconnect between its generation capacity and actual power consumption. Thus while the country should be able to provide electric power to all its citizens, it may not be generating enough to meet demand at particular times or in particular locations due to lack of infrastructure investment and challenges with transmission and distribution of power. According to Gyamfi, Modjinou and Djordjevic (2014) the energy sector in Ghana has been plagued with "supply security and power equality challenges" (Gyamfi et al., p. 1038).

Furthermore, Ghana's power production is 2831MW for an estimated population of 25 million (Energy Commission, 2014) in comparison to Nova Scotia, a relatively small province in Canada, which provides 2,453MW for a population that is a little under one million residents. Considering Nova Scotia's total generation capacity of 2,453MW, Ghana's power production is inadequate and insufficient in satisfying the electricity needs of its people (Nova Scotia Department of Energy,

2014; Nova Scotia Power, 2016). Ghana's Volta Aluminum Company (VALCO) [second largest smelter in Africa] consumes ~ 17% of the total power generated, or the equivalent of 50% of the energy generated by the Akosombo dam. This agreement was set up by an Act of parliament in 1962 where VALCO was to be the primary buyer of energy produced by the Akosombo dam (Ackah et al., 2014; VALCO, n.d). However, VALCO has been shut down a number of times, reportedly due to the persistent energy crises the country has been facing; it later resumed operations however its production has been reduced to operating only one pot line. Boah-Mensah observed that the severity of the load shedding exercise in 2016 would be dependent on the power consumption capacity of VALCO (Boah-Mensah, 2016). This situation provides a window to the enormity of the energy crisis in Ghana, which has been further exacerbated by the fact that the country has been forced to stick to a load-shedding plan to offset the short fall in power production (Electricity Company of Ghana, n.d). Under this plan, a daily time table is created that list areas across the country where electricity will be turned off for a minimum of six (6) to as much as twenty four (24) hours each day (Electricity Company of Ghana, n.d). This is to ensure that electricity can be provided to areas and operations that are considered essential.

As severe as the problem is in urban areas, reliable access to electricity is unimaginable for people who live in rural areas in Ghana. Most rural regions do not have access to the national grid because it is considerably more expensive to extend grid electricity to remote rural areas with a relatively small population size (Gyamfi et al., 2014). Thus most rural areas lack access to reliable, sufficient grid electricity

due to a lack of infrastructure, coupled with a lack of generation capacity to service such regions even if infrastructure was in place (Gyamfi et al., 2014, p. 1036). The total rate of access to electricity in Ghana is 71% with, an urban rate of 78% and less than 30% access in rural areas (Gyamfi et al., 2014, p.1036). Although there is the need to improve access for those living in urban areas, the need for reliable access in rural areas is critical. Therefore, the government has initiated a number of programmes aimed at increasing access nationwide with focus on rural areas. An example of such program is The National Electrification Programme, with a goal to provide electricity for all communities with a population exceeding 500 by the year 2020 (Gyamfi et al., 2014). Although laudable, the impact of these programmes have not been felt; with the ongoing energy crises, it is expected that more focus will be put on providing reliable power to those who are on the national grid. Although notably unfair, there is little appetite to increase grid connectivity when there isn't enough supply for existing consumers.

The Government of Ghana is not the only institution working to provide access to all. There are a number of non-governmental organizations (NGO's) working in rural communities whose intent is to provide access to electricity in rural areas. One of such organizations is Empower Playgrounds Incorporated (EPI). In 2008, EPI set up the *Play, Light, Learn* project with the objective to install power generating merry-go-rounds and swings in rural schools located in communities that lack access to electricity. Such equipment provided play to the students, while generating electricity to power rechargeable lamps (light) that could support student study activities at night. EPI purports that providing renewable energy

through electricity generating playgrounds enhances opportunities for school children in deprived communities. To date, EPI has installed 42 merry-go rounds (MGR) in schools across Ghana, serving about 10,000 children and generating the necessary electricity to supply 2.2 million hours of light (EPI, n.d.-a).

The introduction of innovative technology as a solution to social problems is not something new to international development practice however, there still remains some skepticism due to failures and challenges faced by high profile projects such as the PlayPumps by PlayPumps International, the *One Laptop Per Child* project (OLPC) and the SOCKETT by Unchartered Play (Algozo, 2013). Comparatively, EPI's project design is similar to that of the PlayPumps in that it uses energy from children's play via merry-go-rounds to produce light for studying. Overall, it has received better reviews than that of the PlayPumps, however EPI has not been able to carry out any extensive assessments of its project in Ghana. This poses a challenge as it becomes difficult to understand whether the project is providing maximum benefits to its target beneficiaries. With this in mind, the goal of this research is to assess the successes and challenges of the project through the perspectives of children so as to understand the derived benefits and areas where improvements need to be made.

Using a case study approach to understand children's perspectives of EPI's *Play, Light, Learn* project, I will assess and analyze the successes, challenges and failures of the project on the Pediatorkope Island, located in the Dangme East district of the Greater Accra Region of Ghana, with the intent to derive broader insight to technology oriented development projects and renewable energy

technology in developing countries and the benefits, if any that projects such as these provide for those who lack access to basic services such as electricity.

## **1.2 Purpose of the Study**

The purpose of this research is to assess and analyze user perspectives on EPI's *Play, Light, Learn* project on the Pediatorkope Island in the Dangme East District of the Greater Accra Region of Ghana. Through this research, I explore the perspectives of school children, who are the target users and beneficiaries of EPI's project. The intent is to better understand children's perspectives on a technology oriented development project and also the perspectives of other stakeholders. Through this approach, the voice of children becomes active rather than a passive one since primary focus is placed on their views, expectations and challenges with their participation as users and beneficiaries of the project.

Based on data derived from field research, we can investigate the role of renewable energy technology in development and the impact access to electricity has on improving education for children. Understanding the impact of development interventions by focusing on the experiences and views of beneficiaries is one of the best ways of assessing development projects especially when the target beneficiaries are children. However, in the past the attempt to understand children's experiences has been done by focusing on the views and opinions of adults who are in charge of their care, well-being and support and who are seen as speaking on their behalf (Christensen and James, 2008). In this instance, rather than focusing on the views of parents and teachers, the primary participants are the children, while



also integrating insight from teachers, school authorities and the NGO to put students' views into perspective. EPI works in about 40 communities across Ghana, but the fieldwork for this thesis was based on the Peditorkope Island in the Dangme East district of the Greater Accra Region. The study population is made of school children at the Peditorkope basic school and are nominally representative of a typical rural school setting. This community was selected because it is relatively easier to get to, location wise, as compared to other inaccessible communities where EPI works. Furthermore, the Peditorkope Island is the first community to have merry-go-rounds installed and it is expected that experiences and views from school children and the school community would provide a more rounded representation of the history of usage, children's interaction with the merry-go-round and swings and EPI's interaction with the school and community at large.

The specifics of this research were guided by two additional considerations. Firstly, although EPI has been in existence for nine (9) years, there has been no extensive assessment of their *Play, Light Learn* project. It is anticipated that conclusions and recommendations derived from this research will be helpful in ensuring that users and beneficiaries derive maximum benefits from this project. Secondly, there are gaps in the existing literature on children's views regarding technology oriented development projects in rural communities. Given the limited literature on this topic, the aim of this research is to add to existing knowledge on the subject and also to give a voice to a group of people who in many cases have always been spoken for. Children's voices and thoughts do matter and this research

provides a platform for them to be heard. Although generalizations will be limited to EPI's projects in Ghana, it could also provide insights on the importance of children's voices on interventions that affect their lives and the role renewable energy technology can play in children's education.

### **1.3 Research Questions**

As mentioned above, the focus of this research is to assess and analyze the perspectives of users and beneficiaries of EPI's *Play, Light, Learn* project.

This research is guided by the primary research question:

- What are the successes, failures and challenges of EPI's project on the Pediatorkope Island?

The supporting research questions are:

- What are children's perspectives on EPI's project?
- Does access to electricity have an impact on children's education?
- What factors influence children's use of the EPI's play systems? (Merry-go-round and swings)
- Is EPI's project an effective way of providing reliable, sufficient access to electricity for learning?

### **1.4 Research Methodology**

This research is based on data from fieldwork conducted on the Pediatorkope Island. Field data was obtained from Pediatorkope Island in the Dangme East

district of the Greater Accra Region of Ghana, utilizing interviews, focus group discussion, art and participant observation. At the Peditorkope Basic School, data was obtained from three major groups: 1) students at the Peditorkope School; 2) school authorities (headmaster and teachers) and; 3) the country director of EPI. One on one interviews were conducted with 16 students at the Peditorkope School, which included 8 males and 8 females from primary 4 to primary 6 grade levels, and the junior high school division. Students were divided into two groups based on their grade levels; 8 students each from the upper primary division and the junior high school division. Each participated in semi-structured interviews, which included open and close-ended questions as well as drawing and writing activities. Students from primary 4 to 6 grade levels engaged in drawings of what they considered as important at their school while students in the junior high division wrote about the things that they considered important to them at their school. One focus group was conducted with 3 teachers who were involved in the project as well as one interview each with the headmaster of the school and the EPI country director. In all, 1 focus group and 18 interviews were conducted.

Student participants were also recruited with the support of the school; recruitment was based on one criterion, only students who had received lamps from EPI were asked to participate in the study. Not all students have access to the EPI lamps distributed by the school so in order to assess the project, there was the need to only select students who were directly benefitting from the project. Consent was obtained from participants and their guardians through written and verbal consent; at the beginning of each interview, consent was also obtained to record the

interview. Additional data was also obtained through participant observation and this consisted of observing children in their school environment in order to understand their patterns of play, their use of the technology and the interactions between the community and technology installed by EPI. Lastly, interviews were conducted in English and there was no need to use any local language.

## **1.5 Thesis Outline**

To answer the above-mentioned research questions, the thesis is outlined as follows. Chapter one provides a brief introduction, background and context of this research in Ghana. Chapter two provides an overview on the human capability approach by Sen and Nussbaum including a theoretical exploration and discussion on how the capability approach can be utilized as a framework in assessing development projects. Chapter three provides a review of relevant literature on appropriate technology and development especially in the area of education and also discusses the link between technology and society and the social shaping of technology. It also discusses international development aid, specifically foreign aid and its impact, via development projects in deprived areas around the world. Chapter four provides a brief introduction to the Pediatorkope Island, traces the local history of Ghana and provides an introduction to EPI's work in Ghana. Chapter five provides an outline of the research findings and this Chapter is followed by a discussion of the key findings, providing a detailed analysis of the benefits, impact and challenges of the project in Chapter six. This analysis is made and situated in the

capability approach by Amartya Sen and Martha Nussbaum. Finally, Chapter seven provides an overview of the research findings, its implications and proposes recommendations on how benefits of the project can be ensured for all beneficiaries of EPI's project on the Pediatorkope Island and in communities in which they work.

## **CHAPTER TWO: THEORETICAL FRAMEWORK**

### **2.1 Background**

The 20<sup>th</sup> century has been marked with advances in all spheres of human existence. Life expectancy rates have increased, technology has changed the way society does things and people are more connected than ever before. Despite these, the world continues to be ravaged by poverty, violence and repression, where many live without basic necessities (Sen, 1999). Development is thus challenged with finding solutions to these global problems. This chapter will discuss Amartya Sen's capability approach which has been further developed by other scholars notably, Martha Nussbaum. The approach is relevant for this thesis as it provides a human centered approach to development issues, with its focus on enhancing individual's capabilities within all social, economic and political spheres (Sen, 1999). Discussion and analysis of the research data will focus on Sen's view of freedom and well-being, and also Nussbaum's lists of central capabilities that she considers necessary for "a life worthy of human dignity" (Nussbaum, 2011, p. 32).

### **2.2 Capability Approach**

According to Sen (1999), "Development is the process of expanding the real freedoms that people enjoy" (p. 3). Expanding people's freedoms should therefore be the means as well as the end of development (Sen, 1999, p. 35-36). Sen's approach is very different from the traditional and widespread way of understanding development which focuses on improvement in other areas such as

GDP and income generation however; this may not directly affect the lives of individual members in a given society. Sen's explains that focusing on an individual's income generation or on the GDP of a country does not provide a fair assessment of one's well-being (Sen, 1999). Development should therefore "expand the substantive freedoms" of an individual (Sen, 1999, p. 36). Sen defines freedom as the "processes that allow freedom of actions, decisions and the actual opportunities that people have given, their personal and social circumstance" (Sen, 1999, p. 17). Freedoms are however reliant on other social, political and economic factors which go to augment one's quality of life (Sen, 1999, xii).

Sen states that:

"Development requires the removal of all major sources of unfreedoms such as tyranny, poor economic opportunities as well as systematic social deprivation, neglect of public facilities as well as intolerance or overactivity of repressive states...In other cases, unfreedoms link closely to the lack of public facilities and social care, such as organized arrangements for health care or educational facilities" (Sen, 1999, p. 3-4).

Thus, for Sen, capabilities should be viewed as "freedoms to do" which are positive and "freedoms from" which are negative (Johnstone, 2012, p. 81). Freedoms are important to development because assessments on people's well-being should be based on the freedoms they enjoy and development can only be achieved through positively affecting people's ability to make their own choices, provided that opportunities exist for them to do so (Sen, 1999, p. 4). In the context of this research, children in rural communities who are unable to study because they lack access to modern infrastructure such as light and educational materials are unable to enjoy and fully exercise their freedoms. Their ability "to do" is constrained by the lack of

access to reliable light. On the other hand, when such resources exist but its distribution does not guarantee equal access to those in need, then forms of freedom exist for some but not for all (Sen, 1999).

According to Sen, poverty cannot merely be attributed to low-income generation; rather it is the deprivation of “basic capabilities” (Sen, 1999, p. 87). Although low-income does affect the quality of life one is able to live, there are also other factors besides income that affect one’s basic capability; capability deprivation is the lack of essential and basic needs (Sen, 1999). Sen asserts that around the world, South Asia and Sub-Saharan Africa are the two places where poverty is most severe however, focus should be on the specifics of their deprivations, rather than making generalizations based on GDP, which does not provide a clear picture of their levels of deprivation (Sen, 1999). Assessing poverty by focusing on the basic capabilities of individuals provides a more concrete way of addressing deprivations and forms of unfreedoms. Development therefore has to do with improving freedoms and capabilities that go to enhance an individual’s well-being. On the other hand, Sen purports that the state has a role to play in ensuring that individuals are able to use their capabilities, as such are dependent on other social factors that go beyond an individual’s control (Sen, 1999, p. 288).

Sen notes that, “a child who is denied the opportunity to elementary schooling is not only deprived as a youngster, but handicapped all through life” (Sen, 1999, p. 284). In effect, ensuring the capabilities and freedoms of children determines the freedoms they are able to enjoy later in life. In the case of this research, ensuring education is not only about providing books and teachers but



also providing infrastructure, light for studying and engaging in practical aspects of learning such as science and Information Communication Technology (ICT). The education provided should be functional. The capability approach is also useful in understanding the notion of *energy poverty*, how it impacts education and the real opportunities and freedoms access to reliable energy can enhance. Additionally, both Sen and Nussbaum's assertion support the utility of the capability approach in this context because important issues such as health and education are not usually reflected in per capita growth or increase (Sen, 1999; Nussbaum, 2011, p. 14).

For Nussbaum, the capability approach asks, "what are people able to do and to be?" and "what real opportunities are available to them?"(Nussbaum, 2011, p. 14). She stresses the capabilities(s) in the plural form because of the multi-dimensional nature of human needs (Nussbaum, 2011, p. 18). Nussbaum defines the capabilities approach as a "comparative quality of life assessment", one that provides a theoretical view on basic social justice (Nussbaum, 2011, p. 18). Thus, individuals must be able to freely exercise their right to choose and make use of opportunities that are suited to them, enabling them freedom and choice since individuals differ in what they hold as valuable. Nussbaum's take on the capabilities approach addresses challenges with social injustice and inequality, which occur and thrive due to "discrimination and marginalization" tendencies (Nussbaum, 2011, p. 19). Such issues create disadvantage which inhibit an individual's functioning's (De-Shalit & Wolff, 2007). Functioning according to Nussbaum is the "active realization of one or more capabilities" (Nussbaum, 2011, p. 25). Thus our functioning reflects what we are able to do.

Nussbaum believes that some capabilities can be judged as being more basic than others. She suggests that the focus should be on entrenching basic freedoms without which life is not worth living (Nussbaum, 2011, p. 31). She outlines a list of ten (10) basic “central capabilities” necessary for any individual to live a dignified life. These include: “1) life; 2) bodily health; 3) bodily integrity; 4) senses, imagination and thought; 5) emotion; 6) practical reason; 7) affiliation; 8) other species; 9) play; and 10) control over one’s environment” (Nussbaum, 2011, p. 33-34). Of the ten central capabilities listed here, sense, imagination and thought which covers education, and play which focuses on the enjoyment of recreation will be most useful as a reference point for further discussion on data obtained from field research related to this project. It will also be useful in assessing the overall quality of life of rural students who do not have access to electricity, but who benefit from Empower Playgrounds Incorporated (EPI)’s project. For example, what they are able to do and able to be as a result of accessing light? How does a lack of electricity affect their ability to do and to be? What opportunities may or may not exist as a result? Nussbaum reiterates that this is not a fixed or rigid checklist that needs to be followed; rather, it should be opened to further academic discussion and review (Nussbaum, 2006, p. 53)

Specific to the application of the capability approach to education, Nussbaum explains that being able to use one’s imagination, to think and to reason are all dependent on the education received (Nussbaum, 2011). She believes that education enhances other capabilities such as better opportunities to secure jobs and to take part in the political processes of one’s society. She notes that it is “crucial

to individual opportunity and self-development” because “illiteracy is an enduring disability” (Nussbaum, 2011, p. 154). Education plays such an important role in expanding other capabilities that it should be compulsory for children as it impacts their later years (Nussbaum, 2011, p. 156). Children regardless of where they live or who they are must have access to quality education and support, vital to ensuring the propagation of a better education agenda.

### **2.3 Critique of the Capability Approach**

There have been extensive debates on Sen and Nussbaum’s work. Despite its extensive reaches, this approach is not without critique. The capability approach advocates for basic capabilities for all individuals. The premise that a basic threshold exists at which all individuals need to be for their well-being has been critiqued as being “sufficientarian”(Kaufman, 2006, p. 10), where the approach aims at basic levels of functioning without enough discussion placed on what happens after an individual has surpassed this stage in capability development (Anerson, 2006). Anerson argues that “good is not good enough” and there is the need for a discussion on the actualization of capabilities that go beyond this basic point (Anerson, 2006, p. 18). Furthermore, Anerson notes that the capability approach focuses on capabilities and functioning however individuals’ at any time possess many functionings, some important and others inconsequential. He views this as a problem with Sen’s approach because without a specified ordering of the various functionings, comparisons between different individuals cannot be made (Anerson, 2006, p. 21)

The capability approach has also been critiqued as being very “abstract” (Johnstone, 2012, p. 88). Although the approach clearly explains and defines its main point and its view on freedoms, well-being, etc., Sen’s account does not provide any specifics on capabilities and functionings that are relevant for individuals, leaving his account incomplete. Frediani (2010) reiterates this, suggesting Sen does not provide “clear practical guidelines to practitioners or researchers on how to assess or identify capability” (Frediani, 2010, p. 177). Measuring of functionings has to be done on a case-by-case basis and the diversity found within each individual makes its application a challenge (Johnstone, 2012). This is because individual functionings differ and there is the need to consider how each person views what they are able to do and what opportunities are available to them.

In addition, Johnstone (2012) asks if it is possible for agreement, particularly between practitioners and researchers on a specific list or on a “threshold level of functioning” (Johnstone, 2012, p. 89). Although Nussbaum’s list has been widely discussed, not everyone completely agrees on the components of the list. Moreover, the capability approach is a much newer concept in the area of understanding and assessing individual well-being. Johnstone believes that its usefulness in the future will depend on its ability to provide value in the assessment of technology and to supplement other known approaches in development (Johnstone, 2006, p. 89). Others criticize Sen’s approach saying that it encourages a normative approach by theorist and society at large to decide the best interest of others thereby infringing on their freedoms because their real wants and needs may be completely different

(Sudgen, 2006; Qizilbash, 2011) Sen argues that this view is an inaccurate presentation of his work (Sen, 2006).

Finally, De-Shalit and Wolff suggest that the “term capability is not perfect” because it is used “inconsistently” (De-Shalit & Wolff, 2007, p. 37). It can mean freedoms and it can also stand for a variety of functionings that have not been achieved (De-Shalit & Wolff, 2007, p. 37). Rather, they propose the use of “genuine opportunities for secure functioning” as a replacement (De-Shalit & Wolff, 2007, p. 37). That is, making available real and tangible opportunities that will guarantee an individual’s capabilities. The capability approach can be used to enhance advantage and reduce disadvantage by focusing on “genuine opportunities that secure individual functioning” (De-Shalit & Wolff, 2007, p. 37).

## CHAPTER THREE: LITERATURE REVIEW

### 3.1 Technology, Society and Development

#### 3.1.1 The role of Technology in our Society

There is a predominant notion that technology will change the world but the key question relates to ensuring that technology positively affects global development when confronted with the fact that technology has yet to positively influence significant change to many of the globe's engrained problems. In *The Social Shaping of Technology*, Mackenzie and Wajcman (1985), remark that the social shaping of technology denotes "the influence of social factors on the design and configuration of physical objects" however, technology refers to objects and also human activities (p. 3). Rochracher (2003) adds that the social shaping of technology denotes a focus on "the design phase of technologies and on actors, institutions or generally socio-technical systems that must be tied together in order to shape, stabilize and socially embed innovations (p. 177). Mackenzie and Wajcman (1985) also note that technology is "what people know as well as what they do"(p. 3). "Technological things are meaningless without the know-how to use them, repair them, design them and make them" (Mackenzie and Wajcman, 1985, p. 3). Furthermore, Oosterlaken (2013) asserts that technological artifacts also constitute an integral part of social structures and this is expressed as "socio-technical systems" and because of this, one's capability is correlational to the interactions and relations to other people and artifacts in their society (p. 147).

The social shaping of technology is not limited to social aspects; however, it also includes political, economic, psychological and historical influences (Bijker and Law, 1992). Winner (1985) ascribes to the school of thought that argues that technology is embedded with politics and is thus political. Schelly (2015) buttresses this assertion, agreeing that various academicians in the area of science and technology view technology as being political “through the social construction of the meanings assigned to them...with the “technology’s politics constructed through interaction with other social structures, networks and constructions (p. 27). Conclusively, the actions and inactions of humans in their social environment influences the objects and things designed for their use; thus society can also shape technology in various ways. Furthermore, for advanced technologies to function properly and be successful in societies in which they are deployed, research suggests that culture and traditions must be firmly rooted (Garcia & Bartolome, 2010; Wajcman, 2006).

Mackenzie and Wajcman (1985) however assert that agreeing that the effect of technology on society is uncomplicated causes a simplification of the discourse; the relationship between technology and society is a complex one (p. 6). Assessing the influence and impact of technology on society is a cumbersome and challenging process involving multiple levels of interaction. In order to understand the cause and effect relationship between technology and society, there is the need for a theory that helps us to understand the changing nature of society (Mackenzie and Wajcman, 1985, p. 6). For instance, despite the fact that technology is socially constructed, electrification projects that are solely reliant on renewable energy have

been known to focus on technical issues without much consideration for social issues which may affect the smooth adaptation of such technologies in developing countries (Garcia & Bartolome, 2010). According to Troncoso, Castillo, Masera and Merino (2007) for technology to be easily accepted by its users, it “must be more useful than the one it is substituting. It must also be more compatible with the attitudes, values, beliefs and needs of potential users” because “any innovation that goes against an entrenched custom in a community is unlikely to be adopted (Troncoso et al., 2007, p. 2800). Technology affects society in a variety of ways and there is the need for development practitioners to understand the social and cultural context in which they deploy such projects. Mackenzie and Wajcman (1985) discuss that the design of a technology can “consciously or unconsciously open up certain social options for some and close others”; enabling opportunities for some and creating barriers for others (p. 7). In this way, technology can be designed to favor a group of people over others, enabling inequality and discrimination (p. 7). Winner (1985) illustrated a particular example of builder, Robert Moses, whose work building bridges, roads etc. across New York knowingly discriminated against people in the lower class bracket and racial minorities due to its design, shutting out mostly poor people and people of African descent (p. 28). Moses designed an overpass that could not be accessed by buses due to height restrictions, therefore preventing people who commuted via buses from accessing locations such as Jones beach, a public park in New York (Winner, 1985). The technology had served its purpose of enabling movement and transportation but embedded within it was racial and social discrimination (Winner, 1985). Winner noted that when technology



built for our use excludes or discriminate against others, there is a need to provide a remedy by “redesigning and rebuilding” it to incorporate the needs of those who are left out (Winner, 1985, p. 28). Bijker and Law later added that technology “embody social, political, economic and professional commitments, skills, prejudices, possibilities and constraints” (Bijker and Law, 1992, p. 7). It is quite clear that designers design technological tools based on its perceived usage by the target users or beneficiaries, that is, how the technology will be used however, the way a technology is used (and not used) in the long run cannot be determined by the one who designs the technology (Rohracher, 2003).

According to Winner (1985), focusing on technology may be of less importance than the social and economic conditions in which technology finds itself. However, the author goes on to add that this should not be a one sided view. The technical aspects of technology need to be addressed as well. A one sided view does not provide a full understanding of a technology’s role and impact on our society.

“If our moral and political language for evaluating technology includes categories of having to do with tools and uses, if it doesn’t include attention to the meaning of designs and arrangements of our artifacts then we will be blinded to much that is intellectually and practically crucial” (Winner, 1985, p. 30).

Winner suggests that careful consideration should be given to the technology we create and build just as is done for all aspects of the political order including the structures that govern society.

“The things we call technologies are ways of building order in our world. Many technical devices and systems important in everyday life contain possibilities for many different ways of ordering human activity. Consciously

or not, deliberately or inadvertently, societies choose structures for technologies that influence how people are going to work, communicate, travel, consume and so forth over a long time...different people are differently situated and possess unequal degrees of power as well as unequal levels of awareness” (Winner, 1985, p. 30).

The work is concluded with a recommendation to give more attention to technical objects as it does not mean that the socio-economic and political contexts are overlooked (Winner, 1985).

According to Bijker and Law (1992), primary considerations should be the reasons for choosing a specific technical design, constraints linked to producing and introducing new technology, expectations of key stakeholder such as engineers, political and business leaders regarding the role of the technology, and its potential use [and/or misuse] (Bijker and Law, 1992). Bijker and Law (1992) state, “entrepreneurs like Edison designed not only devices but also societies within which these devices might be successfully located” (p. 12). The authors argued that technology affects society, while society also affects the technology, its application, its design and the ultimate beneficiaries of its development.

If technology and society are interconnected why then does technology development not necessarily match the needs of its users? Akrich (1992) provides some perspectives on this; “technical objects defines actors, the space in which they move, and ways in which they interact.”...“However in the area of technology innovation and transfer, objects and their supposed functions or the relationship between supply and demand are poorly matched” (Akrich, 1992, p. 207, 216). Often times, problems with technology transfer, particularly in the context of developing

countries, are only realized after the technology has been deployed on the field and the intended users come into contact with it. Industrialist would attribute the failure of a technology transfer to “it being socially misused” while the users of the technology would attribute the failure to a technical misjudgment (Akrich, 1992, p. 220). Akrich stresses that this scenario reflects “a lack of relationship between the designer and the designed for” (Akrich, 1992, p. 220). Garcia and Bartolome (2010) assert that when analyzing challenges with technological electrification systems for example, focus is often directed towards issues such as the misuse of materials, the inability of users to understand instructions etc., and these characterize the challenges with renewable energy electrification systems. The problem here is not with the technology being branded as simple or complex rather, if beneficiaries are unable to properly use it then there is a clear need for education as well as engagement with communities where these technologies are introduced. This is because technology is not completely neutral; moreover, its successful implementation is in some ways dependent on user’s ability to interact with it.

Again, “in shaping the socio-technical systems by appropriating technologies, users play an active part in the process of product creation (Rohracher, 2003, p. 184), “and one should be careful about accepting the common a priori distinction made between user and designer. This distinction implicitly inscribes assumptions that one is passive (user), the other is active (designer)” (Rohracher, 2003, p. 184; Lie & Sorensen, 1996, p. 8)

Rohracher (2003) concludes by saying that

“Users do play an important part in shaping technologies-especially at a late stage of innovation or early stage of diffusion and within the limits of existing social technical regimes. However, support of public policy would be needed to make this process more effective and more inclusive from the point of view of both user interest and wider policy aims” (Rohracher, 2003, p. 188).

### 3.1.2 Technology and Development

Technology in development does not need to be sophisticated or hi- tech for it to achieve results; even simple technological interventions can produce far-reaching results (Uphoff, Esman & Krishna, 1998). Likewise, confidence placed in the effectiveness of technology will not always produce the required outcomes. According to Oosterlaken (2013) failures in technology transfer to third world countries in the past can be attributed to “the fact that technologies do not expand human capabilities without the required interdependencies with people, social structures and other artifacts being present in the recipient country” (p. 152). Development projects incorporating technology or requiring the transfer of technology have therefore been labeled as problematic in their implementation (Baark & Heeks, 1999). This is because such projects go beyond mere equipment installation; and social and cultural considerations may differ between the source and recipient societies (Baark & Heeks, 1999). According to the UN Millennium Project, (2005), development projects or programmes that include ICT face uncertainties and challenges and such programmes are unable to extend beyond the pilot stage. Science and technology can contribute to the realization of MDG’s by

contributing to human welfare, better sanitation, improvements in healthcare, political and global security and also in the area of access to energy (UN Millennium Project, 2005, p. 21-23). In practice, rural development may not require the integration of new technologies as technology is not always a solution for development problems (Uphoff, Esman & Krishna, 1998). In some cases development projects and programmes introduce new technology and make changes to existing technology without proper assessment and research (Uphoff, Esman & Krishna, 1998). University of Michigan professor, Kentaro Toyama in his book *Geek Heresay: Rescuing Social Change from the Cult of Technology*, recounts his experiences with “technology driven philanthropy” and the propagation of technology programmes as a fix for improving education outcomes in India (Toyama, 2015, p. 6). The author was in charge of a number of Microsoft’s *technology for education* projects in India. His initial thoughts on the use of technology to solve problems with education in the developing world are summed up, “By inventing and disseminating new, low-cost devices for learning, we believed we were improving education for the world’s less privileged children. But were we?” (Toyama, 2015, p. 6). Toyama suggests that focusing on technological solutions often times neglected other challenges (that in some cases were in a more urgent need), which technology could not address. Similarly, Oosterlaken (2012) adds that improving access to specific resources, programs or infrastructure does not necessarily translate to the development of human capabilities. Thus, well-planned technology oriented development projects - like many other development project - may create more problems than solutions.

Access to education for all had been recognized as being vital to development in any country and this is reflected in its inclusion in the Millennium Development Goals (MDG's) (UN, MDG's Factsheet, 2000). According to the World Bank (n.d.-a), education is an important factor in achieving the MDG's. In light of this, children are enrolled in school than ever before and from 2000 to 2012, there has been a decline from 100 million to 58 million in the number of children who do not go to school (World Bank, n.d.-a). Furthermore, 92% of primary school children are able to finish schooling as against 81% between year 2000 and 2012 (World Bank, n.d.-a). According to the UN Millennium Project (2005), technology impacts development in two distinct ways, which is "innovation can directly increase the ability of existing science, technology and innovation programs to reduce poverty and expand human capabilities. Secondly..."technology can indirectly affect human well-being by enhancing productivity and increasing economic growth and incomes" (UN Millennium Project, 2005, p. 31). However, extending ICT to schools in developing countries also has its own challenges. For educators and governments in developing countries, their main challenges have to do with extending limited resources to meet the needs of poor students while increasing access to ICT for all (Newby, Hite, J., Hite, S, & Mugimu, C, 2012). Information communication technology (ICT) has been a central focus of technology transfer initiatives within the educational sector of many developing countries. The aim is to improve educational outcomes of students, however, it may not always be the best solution to improving educational outcomes. Toyama explains that Inter-American Development Bank economist Ana Santiago and her peers found that the '*One Laptop per Child* programme' did not

provide any “educational advantage” in Peru (Toyama, 2015, p. 8) Moreover, according to Kullman and Lee (2012) the *One Laptop per Child* programme has been criticized as being short sighted, providing only “a quick fix to educational problems in developing nations while paying less attention to the inevitable need for proper training, infrastructure and financial commitments across local-global divides...” (p. 53). Toyama also notes that other researchers’ found similar results in that a) technology on its own was unable to make any significant impact on students learning, and b) computers could be used to complement teaching but could not replace teacher-student classroom engagement (Toyama, 2015, p. 8). Bates (2004) agrees that with the introduction of new technologies such as television, radio personal computers etc., brought about an immense interest in the impact of such technologies on education however, its impact has been minimal because as they describe, “it has not been able to change the essential process of a teacher personally interacting with learners” (p. 271). A statement by the CEO of Azim Premji Foundation in India conceded “At best the fascination with information and communication technology as a solution to all problems with education distracts from the real issues. At its worst, ICT is suggested as a substitute to solving real problems” with education (Azim Premji Foundation, 2010, para. 17); Toyama, 2015, p. 8). The consensus here is that ICT will be unable to make a lasting impact on education when “the basic building blocks of a good education system-teachers, infrastructure, curriculum and content, teaching and learning tools, and administration-are missing in many developing countries” (UN Millennium Project, 2005, p. 55). The Azim Premji Foundation supports programs centering on

improving education in about 350,000 schools in India (Azim Premji Foundation, n.d.); such a stance underscores the notion that technology, as a sole solution to educational problems is not a solution. Although Toyama asserts that technology does not solve all the problems with education, it has proved to have made strides in other educational areas. For example distance teaching and learning enabled by ICT can address the lack of qualified teachers in rural communities, can be useful in the efficient and effective training of teachers and in the area of healthcare, has proved useful in aiding consultations and diagnosis by medical staff in far off areas and also in the area of medical research (UN Millennium Project, 2005). He discusses this apparent contradiction, noting that it is not entirely true that technology doesn't provide positive outcomes for education and learning however, it can be both helpful and unhelpful (Toyama, 2015). He concludes that technology does provide positive outcomes in some cases however, it lacks the ability to be a singular solution to larger societal issues (Toyama, 2015). Lawson (2010) firmly believes that technology plays a vital role in the expansion of human capabilities – this could also mean that educational technology plays a vital role in the expansion of children's capabilities, however Lawson (2010) questions whether “a role can be a defining aspect of “a thing” and whether “a thing can be defined in terms of the position it occupies in the role it serves in some larger system?” (p. 207-208)

### 3.1.3 Appropriate Technology and Development

In “Reasons for Success” Uphoff et al. (1998) discuss case studies on technology-oriented projects in countries such as Bolivia, Burkina Faso, Nepal and



Thailand. The authors note that users consider technological transfer that is first introduced, tested and evaluated based on its fit to local needs as the most appropriate. They go on to suggest that the transfer of technology must be appropriate and be able to fit local needs and conditions in order to work effectively. According to Lawson (2010) technology plays an instrumental role in social change and although scholars have varying views on the degree of its influence, still, Lawson asserts that “whether new technology is understood...to be good...or whether technology is viewed as essentially bad...the instruction of technology tends to disrupt and undermine current ways of doing things” such as “disruption of existing networks of interdependencies as some capabilities are extended” (p. 220).

Rohracher (2003) stresses “the social processes taking place at the early stages of technology diffusion also help us to understand the possible difficulties of transferring existing technologies to new contexts and adapting these to new kinds of use” (p. 178). Nichols and Dong (2012) state that some of the characteristics of technology-oriented development projects include “community participation”, “small scale”, “labor intensive”, and “respectful to local culture and the environment”; comparatively, for technology to be considered appropriate, there is the need for it to be “small scale”, “simple”, “environmentally friendly and utilize low cost technology” (Nichols & Dong 2012). Uphoff et al. (1998) purported that successful development programmes and projects must introduce simple technology that addresses recognizable local problems. Hence, to be considered appropriate or a good fit, technology transferred should be comparatively easy to

use and be able to demonstrate results in the early stages of its introduction (Uphoff et al., 1998).

“Even when program managers are reasonably confident about a particular technology, they cannot be sure of its acceptance by local people until success has been tangibly demonstrated and people feel confident that they themselves, not only trained technicians can put new technology to good use” (Uphoff et al., 1998, p. 114).

Technology-oriented projects and programmes should follow a process that includes testing and introducing simple technology, observing, analyzing responses from users and if positive, it is then that decisions can be made on upgrading or introducing further techniques or technology programmes (Uphoff et al., 1998). Technology transfer and technological change must be introduced slowly as it is almost impossible to determine the dynamics of technological change. Furthermore, change happens during the process of implementation thus, pilot projects are particularly helpful because it provides helpful information on how technology transfer will be received (Uphoff et al., 1998).

Fernandez-Baldor, Hueso and Boni (2012) take a slightly different point of view suggesting that technology has been a powerful tool for development in some instances. The creation of phones for easier communication, airplanes and cars for transportation, and advancement in [even simple] medical technologies has had considerable impacts even in the developing world. However, the authors conceded that there have been many failures for technology-oriented development over the past decades (Fernandez-Baldor, Hueso & Boni, 2012), making the link – as others have – to a singularly focus on the technology itself and little consideration to the

processes of technological change (Fernandez-Baldor et al., 2012). In the process of technology transfer - participation, empowerment and capacity building are sometimes pushed to the side. Uphoff et al. (1998) explain, that communities are not just mere beneficiaries of technology who accept it blindly. User participation in the implementation of technology and development programmes aids in building capacity and instilling confidence in users. It also supports the integration of local knowledge and external knowledge and expertise (Uphoff et al., 1998). Technology transfer should not necessarily replace traditional forms of knowledge; instead it must incorporate - where appropriate - local knowledge in program design and implementation. These two forms of knowledge are complementary not conflicting. One particular form of 'local knowledge' that is often under represented is that related to the point of view of one significant set of beneficiaries: children.

Nichols and Dong (2012) indicate that the aim of a technology-oriented project should be the integration of a technology in a manner that avoids the social and environmental problems derived from conventional technology transfer processes, while decreasing the technological dependence of developing countries on externally supplied knowledge. However, defining *appropriate technology* is not without its challenges. When integrating *appropriate technology* into communities, those communities are usually not involved in the initial stages of technology selection and transfer. Communities do not have much of a say in the design and implementation of the projects they benefit from (Nichols and Dong, 2012). Furthermore, when it comes to the duplication of tech-based projects elsewhere, this becomes a challenge due to the uniqueness of each locality or community. A

'one size fits all' model does not work. Such projects have to be fitted to the unique wants and needs of each community. Again, another challenge is the notion that appropriate technology must have a focus on creating small-scale solutions to problems, rather than focusing on the bigger picture. Investing in solutions at the macro level can have trickle down effects for solving smaller problems. However, to overcome the hindrances and limitations that come with the deployment of new technology and its expansion, there is the need to consider grassroots socio-technical dimensions, thus suggesting the need for a two-pronged approach (Lee & Yun, 2015).

Specific to education, literature asserts that while technology has not solved all the problems with education, it has made strides in some areas. Toyama discusses this apparent contradiction, noting that it is not entirely true that technology doesn't provide positive outcomes for education and learning. In effect, it is both helpful and unhelpful (Toyama, 2015). The transfer of technology in some situations does more harm than good; however it has made strides in other areas. Toyama concludes that technology does provide positive outcomes in some situations however its blanket application lacks the ability to address the greater root problems for which it is designed (Toyama, 2015).

### **3.2 Objects in Development**

Development projects have been utilizing innovative initiatives to solve problems in the developing world for some time now. Innovative technology has been

incorporated into projects to improve education and access to clean and safe drinking water, to promote novel agricultural strategies to improve food security, and to provide renewable electricity via lamps. Examples include the *'One Laptop Per Child'* project, solar powered toilets, the 'Soccket' - a football designed to store energy for learning when children play, and the PlayPump, designed to pump water into a raised tank via a children's merry go round. Two of these examples, notably the Soccket and the PlayPump, will be discussed further below given the potential relevance to the context of the broader research being addressed in this manuscript.

### 3.2.1 Un Chartered Play: The Soccket and Pulse

The "Soccket"<sup>1</sup> is an innovative product targeted at providing clean electricity for children who lack access to reliable electricity. This idea stemmed from a school project at Harvard in 2008 that developed into the for-profit company "Unchartered Play" (Collins, 2014). The Soccket is sold to charitable organizations [and also corporations] and individuals who distribute them to poor children in the developing world. Bill Clinton described the ball as "extraordinary, an off-grid solution that gives us a way to bring power, improve quality of life, working capacity, learning capacity" (Uncharted Play, 2012; Vinter, 2012, para.5).

"The Soccket Original harnesses the rotational energy generated each time the ball rolls. It works similarly to a bicycle generator or windmill. Inside each ball, there is a pendulum, a DC motor... coordinating the process and a rechargeable lithium ion battery. As the ball rolls, the pendulum turns the DC motor, charging up the battery" (Uncharted Play, n.d-a).

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<sup>1</sup> See Appendix B for Picture of Soccket and Pulse

The Soccket looks like a soccer ball designed to store energy within it when it is kicked around (Collins, 2014). It changes kinetic energy into clean electrical energy necessary for powering small appliances (Collins, 2014). It can be described as a “portable generator that is disguised as a soccer ball for playing” (Bertucci, 2015, para. 1). It is made from recyclable Ethylene Vinyl Acetate (waterproof EVA) that is designed to be durable however, the Soccket weighs a little more than the ordinary soccer or football (Bertucci, 2015). Due to its design, it does not require air pumps and this reduces the risk of it being punctured or deflated in rough conditions (Bertucci, 2015). According to Unchartered Play (n.d), the ball has been designed to “promote physical activity and spread awareness about the global energy problem”; the more it rolls around, the more power it produces (Unchartered Play, n.d). The ball also comes with an LED lamp and light is made accessible when the lamp is plugged into the center of the ball” (Unchartered Play, n.d). According to Unchartered Play (n.d), one hour of play is able to generate 3 hours of light for use.

As of 2015, one Soccket ball costs \$99 to purchase however, presently, one ball cost \$199 and included with the purchase of a ball is their think out of bounds education curriculum and one comic book. Initially, the balls were sold separately however it has been rebranded as an education package. The Soccket was first distributed in Puebla, Mexico in March 2013 with the distribution of 150 balls arranged through Televisa, Mexico’s biggest TV network (Collins, 2014). In 2014, Unchartered Play had plans of distributing 50,000 Soccket balls a year, all over the world, however, there were concerns regarding its quality and durability (Collins,

2014). Ten (10) families who had received one of the balls when it was distributed in 2013 were interviewed. The reporter and researcher, Jennifer Collins recounted that eight (8) families mentioned that the balls had broken down within months; some even within days of its distribution (Collins, 2014). In short, many recipients found that balls were not able to last, even though the balls were expected to last 3 years (Collins, 2014). The problems with substandard production and manufacturing made the project seemingly useless in providing solutions. However, the founder countered, explaining that there were two different types of balls distributed to Mexico. The balls that had been distributed later were a much-improved version of the former and the only reason why the first balls had been released without thorough testing was because of pressure from Unchartered Play's funding partners to get the product out. Unfortunately, beyond this one report, there is little information available, directly related to the actual development impact of these balls, merely the intentions and ideals behind the product.

Another more recent product that has been introduced by Unchartered Play is the Pulse. The Pulse is a skipping rope that works as an emergency power storage device. Similar to the Soccket, the Pulse harnesses the rotational energy "generated when one jumps" (Unchartered Play, n.d). It can also be charged via grid electricity by plugging it into an outlet on the wall or a computer (Unchartered Play, n.d). Thus, if there is the need for power and there aren't any available options, play via the jump rope can provide access to power for small electronic devices. Similar to the Soccket, Unchartered Play describes the Pulse as "a portable, emergency battery charging jump rope designed to promote physical activity and spread

awareness about the global energy problem” (Unchartered Play, n.d). It is made out of recyclable plastic with Lithium-ion battery and metal motors and gears. The jump rope purported to be able to produce 2 hours of light with only 15 minutes of skipping (Unchartered Play, n.d). Similar to the Soccket, the Pulse cost \$99 to purchase however, presently; it has been rebranded as part of an educational package. It costs \$199 and included with this purchase is Unchartered Play’s think out of bounds education curriculum and one comic book.

### 3.2.2 Challenges and Problems

Collins (2014) juxtaposes good intentions versus tangible results in the provision of services and resources for people in need. Projects start out with well-meaning people who have well-meaning ideas but intentions alone do not address developmental issues and challenges. Rather, good intentions must be backed up by solutions that work. Jessica Matthews, the co-founder of Unchartered Play, makes a statement that reflects this challenge. In a 2014 interview, responding to problems plaguing the Soccket in Puebla, Mexico, Jessica Matthews stated "This seems a little bit like a general attack on young adults trying to do something good" (Collins, 2014, para. 29), seeming to suggest that the intention was sufficient. Good intentions in development work is not a negative thing; however when the focus is shifted from finding solutions to the propagation of fancy ideas steeped in intention rather than implementation, what follows is often times a considerable lack of success.

In his article “Deflating the Soccket Ball”, Ausland (2012) states that using a cost benefit analysis, the Soccket is no better an alternative to cheaper solar and



LED powered lamps on the market. He explains that although there are other sources such as kerosene lamps and generators that produce or emit smoke, noise and substances that are unhealthy into the environment, the Soccket may not necessarily be a better alternative. Moreover, diesel powered generators produce far more electricity per unit cost than the Soccket - thus its benefits are considered to be fewer and far between.

### 3.2.3 PlayPumps

The PlayPump<sup>2</sup> is simply a merry-go-round designed to use the rotational energy created to pump water. Borland describes it as “an example of a celebrated contemporary design for development object” (Borland, 2011, p. 26). When first introduced in 1994, the play pump received considerable attention within the development world, and was nominated for the National Design awards in 2007 by the Cooper-Hewitt Museum in the USA and also won the World Bank Development Place Award in 2000 (Borland, 2011, p. 26). Then First Lady, Laura Bush, referred to it as an “example of the difference sustainable designs can make” (Bush, 2007 as quoted in Borland, 2011). The PlayPump was designed to utilize children’s rotation on a merry-go-round to pump water into a raised tank or reservoir for community usage (Borland, 2011). In order to sustain and maintain the project, the raised tanks served as advertising boards to generate income to be used to support the project.

The PlayPump, the first of its kind was created in 1994 and its first two installations were done in the Masinga district, South Africa (Watson, 2009). It

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<sup>2</sup> See Appendix C for Picture of a Play pump

wasn't until 1999 when the inauguration of a new school by Nelson Mandela where a play pump had been installed that the concept reared its head again. Due to the considerable attention that ensued, another 700 PlayPumps were installed in South Africa by the end of 2005 (Watson, 2009). In 2006, Laura Bush and Bill Clinton revealed a \$16.4 million dollar grant to be provided by the US government and other aid organizations for the installation of more PlayPumps in South Africa (Watson, 2009). The organization, PlayPumps International had a goal of raising an additional \$45 million for the installation of 4,000 play pumps in neighboring African nations such as Mozambique, Swaziland and Zambia, and then later on expand into Lesotho, Malawi, Ethiopia, Kenya, Tanzania and Uganda (Freschi, 2010). The organization had been able to successfully market its ideas to people who mattered in development, politics, entertainment and also on social media, so much that PlayPumps International was able to raise funds for the "100 pumps in 100 days" project in both 2007 and 2008 on World Water Day (Freschi, 2010, para. 2). The innovator behind the technology was Ronnie Stuiver, an engineer who drilled wells and boreholes in rural communities in South Africa (Borland, 2011). The idea was inspired by his experiences with children while he installed boreholes in rural communities. He decided to create the PlayPump to provide play for children and water for the community (Borland, 2011). The idea grew largely due to Trevor Field, an advertising executive at that time, who obtained the patent for the PlayPumps from Stuiver in 1992 (Borland, 2011). The idea to put up billboards for advertising can also be credited to Trevor Field; the water storage tanks had four different sides; two were set aside for advertising "public service" messages such as HIV

prevention and the promotion of hand washing in children. The remaining sides were rented to corporations such as Unilever (Borland, 2011). Installing a play pump in a community was expected to cost ~\$14,000 not including the drilling of boreholes (Chambers, 2009).

The project was hailed as an innovative solution to solving water and sanitation problems. However despite its strong backing, the availability of funds, and strong international support, it failed to produce much needed results.

### *3.2.4 Challenges and Problems*

Ausland (2012) believes that the PlayPump project and aforementioned Soccket have similar problems. First, will play still be play when it is tied to providing access to a basic need such as electricity? Is it fair to ask children to invest an hour or two every day to gain access a basic need that others receive automatically or at least with minimal inconvenience? Although well intentioned, at what point do beneficiaries view play as work and will they get tired of this. Water Aid was one of such organizations that stated that the PlayPumps encouraged child labor (Chambers, 2009). Borland explains that despite children's efforts to use the PlayPumps, it proved inadequate in producing water because of the pumping rate of the system and also because their play alone was not sufficient enough to supply an entire community's water needs. In this case, children are burdened with play, which is expected to produce water for their community. David Martin from Water Aid asserts that although the PlayPump concept utilizes children's energy its availability cannot be guaranteed in times of high demand which is usually around

early morning and evening and also when it rains (Martin, 2009 as quoted in Borland, 2011). Although an overhead storage tank is provided to store water for later use, it is usually never full because of demand (Borland, 2011).

UNICEF's unreleased paper evaluating the PlayPump as an appropriate technology for water and sanitation programmes provides a list of disadvantages and problems with the PlayPumps. First, the merry go round did not keep children safe from falling most especially when it was rotating at a high speed (UNICEF Report, 2007, p. 8). Furthermore, the platform on which the merry-go-round was built on was made out of concrete, which caused bruising when children fell. The paper recounts reports of children falling off the merry-go-round, which caused bruising and cuts (UNICEF Report, 2007, p. 8). In one instance, a child was reported to have broken an arm while playing on the merry-go-round. Also, children reported that they felt dizzy when they used the merry-go-round. The report mentions that there were cases where women and children vomited after spinning on the merry-go-round. In addition to this, all the women who were interviewed in Zambia stated that they did not like using the PlayPumps. In one community however, it was reported that adults gave children money so that they would play on the merry-go-round (UNICEF Report, 2007, p. 9). Lastly, women in a remote area in Mozambique lamented that turning the merry-go-round was a lot of work especially for older women. They stated that the hand pumps provided earlier were a much easier option and no one had asked them about the views concerning the switch to the current merry-go-round (Troubled Waters, 2010). From these reports, it is clear that the communities were not in favor of the PlayPumps and the idea behind it.

Additionally, there were problems with the design of the project and also with maintenance. For example, when the overhead tank was empty, the water had to first be pumped into the overhead tank before it could be collected by a user, rather than being able to pump water directly to a secondary output. This meant that a lot of effort and energy had to be exerted just to fill up a small container because the overhead tank was usually never full (Borland, 2011). This flaw in design prevented community members from easily accessing water. Maintenance was another issue, with several instances where the pumps had broken down and no one was able to fix them. And although community members contacted the project installers/managers, often times no one came to fix the problem (Borland, 2011).

As mentioned earlier, the billboards on the overhead tanks were to serve as a source of funding for the maintenance of the project however, this was not well thought out. In rural areas where communities were not close to the major roads, the billboard space had no advertisements (Borland, 2011). Borland states that many of the reservoirs that were not within South Africa did not have advertisements on them. This was also the case in Zambia where 38 percent of the Play Pump tanks had nothing to display including public service and commercial messages. On the whole, 75 percent of the overhead tanks did not have any commercial advertisements on them (UNICEF, 2007, p. 12). Funding for maintenance of the project would therefore suffer since it was designed in this way. Without funding, PlayPumps International would have to find other ways through which they could maintain the project.

When asked about what went wrong, Mozambique's rural water authority stated that when the pumps broke down, it took over three months before they were repaired and community members lost their trust in the project as a result (Troubled Waters, 2010). A representative from UNICEF headquarters in New York has also stated that the project was not sustainable enough for rural communities in Africa. There were also no replacements or parts available when the pumps broke down (Troubled Waters, 2010). Trevor Field in an interview with Amy Costello stated that, "He is learning, and improving his technology along the way, he conceded that the Play Pump, which is mainly effective at large schools, will likely never live up to its initial promise" (Troubled Waters, 2010, para. 45). This project was riddled with many problems and in the end it was scrapped; the remaining inventory was given to another charity. In statement published on the Play Pump International's website, the organization stated it "had long-standing challenges with the PlayPumps", and that the campaign had been "hard and humbling work" (Troubled Waters, 2010, para. 48). Instead of trying to fix the problems, the organization decided that shutting down was a better choice.

The problem here is not with the fact that these projects failed, or faced challenges rather, it is the failure to remedy it that is the problem with technology and development. Projects are implemented, they don't produce much result but what is worrying is the trend in development where projects loose funding and are abandoned because they fail to produce results. There is the need to remedy such projects, to figure out what went wrong and to find solutions that will produce the results that are needed. Although Unchartered Play faced problems at the beginning,

they choose to work it out and to find better design solutions for their product. The organization may not necessarily have a perfect plan but what is admirable is their continuous effort to find remedies for their failings. This is one of the ways in which our good intentions can pave the road to better programmes and resources for those in need, helping create better lives for the poor, guaranteeing quality of life and increasing the capabilities of the poor while eradicating systems of disadvantage.

### **3.3 Understanding Development Aid**

The growth of institutions and organizations focused on administering aid to those considered poor became more prominent at the end of the world wars (Carlsson, Somolekae & van de Walle, 1997). Development aid was initially started as a temporary solution to problems faced by the poor but it has gradually become a permanent part of our society and this has created a need for more forms of aid to foster growth in countries that are heavily reliant on aid (Carlsson et al., 1997).

Aid can be viewed in two different ways, as a moral obligation and as charitable giving. The belief that “those who can help should help those in extreme need” has been and continues to be a fundamental characteristic of foreign aid (Riddell, 2007, p. 1). However, foreign aid has become more complex than that. Peter Singer, a utilitarianist and moral philosopher, known for his views on aid and giving believes that we have an ethical obligation to help the poor and those in need and can do more for those in need than we are currently doing (Singer, 2010). His analogy on saving a child who is drowning in a pond even though one might be late for work or

ruin their shoes reflects our moral obligations as humans in helping the poor and needy (Singer, 2010, p. 3-4). Humans should therefore give because it is the right thing to do, while Amartya Sen and Martha Nussbaum express deeper sensitivity, suggesting aid should be viewed through a human rights lens as an exercise of justice for all (Sen, 1999; Nussbaum, 2011). Initially aid was given with the intention of addressing immediate need, however, it is increasingly being characterized by a human rights and social justice based approach (Riddell, 2007).

The development rhetoric that viewed aid as charity and the provision of welfare has transitioned to a human rights and social justice based approach that seeks greater involvement for the poor and needy who are seen as actors rather than mere recipients of aid. This has also provided greater accountability on the part of development organizations and agencies that administer aid. Those who argue that it is an obligation stress that it should be viewed in this manner due to inequalities that have increased poverty and human suffering (Riddell, 2007). Moreover, from the perspective of the capability approach, aid “and activities and actions which systematically reduce and eliminate deprivations” can be viewed as more of a moral obligation than mere charity (Riddell, 2007, p. 133).

Albert Einstein reportedly stated “we cannot solve problems until we change the way of thinking that led to those problems in the first place” (Einstein as quoted in Ramalingam, 2013). Although Einstein was a scientist, his statement has been applied to the approach for finding solutions to problems within multiple disciplines including international development and development aid. A number of scholars have questioned the effectiveness of aid asking whether developing countries would



do better economically without it (Riddell, 1987; Lipton & Toye, 1990; Riddell, 2007). Carlsson et al. (1997) however assert that addressing the question of making aid more efficient and effective by focusing on and identifying the factors that affect the smooth implementation of aid is a better approach. Thus, making aid better at solving the problems for which it was created. How then do we make aid effective?

According to Carlsson et al. (1997), the effectiveness of aid can be determined by “a projects ability to achieve its set goals and objectives and the degree to which such achievements are sustainable” over a long period of time when aid is reduced or cut (p. 9). Ramalingam laments that more often than not, the international development scene is characterized by people and institutions who admit to errors in the course of implementing programmes, yet repeat the same mistakes time and time again - no change and no lessons learned (Ramalingam, 2013). In his book, *Aid on the Edge of Chaos*, Ramalingam (2013) states that foreign aid is at a critical point, with some advocating for its “protection and expansion”, others preferring to “attack and reduce it” and also with some advocates in favor of “rethinking and improving” the way in which foreign aid works” (Ramalingam, 2013, p. xvii). He suggests that these different views on foreign aid are not stand-alone, asserting that replicating the good and eliminating the aspects linked to failure of it is the best way forward. Aid should look to solutions that are a “best fit” before considering “best practices” (Ramalingam, 2013, p. xvii).

Moreover, eradicating poverty and improving the economies in developing countries is one main aim of aid however in Africa, finding the link between improvements in the economy and aid continues to be a challenge for practitioners,

agencies and for those who are directly or indirectly involved in the area of development (Carlsson et al., 1997).

Many countries in Africa and their growing economies are heavily reliant on development aid (Carlsson et al., 1997), however development aid should be characterized by a partnership between aid granting institutions and such countries rather than dependency as this has the capacity to cripple their economies (Brautigam & Knack, 2004). To demonstrate, there have been a number of diverse organizations such as NGOs, businesses and community organizations in African countries working with governments and also in their individual capacities to provide electricity through small-scale energy generation and distribution for local communities (Maclean & Brass, 2015). In short, being heavily reliant and dependent on foreign aid in all forms is not very helpful to developing countries. Aid dependence as defined by Brautigam & Knack (2004) is “where government is unable to perform many of its core functions of government such as the maintenance of existing infrastructure or the delivery of basic public services without foreign aid funding and expertise” (p. 257). Carlsson et al. (1997) however assert “aid dependency lessens the autonomy and resilience of national institutions by systematically devaluing indigenous capacities, technologies and cultures” (p. 12).

Aid is usually given through development projects or programmes and through the provision of technical assistance (Brautigam & Knack, 2004). For about 20 years, countries such as Ghana, Malawi and Zambia have relied on aid for over 40% of government expenses (Brautigam & Knack, 2004). Each year, global aid is

distributed to over 15,000 groups in 54 countries resulting in about 20 official visits every week (Ramalingam, 2013, p. 3). With so many organizations and different funding networks, it becomes difficult to keep track of who is doing what, resulting in “aid fragmentation” (Ramalingam, 2013, p. 3). Ramalingam recounts a case in Banda Aceh, Indonesia where a girl had fallen sick of measles following the aftermath of the tsunami. It was later found out that she had received the same measles vaccine from three different aid groups triggering symptoms of measles (Ramalingam, 2013). Such examples highlight the ease at which such efforts can become complex and disorganized.

“There are more agencies using more money and more frameworks to deliver more projects in more countries with more partners employing more staff specializing in more disciplines. The relationship and interdependencies between existing and new organizations have increased, and so have the pathways and channels through which aid resources can flow” (Ramalingam, 2013, p. 5)

Riddell notes that a project can be described as being ineffective and wasteful if it does not meet its intended purposes, but can also be deemed so “if it duplicates or overlaps with what is already being done by other donors projects, or if the benefits to which the project brings are excessively costly to provide” (Riddell, 2007, p. 188). From this point of view, aid has to be relevant to the needs of its target beneficiaries and appropriately delivered.

Additionally, foreign aid also comes from a variety of sources, collectively, total aid from the Organization for Economic Cooperation and Development (OECD) stood at \$134 billion US dollars in 2011 and approximately \$12.5 billion US dollars

in humanitarian aid. This is in addition to considerable aid from countries like Brazil, China, India, Russia etc., which are not part of the OECD (Ramalingam, 2013). However, according to Easterly and Pfutze (2008) with the exclusion of private sources of aid, up to \$103.6 billion in aid from official sources was given in 2006 and using this figure, this amounts to about 23 trillion dollars in aid distributed over the past 50 years. It is considerably difficult to get exact figures from aid agencies (especially smaller organizations such as NGO's) on their operational spending and funding since most agencies are unwilling to make this information public and they have no obligation to do so. Therefore, being able to make comparisons on how much aid agencies receive and what the money is used for becomes a challenge (Easterly & Pfutze, 2008). Riddell (2007) also agrees that assessing the impact of development aid is a difficult task because data from which assessments are based on may not be entirely trustworthy.

“ Tracing the relationship between aid and its impact at the national and international levels require accurate, reliable and consistent data over time and across countries of both the amounts of aid provided and the different variables against which the relationship with aid is to be tracked, especially changes in poverty levels, differences in overall economic growth rates” (Riddell, 2007, p. 166).

Without reliable data, it becomes a challenge to know if interventions and aid programmes and projects are actually working effectively. Furthermore, poverty is measured and defined in different ways and this means that there is not one clear standard of measurement. Riddell asserts that this also contributes to inaccuracies

in assessments and it is difficult to take conclusions from such studies seriously to affect policy and develop better programmes (Riddell, 2007, p. 167).

On the other hand, aid supports a myriad of development areas, including health care, education, reconstruction projects, high level research, the development of small businesses, climate change, emergency relief, and also for women's empowerment programmes (Ramalingam, 2013, p. 5). Similarly, there is a myriad of aid delivery groups including the United Nations, various International Financial Institutions (IFI's) (such as the World Bank and the IMF), government agencies, both large and small non-governmental organization (NGO's), health organizations such as the Red Cross and Red Crescent, along with a host of other private and public organizations and institutions. However, Riddell (2007) notes that all these groups fall into either one of three major groups of actors, who are increasingly able to coordinate and gradually work together more closely, dissolving the boundaries and demarcations of their mandates.

“The world of official development aid, the world of development aid provided by NGO's and civil society organizations and the world of humanitarian and emergency aid provided by official donors, UN agencies, those that are part of the red cross movement and NGO's” (Riddell, 2007, p. 8).

Easterly and Pfitze (2008) remark that “aid effort is remarkably splintered into many small efforts across all dimensions – number of donors giving aid, number of countries receiving aid from each donor and number of sectors in which each donor operates” (p. 51). Ramalingam paints a vivid but interesting picture of the caliber of

people who work in these groups. Although rather satirical, Ramalingam's commentary provides a human face to bureaucratic nature inherent in aid groups and organizations.

“Passionate and caffeine-fuelled campaigners, media savvy and fashionable fundraisers, hyperactive policy wonks, toe-the-line bureaucrats, hairy engineers, warm hearted community facilitators, burnt-out programme managers, techie nutritionist, obsessive agricultural scientist, geeky economic modellers, poll obsessed politicians, billionaire philanthropist, ambitious civil servants, grumpy male rock stars and millions of well-intentioned givers and volunteers who give their time and energy” (Ramalingam, 2013, p. 5).

According to Riddell, actors in aid and development such as NGO's and official donors will argue that while there were challenges in the past, aid currently provided through their channels does work (Riddell, 2007, p. 165). However, understanding failures and challenges with development aid projects may not be as simple as it looks. Such issues can be seen as a culmination of various factors such as, the intent of the development projects, the methods used, the actual capabilities of the organizations and the often times exaggerated foreseeable benefits that are purported and expected - despite warning signs to the contrary. Often the only redemption is found in “benevolent intentions of aid” (Ramalingam, 2013, p. 7). However, as the saying goes, “the road to hell is paved with good intentions” (p. 7); good intentions alone will not solve the problems of the poor.

“Aid is uneven and disproportionate, politicized and undemocratic, less a global welfare system and more a global postcode lottery with few hand-

picked winners and many more losers...it doesn't have enough good days, and has rather too many bad ones" (Ramalingam, 2013, p. 8).

Riddell (2007) has written extensively on the issue of whether foreign aid works, and has been unable to find a conclusive response to this issue. He suggests that the questions that need to be asked concerning the future of aid are, "whether aid works and what actions should be taken to improve its outcomes" (Riddell, 2007, p. 4).

Burnside and Dollar (1997; 2000) argue that aid is only helpful when receiving countries have the right strong policies in place. This view of foreign aid is held by a number of scholars including Boone, 1996 and Burnside and Dollar (1997). Policy is thus "an important determinant of growth"...however, "given limited resources and implication that aid should be directed at countries with good policies, many developing poor countries with questionable policy records would be especially vulnerable" (Alvi, Mukherjee, Shukralla, 2008, p. 693). On the contrary, Rajan and Subramanian (2008) state that findings on the relationship between aid and growth proved otherwise. They found that there was "little evidence that aid works better in better policing or institutional environments or that certain kinds of aid work better than others..."however the effects of other interventions on growth are indeed discernible" (p. 644).

Research by Hansen and Tarp (2001), Ghura et al. (1995) and Durberry et al. (1998) however revealed that "aid on the average, works although with diminishing returns" (Alvi et al., 2008, p. 695). Alvi et al. (2008) suggest that it is not always the case that good policy makes aid more effective. Their research partly supports the findings of Hansen and Tarp (2001). Dreher, Nunnenkamp and Thiele (2008) assert

that what has been ignored in the impact of aid discourse is that “different types of aid are unlikely to have the same economic effects on recipient countries” (p. 292). They also argue “aid is effective in improving education and should also have favorable long term effects on economic growth (Dreher et al., 2008, p. 308).

On the other hand, a human capability approach to assessing the effects of aid would focus on what the individual beneficiaries are able to do and be as against assessments based on GDP and economic growth of a country. For Sen and Nussbaum, whether an individual’s capability has improved or increased as a result, is the question that needs to be addressed. Assessing aid using this approach provides a better way of addressing deprivations and forms of unfreedoms rather than making generalizations based on GDP and economic growth, which does not reflect the realities of individuals. These different views on the impact of aid make it a challenge to understand the real impact of aid and how research findings can be used to influence development aid policy. Moreover, Easterly and Pfutze (2008) assert “aid is less effective at reducing poverty when it goes either to corrupt dictators or to relatively well-off countries. However, poorer countries are also more likely to be corrupt or autocratic” (p. 45). They also assert that “tied aid, food aid and technical assistance” are the 3 types of aid “that are known to be “intrinsically” ineffective (Easterly & Pfutze, 2008, p. 45).

Moreover, in assessing the impact of aid, some researchers have suggested that there has been a focus on aid from the official stance, that is the impact of aid received through governments and Riddell (2007) adds however that this one sided view of development aid is changing due to the increasing presence of NGO’s and



other aid actors in development. Riddell also brings attention to the specific role of the beneficiaries of aid in a rights based approach, stating that their role should not solely be associated with the implementation of aid projects and programmes, but instead beneficiaries should be actively involved in the decisions and choices about how aid should be used and the forms in which it is provided (Riddell, 2007).

### **3.4 Conclusion**

Technology has become an important aspect of our society and there is the need to understand its interactions and relationship with people. In the same way, there is the need to explore and examine technologically oriented development projects funded by foreign aid in poorer societies. This chapter has explored the use technology in our society and the challenges and opportunities embedded in the transfer of appropriate technology in developing countries. This section also examined technological objects in development such as the Play pumps and Soccket, discussing the challenges with its introduction into relatively needy communities around the world. Because some development projects do provide technical assistance in the form of technology transfers to developing countries via foreign aid, it is important to understand and examine the challenges and opportunities that result from this and to discuss the ways in which such assistance can provide maximum benefits for beneficiaries. This chapter sought to not only draw a link between these different set of actors and resources but to provide an analysis focused on how the transfer of technology via aid organizations is implemented and the challenges and opportunities for growth and development.

## **CHAPTER FOUR: CASE STUDY OF EPI'S WORK IN GHANA**

### **4.1 Brief History of Ghana**

Ghana, formerly called the Gold Coast is a vibrant country located on the West Coast of Africa (Figure 1.). The West African nation has a total of ten (10) administrative regions with its capital, Accra, situated in the Greater Accra region. Ghana was colonized by the British and it was the first country south of the Sahara to gain independence from British Colonial rule in 1957 (CIA, 2016). The country shares a border with Togo on the right, Ivory Coast to the left, Burkina Faso to the north and the Gulf of Guinea to the south (Ministry of Foreign Affairs & Regional Integration, n.d). Its first Leader was Dr. Kwame Nkrumah, a visionary leader who dreamt of uniting Africa as one country under one leadership. He is known for the famous independence speech on March 6<sup>th</sup>, 1957. Nkrumah proudly noted, "At long last, Ghana our beloved country is free forever...our independence is meaningless unless it is linked with the total liberation of Africa (BBC World Service, 2007, para. 1-2, 11). His independence speech became a symbol of hope for African countries that were yet to gain independence, echoing the belief that the "black man was capable of managing his own affairs" (BBC World Service, 2007, para. 11).



Figure 1 Map of Ghana  
 Source: Nations Online Project

Ghana's political stability after independence was marred by a significant number of successful and unsuccessful coup d'états, the first of which overthrew Kwame Nkrumah in 1966 (Government of Ghana, n.d). This saw the end of the first republic. Ghana is currently under the 4<sup>th</sup> Republic after a successful coup by Jerry John Rawlings saw the end of the third republic of Ghana in 1981. However, he

wasn't fully elected president of the 4<sup>th</sup> republic of Ghana until 1992 and from then served 2 terms in office (Government of Ghana, n.d). There have been 3 more presidents under the 4<sup>th</sup> republic; John Dramani Mahama, the current president was sworn into office following the death of the sitting president, John Evans Atta Mills in 2012 (Government of Ghana, n.d). Ghana is part of the Economic Community of West Africa States, the African Union (AU), the United Nations, the Commonwealth and the World Trade Organization (WTO) among others (CIA, 2016).

The West African nation is categorized as a lower middle-income country with a population of 27.4 million (2015) and an average annual population growth of 2.1% from 2015-2016 (The World Bank, n.d.-b). It has an urban population of 53.4% and a rural population of 46.6% (UN Statistical Division, 2016), with a life expectancy of Ghanaians at birth at 61.3 years and a gross national income (GNI) per capita of \$3,852 (The World Bank, n.d.-b). According to the World Bank, 24.2% of Ghanaians live below the poverty line in 2012 and 37.9% in rural areas live below the poverty line (The World Bank, n.d.-b). The annual GDP growth is expected to sit at 5.2% and this reflects an increase of than 2.2% from 2015 (The World Bank, 2016). It is important to note that Ghana's GDP growth is expected to be higher than Sub-Saharan Africa whose annual GDP is projected at 4.2% in 2016 (The World Bank, n.d.-b). In addition, its literacy rate for citizens 15 years and above stands at 71.5% (The World Bank, n.d.-b).

Ghana is also endowed with abundant minerals and natural resources such gold, cocoa and oil (CIA, 2016). It is also one of largest producers of cocoa in the world, second only to Ivory Coast (UNDP, n.d). According to the UNDP, malaria is a

prominent health problem in Ghana and has been described as the main cause of death (UNDP, n.d). The main currency of exchange in the country is the Cedi (GH¢).

#### **4.2 Empower Playgrounds Incorporated**

Empower playgrounds Inc. (EPI) is a not-for profit organization (NGO) established in Ghana by Ben Markham, a former vice president of engineering at ExxonMobil. After retiring from his position in 2003, he moved to Ghana with his wife in 2004 and engaged in volunteer work for 18 months (EPI, The Founding of EPI, n.d.-b). While volunteering in Ghana, Ben Markham, “observed the darkness of homes and school classrooms. He also saw the scarcity of play equipment in school yards” (EPI, n.d.-b, para. 1). He started to think about ways in which he could harness energy from school children’s play to be used as light for classrooms and also for studying at night. This experience led him to create a solution to the problem of electricity access in rural Ghana and the lack of play equipment in communities, with the help of students and faculty from Brigham Young University (EPI, n.d.-b).

With the introduction of this initiative, it was expected that this project would help children study, using lamps charged with energy produced through their own play, helping to reduce the disparity in electricity access between rural and urban residents. EPI started working in predominantly rural communities in Ghana without access to electricity in 2007 and by 2008, they had installed the first merry-go-round because they saw “a need for light, a need for play, a need for education and a need for opportunity” among school children in a rural community in Ghana (EPI, n.d.-f).

The play systems<sup>3</sup> were initially manufactured using local materials and were made of wood however, currently, the merry-go-rounds are manufactured by Play World Systems Inc. and most of the merry go rounds, made of wood, which were initially installed have been replaced with the current design from Play World Systems which is durable and of a better quality (EPI, n.d.-f). Power generating swings were also introduced in 2009 however, these were discontinued due to safety reasons. On the contrary, there is a power generating swing on the Pediatorkope Island. EPI strives to enhance opportunities for school children in deprived communities by providing renewable energy through electricity generating playgrounds. This project is targeted at rural schools with the intention of supporting students' education by providing access to electricity via play systems such as merry-go-rounds (MGR) and swings. As school children play on the merry-go-round, it generates power and this is used to charge LED lamps provided for students. These lamps were designed and manufactured by Energizer Battery through a sponsorship agreement in 2010 however, this partnership has ended although EPI still has inventory of lamps manufactured by Energizer (EPI, n.d.-a). These lamps are expected to last for 40 hours on a single charge ((EPI, n.d.-a). In most cases, lamps are distributed to groups of 4 to 5 students rather than individually, due to the increasingly large population of community schools (EPI, n.d.-b). Students are put into groups of 5 students or less and one student who is usually in an upper grade is made the lantern leader. This student ensures that lamps are charged and that students come to study at night with the group (EPI,

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<sup>3</sup> See Appendix D and E for a picture of the merry-go-round, swing and LED lamp

n.d.-f). This project was established to enable students' study in their homes at night using lamps recharged by their own play (EPI, n.d.-a). Currently, EPI has installed 42 merry go rounds (MGR) in nine of the ten regions in Ghana, in schools across the country, serving about 10,000 children and providing 2.2 million hours of light generated through merry- go-rounds (EPI, n.d.-a.). Although EPI is based in Ghana, it has also installed one merry-go-round in Mali (EPI, n.d.-a.). Currently, it cost about \$10,000 to install one merry go-round in a community without access to electricity in Ghana.

Aside from installing merry-go-rounds, EPI runs other projects in rural communities. This includes the "Light a village project, the BioFil toilets and borehole drilling project and also distributes science kits in communities where merry-go-rounds are installed (EPI, n.d.-a) The Light a village project provides electricity to rural community residents without access to electricity. A charging station is built in a community and solar panels are attached to the roof (EPI, n.d.-a). The solar power generated charges batteries, which are sold together with a home kit to community members at a subsidized rate (EPI, n.d.-c). The home kit is installed by EPI and this powers bulbs and other smaller electrical appliances. Community members are however charged a small amount of money every 1-2 weeks when they come to recharge their batteries (EPI, n.d.-c). This money is used to run the charging station and also serve as a source of income for one local who is tasked with running the station (EPI, n.d.-c). Also, boreholes are drilled in some communities to provide portable water for residents where there is none available.

EPI also provides BioFil toilet systems as a sanitation measure to remove human waste and also eliminate odours in select communities (EPI, n.d.-e). These projects are run in schools for students and community folks because “sanitary health conditions at schools increase attendance rates and improves the overall quality of education” (EPI, n.d.-e, para. 1). With the installation of merry go-rounds, science kits are included to provide students with a “hands-on science experience” (EPI, n.d.-d, para. 1). These kits are manufactured by Thames and Kosmos and are given to schools so that they can “experiment with their own hands and learn how science works” (EPI, n.d.-d). During science classes, it is expected that teachers will use the science kits to enable student visualize and obtain a more practical science education.

#### **4.3 Pediatorkope Island**

Pediatorkope Island is a relative rural island community off the coast of Ghana. It is located in the Dangme East district of the Greater Accra Region of Ghana. Although Pediatorkope Island is only 2 and a half hours away from the capital Accra, it is relatively poor, lacks access to basic services such as electricity and safe running water (Otchere, Phebe 2014, Field notes). The island is located on the Volta Lake, which is the largest man-made lake in West Africa. The chief of the area is Nene Pediator the IV and the assemblyman for the area is Mr. John Ahortu (I. Darko-Mensah, Personal Communication, December, 2014)



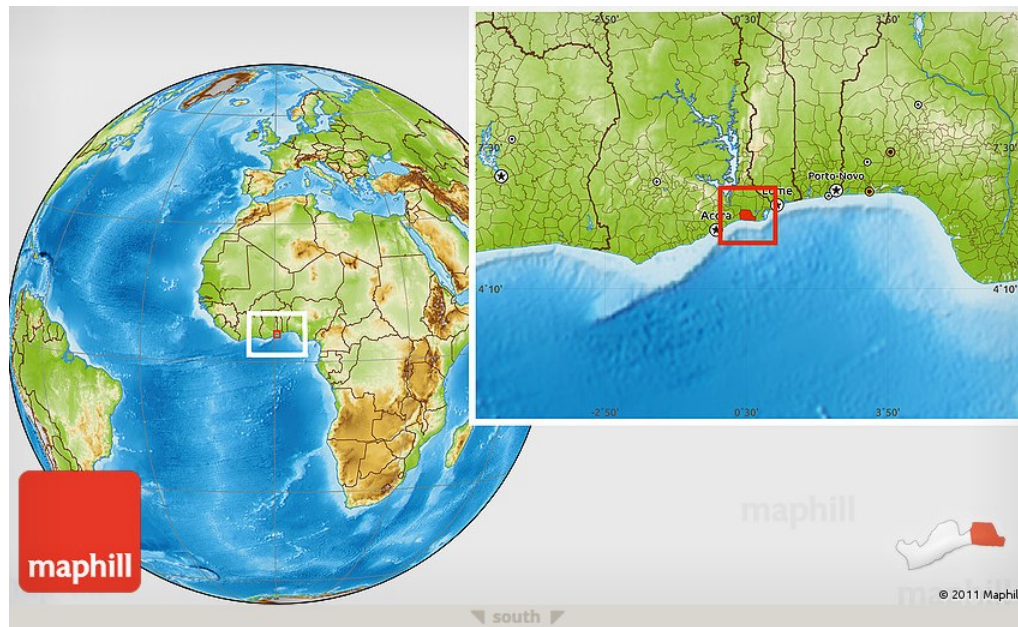


Figure 2 Map of the Pediatorkope Island Area  
Source: (Maphill, 2011)

Pediatorkope Island is comprised of 22 scattered villages and communities and the only form of transportation to and from the island is via a canoe or boat (E. Ametepey, Personal Communications, December, 2014; Otchere, Phebe 2014, Field notes). Furthermore, some villages are entirely made up of one extended family. With regards to size and population, Kpetsupanya is the biggest community and is comprised of approximately 30-50 families. This community is a 10-minute walk from the Pediatorkope Basic School (Otchere, Phebe, 2014, Field notes). On the other hand, the smallest community, Adjake, found on the northern tip of the Island is made up of only six (6) families (Otchere, Phebe, 2014, Field notes). Pediatorkope Island is the biggest Island community among the group of Islands located in that area, in terms of size and population. It boasts of a school and a health center. The main occupation on the island is fishing, oyster mining and trap setting for shrimp

and lobster harvesting. Although there is a lot of land for agricultural purposes, most of the land lays bare and unused. (Otchere, Phebe 2014, Field notes). Majority of the women on the Island engage in trading activities at the market on the mainland on Tuesdays and Thursdays, which are established market days (Otchere, Phebe 2014, Field notes). Because there is no electricity or portable drinking water, residents use water from the Volta Lake for washing, cooking and drinking (Otchere, Phebe, 2014, Field notes). Furthermore, most homes do not have access to clean toilets or water closets and pit latrines are the only alternatives for residents.

One distinct feature of the island is the footpaths paved with oyster shells. Since this is a fishing community, large heaps of oyster shells can be found everywhere (Otchere, Phebe, 2014, Field notes). It is also a delicacy amount resident in the area. Houses are made of thatched roof and mud walls usually built with very small windows (Otchere, Phebe, 2014, Field notes). On the average, families are large as reproduction rates are high in the area. Thus, the average nuclear family consists of 6 people including parents (Otchere, Phebe, 2014, Field notes). There is little information on Pediatorkope Island and most of the information obtained concerning the Island and its inhabitants, was through personal observations and interaction with community members.

## **CHAPTER FIVE: RESEARCH FINDINGS**

### **5.1 Summary of Findings**

This study utilized qualitative research techniques and participant observation to obtain data from a total of twenty (21) participants. Data was obtained through interviews, focus group discussion, participant observation, and interpretations of student drawings and writings. Sixteen (16) students took part in this research, with eight (8) students from the upper primary division and 8 students from the junior high school division at the Peditorkope Basic School. Data was also obtained from focus group discussions with Teachers including a one on one interview with the school's Headmaster and with the Country Director of EPI in Ghana. This section explores and summarizes findings from field data collection regarding EPI's *Play, Light, Learn* project.

### **5.2 Appreciation and Support for the project**

Data obtained from most participants of this study reflected a strong level of appreciation and support for the project. It was clear that the school community had positive feelings towards the project, including both students and teachers. Teachers and students were able to identify the nature of the merry-go-round and swings with the exception of 2 students who knew what the play systems were but were unable to name them correctly. Furthermore, although it was made clear during the interviews that this study was for research purposes only, students continued to make requests for more lamps especially those students whose lamps

were either not working properly or had broken down. During a focus group discussion with 3 teachers involved with the distribution and charging of lamps, and teaching of science and technology, they acknowledged that the project had been and continued to be very helpful to the students.

“It is helping the students especially in the evening. It has changed their way of learning. Formally, when we did not have the lanterns students were unable to study at home at night because their parents were using the lanterns but because EPI has brought these lanterns, we are able to see the improvements and the changes in the student’s results”. [Teacher 1]

This statement reflects the perceived importance of the project to the school but most especially the importance of the lamps that provides light for children to study at home when the sun goes down. Through participant observation and observation of other community members who live on the Island, it was very clear that the level of acceptance and support for the project was high. For example, community members were aware of the project and for students who had not been given lamps, parents were eager to ensure that their wards were able to receive lamps to enable them study at home.

### **5.3 Impact on Students Performance**

One of the objectives of this research is to assess the impact of the project from the perspectives of the beneficiaries. When asked about the impact of this project on their education, all student participants responded very positively. Based on their own assessment of their performance, students mentioned that their grades had

gone up mainly because they were able to study when they went home after school. Other reasons for better performance in school were attributed to the ability of students to not only study but also review question posed to them in class by their teachers and revise their responses. Teachers' perspective on the performance of students was more balanced. From their perspective, students' performance was not always constant. Although the lamps helped students to study at night, they suggested that there were likely other factors that affected students' performance in school. Student's level of motivation and interest in utilizing the lamps were important factors that would also affect the performance of the students. According to the teachers, unmotivated students would still perform poorly and those students who chose not to utilize the lamps for their studies tended to under-perform as well. The lamps were useful but from the perspective of the teachers, simply having access to the lamps would not guarantee good grades.

#### **5.4 Factors that influence the use of the merry-go-round and swings.**

When students were asked what they liked to do during their break periods, eating, chatting and using the washroom were at the top of the list. Other activities included playing football, volleyball, learning, and playing ampe which is a popular local female game that involves a lot of jumping, clapping and moving of the feet. Interestingly, none of the participants in the junior high school division mentioned playing on the merry-go-round and swings during their break periods. Furthermore, there was only one student in the upper primary division who mentioned playing on the merry-go-round and swings during break periods. Some students in the junior

high division mentioned that they were either too old to play on the merry-go-round or the merry-go-round and swings were meant for the “kids”.

Based on the responses of student participants, certain factors influenced student’s use of the play systems. These included: age; grade level; gender; and alternative play options. Older students in upper grade levels were less likely to play on the merry-go-round; there seemed to be an unwritten rule that the merry-go-round was meant for students in kindergarten and lower primary levels. Furthermore, female students’ preferred local gender based games and activities over the merry-go-round and swings. Male students’ suggested that they preferred playing football or volleyball to playing on the merry-go-round. Lastly, older students, mostly students in the junior high school division mentioned that because the merry-go-round and swings were mostly occupied during break periods, this influenced their ability to use the play systems. With a myriad of play options and activities, such students could easily choose to do something else with their free time because the options for play at the Peditorkope basic school are endless.

## **5.5 Users vs. Beneficiaries**

Data from this research suggest the creation of three types of participants within the EPI project. These groups can be categorized as the users and the beneficiaries. As noted previously, the main aim of EPI’s project is to provide play and also light for students to study at night. However, not all students are able to utilize light generated from their own play. EPI provides 40 lamps to every school where merry-go-rounds are installed. However, this is not adequate to address the demand due

the sheer number of students at the school. Field data from the Pediatorkope Basic School indicated that about 120 lamps had been distributed since the start of the project; since the project was initiated, three different groups have emerged. Under the user category are two types of students, 1) Those students who only use the merry-go-round and swings but do not have access to the lamps and 2) Those students who do not use the merry-go-round- either by choice or not, but still have access to the lamps. The third group, which is the beneficiary group, is made up of students who use the merry-go-round and also have access to the lamps provided by EPI. They therefore benefit from play and light generated by their own play.

Furthermore, one significant factor that motivates students to use the play systems (merry-go-round and swings) is because it generates power for charging lamps provided by EPI. Without the lamps there would be less motivation to use the play systems as other play options exist for students. EPI's project intends to provide two types of benefits - play and light. However, it was clear that some students only receive a single benefit (light or play), while others benefit from both. Findings revealed that (perhaps unsurprisingly) more importance was put on the lamps than on play. Students need the lamps to study when they go home after school and place more value on accessing light than on the need to play - particularly as options for play already exist.

Although distribution of lamps is spread across upper primary to the junior high school division, priority is given to students in junior high school. Lamps are necessary to support their studies for the final national exam, Basic Education Certificate Examination (BECE), which impacts their admission to senior high

school. However, findings suggest that students in this division rarely use the merry-go-round and swings.

Due to the limited number of lamps distributed in each school, lantern groups were formed to allow 4-5 students study together under the leadership of one older student - usually in upper primary or junior high school. However, during interviews students indicated that these lantern groups had largely broken down and were no longer functioning appropriately. With the break down of these groups, students who are not given lamps directly are currently being deprived of the opportunity to study at night with the lamps that may be charged by their own play.

## **5.6 Challenges with Distributed Lamps**

The wear and tear on products creates the need for replacements; over the years, EPI has had to replace a number of broken lamps, but also lamps that had been lost or stolen. Students complained about the lamps that had been provided to them, suggesting that the lamps that had been provided in the early stages of the project in 2008 were more durable and lasted longer than the lamps EPI is currently distributing. When asked, the EPI country director mentioned that although the organization had changed manufacturers, as at January 2015, the organization still had the same stock of lamps, which were manufactured by Energizer. Thus, he indicated that there had not been any changes in lamp quality. However, the students and teachers at the school felt differently. According to them, the quality of the lamps has dropped over the years.



- “The old lamps lasted longer.” [Participant 1]
- “My lamp used to last one week but now it only last 2 days.” [Participant 4]
- “The old lamps were very good but the new ones...” [Participant 7]
- “You can charge today and tomorrow you can come back and charge again. There are instances where you give students new lamps, you charge them and then switch it on but it goes off in less than 2 seconds. But with the old lamps even over one week, it is still very strong.” [Teacher 1]
- “The first lamps were better than the 2<sup>nd</sup> lamps distributed. The life span is very short. It has to be charged daily but the old ones can stay up to one week that was helping us to check the charging system but this one, they come every day to charge their lamps. They queue the lamps. It is a big problem.” [Teacher 2]

These responses reflect the views of both students and teachers on the quality of the lamps being distributed. Many complaints were with regards to the lamps they were using. Although EPI had made efforts to replace lamps that had broken down, Pediatorkope Basic School is not the only school where they run such a project.

## **5.7 Play as Punishment**

EPI advocates for play, as a positive way of enhancing the lives of children living in rural communities. However, for some of these children, play on the merry-go-round is perceived as a negative experience in certain circumstances. For example, some participants suggest that during the rainy season when there is limited power supply for charging lamps, students who are late to school are made to play on the

merry-go-round as punishment – with the aim of generating power while their classmates learn.

“There are also instances where there is no power. During the rainy season, there is not enough power for charging if we should charge 2 or 3 lamps at a go, the batteries will go off. So we have to charge the lamps one by one.”  
[Teacher 2]

“Sometimes if the children are late to school we punish them as a form of exercise to be turning the merry go- round and swing so that it generates power.” [Teacher 2]

If play becomes a form of punishment it can create negative experiences for students, and possibly influence the student’s perception of the equipment, resulting in students seeking other play alternatives. This challenges the success and viability of the project given that power needed for charging lamps is derived from children’s play.

## **5.8 Lack of Monitoring and Evaluation**

The EPI country director acknowledged that there had not been any proper evaluation or assessment of their projects since it begun. The only assessment was one that simply evaluated whether there had been any increase in student grades.

“The assessments that we did were on their grades. One lady from Brigham Young University came to do it. She actually worked with the exams council to get their grades for the data. We tried to see their grades in science because of the science kits that we provide. We tried to look at how well they are doing in science. Some schools went up. You won’t have 100 percent but

you can see some improvements. That is the only assessment I am aware of and that was 2 years ago [2013]. “[Participant 222]

Without a full evaluation and assessment of all community projects, it is difficult to know the impact of EPI’s interventions on the lives of school children in rural Ghana. Furthermore, the importance of assessing projects in the international development sector cannot be over emphasized. Just because a project has good intentions and seems to be doing fine does not mean that it is having the desired impact – or any impact for that matter.

### **5.9 Inadequate Staffing**

EPI has projects initiated in about 40 communities in Ghana; currently there are two permanent staff members present in Ghana, namely the country director and the project manager. However, prior to 2014 there was only the country director who was responsible for all facets of EPI’s Ghana operations including installations, visiting schools, replacing lamps, and fixing equipment. Even with two staff members, given that most of these schools are in remote rural communities with poor roads, keeping up with ongoing project requirements is a considerable challenge.

“When the chain on the swings gets unhooked, we don’t get anyone to fix it for us. They are only fixed when Isaac [country director] comes around. It is difficult to get access to them for them to come. It is not hard to do repairs rather it is hard to get access to them (NGO).” [Participant 221]

This statement reflects the effect of inadequate staffing on the community's ability to engage with EPI's equipment and therefore on the overall project. The school has to wait until the country director is able to come by and fix things for them when they break down. Other participants stressed that there was the need for the NGO to train someone in the community to fix equipment so they do not have to wait so long. Participants felt there was a need for beneficiary communities to be self-reliant rather than having to always rely on the organization that provides a much-needed service. It would also be more cost effective to provide training to stakeholders in recipient communities than paying the travel costs for one of the staff members to address the issues directly.

"My only problem is that any time the lamp gets spoilt, we should be able to repair it ourselves. Maybe there may be a small fault but sometimes, we have to wait for them to come, pick it up, send it away and bring another one. We could try to do something about it but we don't know anything about how it works. If they know how to or if they can, they should teach us how to fix things when they break down." [Teacher 2]

### **5.10 Stakeholder Demands and Interaction**

The community's responses and interactions have provided insight on how well the EPI project has been received and the potential for positive impact. For example, a positive response from parents towards this project is vital to ensuring that the children actually use the lamps to study when they get home.

"[]...We tell them that the lantern (lamp) is not for them. I always say that a mother should not say give me the lamp and let me use it to fetch soup for you father. They always laugh. That is the time that we let them know that

the project is for them. When the children are using the lantern to study they should encourage them. Parents should be around to monitor that the children are doing the right things. They should also make sure that the children take care of the lantern.” [Participant 222]

The EPI project is one of the projects that have been well received on the Pediatorkope Island; however challenges arise when parents begin to display forms of personal entitlement to project benefits. For example, while parents are briefed that the project is for their wards/children, parents whose children do not directly receive lamps (are in a group but are not the ‘lantern leader”) begin to make demands because they also want their children to be directly given lamps as well.

“I received eight (8) lamps from Isaac but I have only distributed one of the lamps. If I give them out, parents will come and harass me, asking why I did not give their child one of the lamps.” [Participant 221]

Although EPI does provide information to parents before the commencement of their project in select communities, there is the need to provide further information on the distribution of lamps, the criteria for the distribution of lamps and what children’s entitlements are, if any.

### **5.11 Diversity in Play**

There are a lot of things for children to do in Ghana. Observations of students in their play environment revealed diversity in play options and choices. Analyses of the student interviews revealed that eating, chatting and using the washroom were the most prioritized activities during break periods. As noted previously, other activities such as playing football, volleyball and ampe, a local female game were

identified as well; play was not restricted to the merry-go-round. Participant observation provided an important insight into the patterns of childrens' play. EPI's suggestion that children in rural communities lack play does not appear to be factually based. Rather, observing the patterns of childrens' play revealed that children at the Peditorkope basic school preferred to make different play choices and enjoyed having different options for play. Their selection did not always include the merry-go-round or swings; therefore expectations linked to project outputs should take such realities into consideration. Children will still play regardless of whether there are merry-go-rounds or not.

## **CHAPTER SIX: DISCUSSION**

### **6.1 Overview**

This Chapter provides an analysis of data obtained from the Pediatorkope Island through interviews, focus group discussions and participant observations. It also provides a detailed analysis of the findings, including children and teachers views and perceptions of their benefits if any and the impact of the project in their community. The capability approach is used as a framework to guide the discussion and analysis of the impact of the project, including the successes and challenges of EPI's *Play, light, learn* project on the Pediatorkope Island.

### **6.2 Using Technology to Expand Children's Capabilities**

Sen (1999) believes that when we expand a person's freedoms, their lives can be improved. When people have the freedom to do and to be, as they desire, they are able to live lives that are meaningful. In this way, one can suggest that technology can be used to improve the lives of children, helping students function in their educational environment, creating opportunities that they did not previously have access to. This research seeks to understand the influences of a technology oriented development project on the lives of Ghanaian school children and how the use of technology to solve to problems could further expand their freedoms and improve functioning.

The findings support the notion that EPI's project has been able to improve some functioning of school children. The lamps provided by EPI enable students to learn in their homes at night, because there are many areas in Ghana without access

to grid and off-grid electricity. Without electricity most residents' turn to the use of kerosene lamps (known as "bobo kanea" in the local Akan dialect), [disposable] battery powered lamps, torchlights, and for those who can afford it, generators. The battery-powered lamps are expensive to use because batteries have to be replaced frequently for optimum power performance. The kerosene lamps, on the other hand, are unhealthy because they produce a lot of smoke and negatively affect the interior air quality of the homes, which is harmful to children's health.

Analyses show that although providing lamps for students to study at night has expanded some capabilities of students, when considering the broader problems of access to quality education, there has not been a significant impact. The project has been able to provide a short-term solution to access to electricity and improve some educational outcomes. However, where economic, social and educational opportunities do not exist for students to continue their education, it becomes insignificant. Providing lamps to students can help motivate students to study; however a long term positive effect is dependent on a) whether families have the income to enroll their children in further education, and b) whether there are schools available offering quality and affordable education.

### **6.2.1 Ama's Story**

The story of Ama<sup>4</sup> provides some insight to the life of a student at the Peditorkope Basic School. Ama is a 13-year-old female in junior high school. She was born on the Peditorkope Island and started schooling at the only basic school

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<sup>4</sup> Names have been changed.



on the island when she was 6 years old. She lives in Kpetsupanya; it is the biggest community on the island with 30-50 families. Everyone knows each other. Ama has never had access to grid electricity in her community, and can only access it when she crosses the river to Big Ada via a canoe. Her father is a fisherman and also harvests oysters for a living; her mother prepares the day's catch and sells it at the local market on market days, which are on Tuesdays and Thursdays. She has three other siblings and is the second among three daughters. Ama is a hardworking student who goes to school on time, studies every day and does her homework; for this reason she has been able to receive a lamp from the school. Ama enjoys using her lamp to study with at night under the stars. The lamp is clean, it does not flicker and there is no smoke and she only needs to charge it every 3 days at the school. She studies for 2 to 3 hours every day with her two sisters and one of her cousins from a neighboring house. Most nights, she only studies with her cousin because her older sister, Mavis, who has had to repeat a grade twice, does not study much. After Ama's final high school exam, she returns the lamp to the school. Her older sister Mavis makes a request for the lamp but she does not receive one. The lamp is given to another student.

When I inquired, the teacher discreetly explains that Mavis does not study and does not do well in school, which is why she is not considered for the lamp. She will have to use the battery-powered lamp from her household to study. The lamp flickers, it is not bright enough because the batteries are old and have not been changed. Every morning, the batteries are removed and put in the sun. The family tries to extend the life of the battery as much as it can, until new ones have to be

purchased. Mavis also has to compete with everyone to use the lamp at home. Mavis is not given a lamp although the family makes a request.

When the BECE exam results are released, Ama's grades are good enough to help her gain admission into a senior high school nearby; however, she has been made to stay home for a year. Her family says that she is sick and has to receive treatment before she can go to school, but Ama is not in any noticeable pain or discomfort. At the same time, her brother is a second year student in a senior high school that is about an hour away. It is somewhat evident that her family cannot support both of them at the same time and although Ama is unhappy, there is nothing she can do. She spends her days cooking, washing clothes and helping with the household chores.

Ama's story is not very different from some of the students at her school. Although EPI's project has been able to provide opportunities for her, it can only help her to a certain extent. First, Ama has access to a lamp, which allows her study at night. This, along with her own motivation has resulted in her achieving good grades. One important point to note is the choices and freedoms Ama has as a result of owning a lamp. She can choose to study or not, and she has the freedom to make choices because she has access to power which she did not initially have. Just like her older sister Mavis, Ama had the opportunity to decide and the freedom to do what she considered valuable to her, in this case, doing well in school and being able to get a better education, whereas Mavis may be unmotivated to study due to several unknown factors and this could influence what she values and her

educational choices as a result. Without the lamps, Ama's level of functioning would have been reduced.

### **6.2.2 Sen's Interpretation**

According to Sen (1999) one's quality of life cannot be assessed based on their perceived income or wealth because well-being is multi-dimensional. In *Development as Freedom*, Sen explains that the freedoms individuals have are dependent on social, political and economic factors which enhance one's quality of life (Sen, 1999). From this case in point, when considering programmes that target poverty or education, it is important to understand how these solutions go to complement and affect the broader economic and social needs that exist, and how these programmes can effectively alleviate the problems of the poor and produce far-reaching results. For example, providing students with free educational materials such as books and computers aimed at improving access to quality education in rural communities is a step in the right direction however, where there is unreliable electricity or a lack of access to electricity in these communities, computers will be of little use to students because they will not be able to power them. Furthermore, where parents are not financially capable of paying for their children's education or where female education is discouraged or prohibited, then these solutions become ineffective in improving education or making it accessible for all due to present economic and social needs and also the cultural context in which these solutions are implemented. If one's well-being and abilities are influenced by external factors that they have no control over, in providing solutions and opportunities for them, there

is the need to take into consideration those external factors and how solutions will create opportunities for them to better function in their environments.

In the case of Ama, although having access to a lamp gives her more time to study and improves her functioning as a result, Ama is unable to continue her education for reasons that are out of her control. Although her family stated that Ama was sick and would not be able to go to school, it was clear that without a stable income from her parents to pay for treatment, Ama would be unable to finish her education. It is more probable that her inability to go to school is due to her parent's inability to financially support both her and her older brother who is also in senior high school. Therefore, EPI's intervention has not provided a fulsome solution to Ama's educational challenges. Without properly assessing how interventions contribute to the broader context, projects will continue to provide solutions that are not far reaching and encompassing. While there are challenges with the application of EPI's project, it is the lack of impact on the broader social, educational and economic front that may prevent it from being successful in the long run. This is because the freedoms that students like Ama enjoy are short lived if they are unable to continually access basic services, depriving them of choices other children freely have. It defeats EPI's purpose, if students are able to receive a good education at the basic level because of access to light which enables them to study, but are then unable to move onto the next level because of economic and social barriers.

Also, Mavis's inability to obtain a lamp despite requests by her and her family show that disadvantages exist for some students due to unequal access to lamps.

EPI's project is targeted at providing access to play and light which can potentially improve children's educational outcomes however, making lamps available to only students who do well in school means that capabilities are enhanced for some students but not all. In distributing lamps to students, all students irrespective of their age, gender, and level of intelligence must be considered. It defeats the purpose of the project if lamps for studying are only made available to students who study and do well in school.

To conclude, although technological solutions to improving access to electricity and education are vital, such initiatives need to contribute to expanding one's capabilities on the whole. The impacts of such projects should not just be sufficient but rather encompassing, with beneficiaries being viewed as the ends rather than the means to achieving required outcomes. This point is reiterated by Oosterlaken (2012), who remarks that improving access to specific resources, programs or infrastructure does not necessarily translate to the development of human capabilities.

### **6.3 Determining Successes and Challenges of EPI's Project**

#### **6.3.1 Successes**

Empower Playgrounds Inc. has been installing merry-go-rounds and play equipment in rural Ghanaian communities since 2007. As with any intervention or programme that provides services to people in need, there is the need to fully understand the potential impact of such interventions, what would be a successful outcome, its failings and challenges and how to integrate 'lessons learned' into any path forward.

One of the major successes of this project has been its ability to target a specific need, in this case access to electricity. Residents of Pediatorkope Island and its neighboring island communities have never enjoyed access to grid electricity in their homes. The total rate of access to electricity in Ghana stands at 71% however; the rural rate is less than 30% (Gyamfi et al., 2014). These figures show the need for improved access to electricity in urban but most especially in rural areas. Moreover, as Pediatorkope Island is an Island community, connecting to grid electricity becomes more complex because it is surrounded by water. There appeared to be a general belief within the community, as from the participants, that providing access to electricity was not a main priority of the government because the island had no resources and thus nothing of interest to the government. However, community members were still hopeful that access would be available one day. Although EPI's project does not provide full access to electricity, it has helped to reduce the financial burden on community members who would otherwise need to buy batteries for any lamps provided for their children to study. It has also reduced the incidence of pollution from kerosene lamps and its effects on the health of growing children. During interviews, students were asked about their method of studying prior to receiving lamps.

- "I was using a kerosene lamp." [Participant 2]
- "I was not studying after school but last time our mothers were complaining that we don't study." [Participant 1]
- "I used a battery-powered lamp." [Participant 8]

These responses demonstrate that the EPI lamps have the potential to improve their study conditions. Equally important was the level of appreciation and support which

students displayed during the interviews. 14 out of 16 students were able to identify and name the play equipment on their school compound; the other 2 students knew what they were however, they were unable to correctly name them. Teachers also acknowledged that the project had filled a need and was very helpful to students.

“It is helping the students especially in the evening. It has changed their way of learning. Formally, when we did not have the lanterns students were unable to study at home at night because their parents were using the lanterns but because EPI has brought these lanterns, we are able to see the improvements and the changes in the students’ results.” [Teacher 1]

In addition, during participant observation and interviews, it was evident that the project had been well received and was being fully utilized by the school and the students at the Pediatorkope basic school.

“The lamp help us very well because we use it to learn and to do other things in the night...I was able to improve in class and develop the habit of learning in the night”. [Student 2]

“The lamp is important to us because the lamp helps the student to learn and do their homework very fast when there is no light in the house. This helps students to perform in their examination because they allow us to learn”. [Student 4]

Another success of the project is that it has added to the variety of play options for students. Students mentioned that their play activities during break periods included sporting activities such as football, volleyball and also local games such as ampe and pilolo. With the introduction of the merry-go-round and swings, students have a variety of play options to choose from. Although having more options for play could encourage more children to engage in play activities during their break periods, data revealed the presence of EPI’s play systems did not necessarily guarantee that students would use it nor prefer the merry-go-rounds and swings to

other play activities. Rather, responses showed that students, especially older students in the junior high school division preferred to engage in their regular activities such as sports, eating and chatting.

The World Bank defines empowerment as “increasing the capability of individuals or organizations to make choices and to transform those choices into desired action and outcomes” (World Bank, n.d.-d, para. 1). Empowerment in this sense can be viewed as an individual’s ability to choose and to act without any inhibitions. When people are empowered, their human capabilities also increase because they are able to make choices and act upon those choices. EPI’s *Play, Light, Learn* project has been able to empower students at the Pediatorkope Basic School by expanding their options for choice concerning their education and the lives they want to live. During interviews students were asked about their reasons for going to school. Majority of the responses were focused on their desire to “become something in future”. Without access to quality education, opportunities for students are limited and their ability to compete with other students from more endowed urban areas for better jobs and opportunities would also be limited. There is a scarcity of jobs, and the nature of hiring in Ghana puts focus on applicants with high educational achievements and good grades. Additionally, without access to electricity which ensures that students have extended hours for studying, capabilities and opportunities to function and to contribute to society as responsible adults would be affected in the long run. Although lamps may not necessarily provide complete access to electricity for children living in rural communities, it gives them an opportunity to study, to read and to engage in productive learning



activities. Furthermore, although the project is relatively small scale, there is evidence of a positive effect on the self-determination of students at the Pediatorkope basic school.

### **6.3.2 Challenges**

#### 6.3.2.1 The Complexity of Play

- "There are a lot of things to do".

Play is perceived as an activity most children enjoy because it is essential for good health, growth and human development (Bailey et al., 1995). Nussbaum (2011) lists play as a basic and central capability for any individual. According MacMillan, Ohan, Cherian and Mutch (2015), play, "is a formative and essential part of normal childhood and development, building skills in tolerance, problem solving, resilience, leadership and cooperation" (p. 771). Play also affects emotional, cognitive and social well-being; it can also be used as a curative remedy for children who have experienced mental health problems (MacMillan, et al., 2015). In a study by Barros, Silver and Stein (2009) that compared the behavior of groups of 8 and 9-year children who receive recess and another group who do not, the authors concluded that students who had daily recess behaved better in class than those who did not receive any recess.

Because all children like to play, it has become an important tool in enhancing all aspects of a child's development regardless of race, nationality or social class. Children at the Pediatorkope Basic School are no different. One of the objectives of EPI's *Play, Light, Learn* project is to enhance and encourage children in

rural communities to play. Although there are various way and forms in which children play, play technologies such as toys, games, playground objects are but a few under this category. Apart from the merry-go-round and swings installed by EPI, the Peditorkope Basic School does not have any other play equipment on its school compound. However, there is a large stretch of land behind the primary school where goal posts have been fixed for playing football and volleyball. As noted previously, while play technologies are limited at the school, children have other play alternatives and do play. Engaging in local games such as pilolo, ampe, hide and seek, some of which are gender-based games, is common.

Data from interviews with students on play provided insights on children's play patterns and what they consider as play. Firstly, the perception that rural school children lack play because play technologies do not exist has proven to be an incorrect assumption as has been discussed already. These activities fit the local and social context in which children live in and should not be considered inferior to other forms of play. For example, when male and female students play separately, this does not mean that they do not enjoy playing together, rather, in Ghana, some popular games are gender specific and this could account for why some male and female children would prefer to play separately. McArdle (2001) reiterates this assertion by stating that children do prefer to play in gender-defined groups mostly, primary school children also those in pre-school.

Secondly, during interviews, students often included eating and chatting in their list of play activities. Although many would not necessarily consider these play activities; students who were interviewed did. For many, play is not just a physical

activity: it is also seen as a break from hours of sitting in a classroom, listening to a teacher. It is a time to catch up with friends, unwind and leisurely engage in an activity that gives them comfort. This may be due to the fact that students are not allowed to eat during class and can only do so during their break periods. It was also clear that students enjoyed sitting in groups under the shade of the trees on their school compound to simply engage with each other. However, there were also a considerable number of students who did engaged in other activities on the school compound including playing on the merry-go-round and the swings. The conclusion that can be made from observations and interviews with students is that play is regarded as a fun activity that the children can choose. Providing children with a variety of play options is important but it is only useful to children's growth and development when they enjoy the activity and choose to engage in it on their (Gray, 2008).

From this perspective of choice and enjoyment, the PlayPumps project by PlayPumps International can be regarded as one of the failures of international development projects. This project as discussed earlier in Chapter three was heavily reliant on children's play which meant that children had to engage in the same play activity every day in order to produce water for their communities. One of the many criticisms of the project was the level of reliance on children's consistent, regular play with a singular piece of equipment. Children enjoy choice and the freedom to engage in play as they prefer, otherwise, play becomes monotonous and boring and ceases to be a fun activity when they no longer view it as play. Thus to encourage children to play and for play to be meaningful and useful to children, there is the

need for variety, for children to choose their own play and for institutions and organizations who create and implement programmes incorporating play to understand the social and cultural context and dynamics that could discourage children from playing. This is particularly true of play activities that do not take into account gender differences, restriction and preferences.

Furthermore, when play becomes a negative experience for children, it can affect their ability to engage in it. During interviews a respondent who is an authority figure mentioned that children were sometimes punished to play on the merry-go-round and swings when there was no power for charging lamps.

“There are also instances where there is no power. During the rainy season, there is not enough power for charging if we should charge 2 or 3 lamps at a go, the batteries will go off. So we have to charge the lamps one by one”. [Teacher 2]

“Sometimes if the children are late to school we punish them as a form of exercise to be turning the merry-go-round and swing so that it generates power.” [Teacher 2]

In this case students were forced to play on the merry-go-round and swings when they were late for school. Although this may seem insignificant, overtime, some students may choose not to use the merry-go-round and swings due to the negative experiences associated with their interaction with the play systems. In most cases, children are punished by reducing or taking away their play hours however; punishing children by giving them more playtime appears to be a rare occurrence. Punishing children by restricting their play options to a particular selection will not be a fun activity for them in the long run. For example, pushing of a merry-go-round requires a lot of physical energy and will likely tire the children eventually.

Moreover, students who are punished because they are late for class are already losing period of teaching, learning and studying with their classmates. It is possible that this could affect their studies and create an unpleasant experience for them. As a form of exercise or not, forcing children to play may be detrimental to their education and development, turning play into work rather than a fun activity for children.

#### 6.3.2.2 Problems with the distribution of lamps

The primary objective of EPI's *Play, Light, Learn* project is to provide access to electricity for school children, via lamps charged with electricity generated from their own play. Access to electricity is provided to students at the Pediatorkope basic school through lamps charged by their own play. However, findings pointed to the fact that some students benefited more than others, with some students receiving little to no benefits from the project. Due to capacity issues and limited number of lamps distributed, not all students receive lamps creating three slightly disparate groups. There's the beneficiary group and the user group however there are two groups within the user category. Within the user category are students (1) Who play on the merry-go-round and swings but do not receive one of the lamps for studying and (2) Students who do not use the merry-go-round (due to various reasons) but still have access to the lamps. The beneficiary group is made up of students who play on the merry go-round and swings and also have access to the lamps provided by EPI. However, even those students who do receive lamps to

study do so as a part of a 'lantern group' of four (4) to five (5) students who were expected to study together.

During interviews, students were asked about the lantern groups. The majority indicated that the groups were not working well or had completely broken down. Although the intention of the project was twofold, many students only benefited from one element – either play or light. Specific to the limits in “light” benefits – this was largely due to capacity issues already mentioned – the limited number of lamps available for distribution. About one hundred (100) lamps have been distributed to students at the Pediatorkope Basic School; about 60 more lamps than are typically distributed in schools where merry-go-rounds have been installed. This is due to the higher enrolment numbers at Pediatorkope basic school as compared to other schools in which EPI have projects. However, this number was still not sufficient to avoid the necessity of forming the aforementioned 'lantern groups' to permit more than one student to use a lamp at the same time. It was often noted during the interviews that a lack of monitoring of the ongoing group function had resulted in a complete breakdown of many of the groups. This is likely exacerbated by the fact that most of the teachers including the headmaster and teacher who has been put in charge of the distribution and charging of the lamps at the school live on the mainland and commute to the island each day

Some students mentioned that they were using their lamps with their siblings only, excluding other students who were not part of their family. Thus, students who play on the merry-go-round and swings but do not belong to a functioning lantern group or do not have siblings who have been given a lamp are

unable to fully benefit from the project. Although students may enjoy playing on the merry-go-round, at the end of the day, being able to study at night with a brightly lit lamp is most important. The result is that some students are disadvantaged by this project because they do not enjoy the full benefits of the technology, increasing inequality between them and their peers. Moreover, where more consideration is given to students who do well in school than those who do not, this propagates inequality and limits the freedoms and choices of disadvantaged students. The EPI project can help increase the capability of some group of students but reduces capabilities and functioning for others. According to Fernandez-Baldor, Boni, Lillo and Hueso (2014), technology oriented development projects should be people centered and should focus on improving the lives of all beneficiaries, serving to diminish inequalities as a result.

The capability approach is focused on an individual's ability to do and to be; the freedom to choose and the ability to pursue what is important to him or her. However, in the case of EPI's projects inequalities exist in the distribution of lamps affecting the ability of some students to function and reducing their freedoms as a result. Students who are eager to study at home during the night may be unable to do so because they do not have lamps. There is the need for EPI to implement a more strategic approach to the distribution of lamps, one that has increased monitoring and follow up to ensure that all students can access and enjoy access to power which can increase their capability. This will be discussed below.

### 6.3.2.3 Challenges with Effective Monitoring and Evaluation

Since 2007 when EPI began its work in rural Ghanaian communities, the organization has not conducted any extensive assessment or evaluation of its *Play, Light, Learn* projects. A researcher from Brigham Young University conducted the only known assessment.

“The assessments that we did were on their grades. One lady from Brigham Young University came to do it. She actually worked with the exams council to get their grades for the data. We tried to see their grades in science because of the science kits that we provide. We tried to look at how well they are doing in science. Some school went up. You won’t have 100 percent but you can see some improvements. That is the only assessment I am aware of and that was 2 years ago (2013)” (Participant 222)

This research focused on students’ performance and grades in science (this was a primary target) however it did not address a broader evaluation of the program in and of itself.

EPI’s impact and contribution development on the Island would benefit from routine program assessment and evaluation. Regarding lamp use and distribution, a thorough evaluation could help the organization restructure and improve its design and distribution thereby providing better lamps and services for students and beneficiaries. Moreover, this could dispel the belief that the lamps distributed at the start of the project were better than the current. Both teachers and students argued that new lamps distributed by EPI to replace lamps that had either broken down or being stolen were not as good, because the lamps could not hold a charge for long. Another area where routine assessments are needed is in regards to the functioning of the lantern groups. Findings clearly indicated that most of the lantern groups



were not functioning properly. No system was in place to ensure that teachers made periodic checks on students during study time with their lantern groups, nor to ensure that students assigned to a group were still involved or accessing the lamp. As noted, this was exacerbated by the fact that most of the teachers did not live on the Island and the few teachers who did would be unable to visit all the lantern groups due to the scattered and dispersed nature of the villages on the island. However, periodic check-in with the students during school hours to ensure things were still functioning properly was not always done. Thus, if the lantern leaders are not proactive and do not make reports to the teachers, the teachers would not know what was going on with the groups. This is particularly troublesome as it considerably disadvantages those students who are not lantern leaders since they rely solely on lantern groups to study. Routine assessment of group function and equity of access or regularly rotating 'lantern leader' responsibility would offer a more effective system where all students benefit from the lamps, improve beneficiary satisfaction, and increase the effectiveness of EPI's program.

Although routine evaluation can sometimes seem to be a waste of time and resource, such activities are a must for projects that hope to have a positive effect on developing and/or vulnerable populations. Such activities provide useful information on the performance of development projects, how the project is doing, who is benefiting, and what improvements are important and/or necessary. Furthermore, it is important because conclusions from assessments are useful in decision-making on continuing successful programmes and also developing new programmes that are in line with the needs of beneficiaries and stakeholders, in this

case the students, teachers and parents of the Pediatorkope community. Because development aid seeks to help those who are disadvantaged, there is the need to also evaluate and assess such donor-funded projects because it also creates and preserves accountability and transparency.

#### 6.3.2.4 Impact on the Academic Performance of Students

One of the ways through which the impact of EPI's project on the Pediatorkope Island can be assessed is by analyzing data on students' academic perform. Although raw data representing students' performance in various subjects at school was not obtained for this research, all students who were interviewed and took part in this research stated that there had been improvements in their academic work, grades and participation in class since they started using the lamps. According to the participants, English, Science and Mathematics were the subjects where students had the greatest improvement. Students' personal assessment of the project's link to their own academic performance was on the whole very positive. However, views from teachers were more critical; they suggested there were other factors that could influence student's grades and performance in school.

“For their performance, it is not always constant. There are ups and downs. This year they will perform well, next year they can flop. Generally, we've been on the average” [Teacher 3].

However, teachers did note that when assignments are given to the students, they were more likely to submit them on time because the students were able to use the lamps to study and to do their homework; this was previously not the case.

Before the EPI project began, most of the students both shared and competed with their household members for access to family owned torch lights, kerosene lanterns and battered powered lamps. Given that the average family size is relatively large and on the Island, consisting of about six (6) people, more people compete for access to lamps. Consequently, students are often times unable to do their assignments on time or study for tests and exams after school hours. In some cases this results in students being unable to pass their final exam and this negatively impacts their future educational prospects. According to the teachers, giving students the opportunity to study made a lot of difference in their performance in school. Teachers stressed on the importance of giving students the opportunity to study, something the lamps have been able to accomplish, and a privilege most students in developed nations with access to constant and reliable electricity take for granted.

“Formerly, they don’t have the lantern in the house when they want to use it their parents are also using it. Maybe a household with six (6) children has only one lantern in the house. Parents are using it, by the time the parents are done using it they are in bed. So early in the morning when they wake up they will be dodging you in the class but now the students cannot complain that they did not have any lantern to do their homework so it forces them to do their exercises and bring them to the school for marking”. [Teacher 1]

“First and foremost, when assignments are given, they are done and brought on time. That is the main purpose for giving them the lamps. To study and pass their exams so we can see that with that there has been an improvement”. [Teacher 3]

If students have access to the lamps, they are unable to complain or make excuses as to why their homework is not done, giving the teacher more opportunity to be firm with students about their performance. In addition, the lamps motivate students to

do their work and submit it in class on time. With regards to grades, teachers who participated in the study agreed that although the performance of students was not always constant, on the average students were doing better. However, they reiterated that each student is different and each individual comes from a different home therefore there are other influencing factors besides the use of the lamps that affect individual performance. Likewise, lumping them together and stating that they are all doing well does not provide an accurate picture of student's academic performance.

Furthermore, teachers noted that there were various degrees of motivation for students.

“Obviously some will do well and some wont but those that are utilizing it very well are doing well “. [Teacher 2]

“Also I said utilizing because there are some students, you give them the lamp and they are careless. Instead of coming to charge the lamp, they give it to their sisters in kindergarten to bring the lamps for charging and they also leave it somewhere. So those who are using it the way they should are doing well” [Teacher 2].

“Like human nature some people are lazy even when you give them the best opportunity they will not make good use of it. Some people too, the little opportunity they have, they will make it and those who are lazy naturally will not perform even if you should give them money to study”. [Teacher 3]

For example, there were students with lamps who would make use of the lamps by studying and making use of the opportunity given to them and there were also students with lamps who didn't try as hard. Although the lamps are essential, motivation also plays a huge role in determining whether the opportunity to study is fully utilized by students.

In another study by Furukawa (2014) in Uganda on whether lamps help children study, data obtained from this study suggested otherwise. Furukawa (2014) concluded that although access to lamps increased students' hours of study by 30 minutes each day, their test scores showed a reduction of 5 points in 100. In addition, although on the average, students spent more time studying, their productivity was lower than expected. Conclusively, providing students with lamps did not significantly improve their performance in Furukawa's study and this could support the notion that stand alone technological solutions aimed at improving educational outcomes may not always be successful. This is because other challenges with education such as lack of infrastructure and education materials such as books may not be available, lack of qualified teachers and lack of training (Kullman and Lee, 2012). The UN Millennium Project (2005) also noted that the "basic building blocks of a good education system-teachers, infrastructure, curriculum and content, teaching and learning tools, and administration - are missing in many developing countries" (p. 55). During research activities at the Pediatorkope basic school, I observed that the school did not have a library, furthermore, because the main primary school block was under renovation with the roof torn down, students from primary one to four had been moved into the schools only canteen and two of the kindergarten classrooms had also been given away to house students left without a classroom. The construction had been ongoing since the beginning of 2014 but as of January 2015, the construction had not been finished. With this in mind, it is clear that the burden placed on technology to improve educational outcomes in developing countries is misplaced when facilities

and resources such as classrooms, books and teachers are not readily available. Irrespective of the level of motivation students have as a result of technology, “the basic building blocks of a good education system” must be first put in place for the outcomes of technology on education to be realized (UN Millennium Project, 2005, p. 55).

Lastly, teachers mentioned that the merry-go-round was helpful in science education because it provided students with practical and visual science education. Teachers made use of the merry-go-round and solar panels at the school in teaching lessons on solar energy for pupils in primary four, with lessons focusing on how solar energy is obtained. The solar panel located on top of the roof of the primary school building is used for teaching this topic. According to the teachers, students are able to receive a well-rounded education and this made teaching easier for teachers and also made students willing participants in their own education. Teachers also acknowledged that including practical aspects of teaching meant that they talked less during lessons however, students were able to understand the topics that were being discussed. The science kits provided by EPI were also useful because the materials, according to the teachers, are in line with the syllabus and students were excited to try assembling and creating their own solar powered machines such as motors, panels and excavators. This also fueled their curiosity and interest in the subject. Notwithstanding, the views of students on practical science education were not very positive. According to the students, most of their classes were more theoretical than practical with the exception of computer science where

teachers sometimes brought their own computers for class demonstrations. Apart from this, there was no significant practical education or materials introduced by teachers.

On the other hand, teachers mentioned that most of their materials were provided for them by the NGO and were not available or manufactured locally. To them, this was unfortunate, as they would have preferred to have the science kits manufactured and produced locally.

#### 6.3.2.5 Technological Objects in Development – Challenges

Technology oriented projects have been in the area of international development for a while now. Projects such as the One Lap to per Child programme, Play Pumps by PlayPumps International, the Soccket by Unchartered play and Merry-go-round by EPI are but a few examples of projects in international development utilizing advanced technology to solve social and educational problems. Although relatively small scale, technologies such as these are designed to improve lives and to improve access to basic services and resources such as education, electricity and clean portable water. As discussed in Chapter two although these technologies are designed to solve social problems, some of them have not been very successful. This is because some technology oriented projects in developing countries fail to take in to account the social content in which the technology is transferred. In some cases, the problems with technology oriented projects stem from its inability to fit local needs and conditions (Uphoff et al., 1998).

Some of the problems with the above-mentioned technological projects especially the PlayPumps occurred because it did not fit the needs of the target beneficiaries. The PlayPumps failed to produce much needed results in the long run because its well-intended ideas did not produce tangible results. Furthermore, it was plagued with a lot of challenges such as safety and design issues and maintenance and funding concerns. The Soccket on the other hand was plagued with quality and durability challenges however one of its main concerns has been its ability to generate adequate and reliable electricity for children. Both technologies have also been described as being too tied up with the concept of using play to generate electricity as it has been argued that this system encouraged child labor (Ausland, 2012; Chambers, 2009). The merry-go-round by EPI is similar to that of the Play Pumps as both are designed to utilize children's play via a merry-go-round. The main difference between the two is its use. The PlayPumps project was designed to produce water via a merry-go-round while the EPI project is designed to produce electricity via the merry-go-round and swings. The Soccket on other hand is a football, which utilizes children's play to produce electricity, similar to the merry-go-round and swings. These three projects are linked in terms of design and the designed for. Likewise, some of the challenges faced by either of these projects might be evident in projects that have a similar design and concept.

During interviews students were asked to choose the play object they preferred using. Majority of the students picked the swing as their most preferred play object. Reasons students gave included feeling nauseous and dizzy when using the merry-go-round. Furthermore, student's mentioned that the swings allowed



them the opportunity to enjoy play on their own. The reasons stated above are not entirely new. A UNICEF report in 2007 also stated that there were instances where children who used the PlayPumps experienced dizziness and vomiting after spinning on the merry-go-round. The report viewed these issues as a safety concern for children. Although students are benefitting from the power produced by their own play, their safety on the playground is essential and should be secured at all times.

Also, PlayPumps International faced challenges with maintenance of its technology in project communities. In Mozambique for example, when the play pumps broke down, repairs took longer than expected, specifically, 3 months. This caused the communities to lose their trust in the project (Troubled Waters, 2010). Furthermore, there were no replacements or parts available when the pump broke down. With regards to EPI's merry-go-round, students mentioned that the swings broke down frequently and maintenance was not always done on time. Some of the reason for this is due to the location of the island. However, the problem was not only due to a lack of maintenance rather, the availability of personnel from EPI. This is because EPI has only 2 local staff members and most of the schools where merry-go-rounds are built are located in inaccessible rural areas with poor roads. In order for EPI to fix this problem, the organization would have to employ or increase its local staff; alternatively, it could train and make use of local community residents in project communities.

### 6.3.2.6 Broader Challenges to Education on Pediatorkope Island

Using technology to develop solutions to social problems can be a positive process; however technology tends to only be part of the solution. In many rural communities in Ghana, there are several challenges in the provision of quality education. In some communities, students sit under trees because classroom facilities do not exist (“Wa west district”, 2015, para. 1). At the Pediatorkope basic School there is a lack of qualified teachers, lack of educational materials such as textbooks and there are challenges with water, sanitation and electricity access coupled with high teacher to student ratio in many classes. According to the Consortium for Research on Educational Access Transitions and Equity (CREATE) (2007), children in rural communities are less likely to go to school as compared to children living in urban areas. EPI’s provision of lamps at the Pediatorkope basic School provides solutions to addressing some of these challenges specifically, electricity access and the provision of practical educational materials such as science kits. EPI’s lamps are significant not because they produce light, rather its significance is found in its ability to empower students to do and to be, improving their quality of life as a result (Oosterlaken, 2013). Although this project does not provide a comprehensive solution to all the educational challenges faced by students at the school, it has given students more hours of study via lamps and also more options for play. Despite the effect of these interventions, other challenges exist which affect the educational outcomes of students.

Prior to my research visit at the Pediatorkope basic school, the roof on the primary school building had been taken off for months due to an approved

construction on the building by the district. It had been months since the districts education office had approved the construction but nothing had been done. The primary school block was empty and no longer in use. The building had housed students from primary one through four however due to the stalled construction, students had to be squeezed into the school's only cafeteria and the kindergarten had lost two of its classrooms as a result. The solar panel that had been installed on the roof of the primary block was lying on the ground exposed. Problems with the ports for charging lamps, which were in need of repairs had to be put on hold until the roof had been reinstalled on the building. Without addressing these problems, interventions and programmes targeted at improving access to quality education and electricity at the Pediatorkope Basic School will be unable to fully meet its objectives.

Furthermore, Pediatorkope basic school has a population of 556 students however these numbers are not evenly spread across class levels. Most of the kindergarten and primary level classes have a student population of forty (40) and over and in some cases, the classes are divided into two groups to make more room for students and also for teachers. Classes in the junior high school division however, have very low number of students as compared to the primary and kindergarten classes. Enrolment stood at forty-two (42) for Junior High School 1, twenty-nine (29) for Junior High School 2 and twenty-two (22) for Junior High School three 3. In all three-grade levels, female enrollment was lower than male student enrollment (Table 1). The school also has 17 teachers including 2 female teachers.

Table 1: This table provides a break down of student population figures at the Peditorkope Basic School for the 2014/2015 academic year.

Grade	Male	Female	Total number
KG 1	32	34	66
KG 2	31	30	61
Primary 1	20	25	45
Primary 2	31	29	60
Primary 3	33	33	66
Primary 4	32	32	64
Primary 5	31	22	53
Primary 6	28	20	48
Junior High 1	26	16	42
Junior High 2	18	11	29
Junior High 3	14	8	22

During an interview, the school's principal gave reasons for the downward trend in enrolment in the junior high school classes. He explained that female students at that level dropped out of school due to teenage pregnancy and other related issues and eventually, the male students also dropped out as a result. According to CREATE (2007) the percentage of students who move from Junior high school to Senior high school in Ghana is below 50% with about 100,000 students failing to pass the Basic Education Certificate Examination (BECE) needed for admission into senior high schools across the country. Unfortunately, students who fail end up repeating a class or dropping out of school entirely (CREATE, 2007). From these examples, it is clear that the lack of access to electricity is not the only problem faced by students living on the Island. Although improving access to

electricity does help to improve educational outcomes of students, it cannot provide solutions to issues of teenage pregnancy, low student numbers in the Junior high school division and in motivating teachers to stay in comparatively rural schools since this is obviously not its target however, these challenges must be addressed as well. There is the need for an integrated approach to these challenges, which will ensure comprehensive rather than sufficient access to quality education. This can be done in collaboration relevant actors including the government, relevant educational authorities and also NGO's with mandate in this area.

#### 6.3.2.7 Gender Issues

According to Nussbaum (2011) limiting women's opportunities has negatives effects on the growth of any country, however inequalities continue to exist between men and women. The Pediatorkope Island is a mostly patriarchal society that is run by men. Men are considered authority figures and head of households, which means that men mostly hold positions of power and authority in the community. This system creates inequalities, discrimination and disadvantage with women's ability to access basic services, job opportunities and positions of power in society. Therefore, cultural and social dynamics of the community have to be taken into account as these could potentially impact and undermine perceived benefits for students.

At the Pediatorkope basic school, out of a total of 17 teachers, only two are female, showing inequalities in the representation of female teachers at the school. Findings also suggested that students who did well in school were more likely to

receive lamps. This system however could potentially put female students at a disadvantage. Although lamps are given to both male and female students, participant observation revealed that male students had more opportunities to maximize their study time after school, helping them to do better in school. Females on the other hand had household chores such as cleaning, cooking meals and fetching water from the surrounding lake after school. They therefore had less time to study, were more likely to be tired and this could affect their level of concentration when using the lamps. Because students rely on lamps to help them study, there is the need for a well-structured lamp distribution system that takes these issues into account, ensuring that all students receive full benefits.

Ultimately, all students should be considered for lamps regardless of their level of intelligence, gender or age. Lantern groups should also consist of male and female students in different grade levels, as this has the capacity to motivate students to study and help each other in areas where they are lacking.

## **CHAPTER SEVEN: CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE STUDY**

### **7.1 Overview of Findings**

In many developing countries around the world such as Ghana, basic services such as good roads, access to clinics and hospitals, clean portable drinking water and sanitation are either non-existent or not readily available to all. These services are however fundamental and vital in improving peoples well-being and quality of life. Over the past few decades, Ghana has received and continues to receive aid in all forms and from multinational to small type organizations (Brautigam & Knack, 2004) however in many areas, especially rural communities, challenges continue to exist in the provision of these basic services. In the area of electricity provision, this continues to be one of the major challenges that the country faces, with more than 70 percent of rural areas lacking access to reliable electricity (Gyamfi et.al, 2014, p. 1036).

The challenge is that its power generation capacity of 2831MW for an estimated population of 25 million is not sufficient to power all areas within the country and in areas where access to electricity exist, sporadic power outages and unreliable access to electricity is a constant phenomenon (Energy Commission, 2015). Moreover, because electricity is a much needed service that ensures the smooth running of other basic services such as hospitals, educational facilities and also businesses and industries, which contribute to economic growth and development of many nations, it is essential that challenges with electricity

provision are addressed. For the past couple of years, Ghana's GDP was reported to have dropped to 3.4 % as the ongoing challenges with energy provision has had a toll on its economy (World Bank, 2016). The sporadic power outages have also affected individuals and businesses as well. In light of these ongoing challenges, the Ghana government has made efforts to improve its energy generation capacity with the introduction of various power barges to augment its production capacity. In this area of development, organizations such as Empower Playgrounds Inc. have implemented projects on a considerable smaller scale to help communities, especially rural school children in these communities, gain access to electricity via merry rounds, swings and lamps.

The main purpose of this research was to assess the success, challenges and benefits of EPI's *Play, light, learn* project by focusing on the views of its target beneficiaries who are children and, using a capability approach provide insights on whether the quality of life and well-being of beneficiaries were improved. While this research focused on only one of about 40 predominately rural communities where EPI works, it has provided a unique perspective on technology oriented development projects aimed at improving children's education and quality of life in Ghana. A variety of relevant findings have been discussed in the earlier chapters. In the area of designing programmes and technology for children, it reflects the need for assessments to pay more attention to the opinions of children, explores the social context in which technology oriented projects function and documents the ways in which development projects targeted at children may or may not be improving their quality of life and well-being. It also contributes to existing



literature on the need to assess development projects by focusing on its ability to improve the well-being of target beneficiaries rather than economic growth targets such as GDP, as this does not reflect the realities of each individual.

This chapter presents findings and provides a discussion on the implications of this study and recommendations for future research. The successes, failures and challenges with EPI's project were measured using a capability approach that focuses on what individuals are able to do and be as a result of development interventions and programmes they benefit from.

EPI's project has been successful in targeting the right beneficiaries and helping to address a specific need. The premise here is that in providing students with play and using play to power lamps, this provides students without access to electricity with an opportunity to learn. Development projects that are able to accurately target the right beneficiaries are usually welcome by communities in need because it is expected that the project would contribute to improving the quality of life and well-being of beneficiaries (Fernandez-Baldor, et al., 2014). Some challenges however exist where technological objects are designed to create positive outcomes for people in developing countries. This is because technology transferred is usually unfamiliar to beneficiaries however, it is anticipated, as was with this project, that beneficiaries would interact with the technology that is expected to improve their well-being. Although play technology is used to solve social and educational problems, overall the project has been accepted by the students and has been well adapted on the Pediatorkope Island. These findings confirm the belief that where technology is able to meet the needs of beneficiaries,

acceptance of the project is high. It also shows that although some technological transfers have failed in developing countries, there are others that have made a significant impact in rural communities around the world.

Despite it being a rather simple activity, when play becomes intertwined with technology and development, play becomes a rather complex activity. Findings demonstrated that students did enjoy playing on the merry-go-round and swings. The play systems provided students with play options which were not previously available however, students continued to make their own play choices according to their preferences. There were students who preferred other play activities and there were also students who liked to play on the merry go-rounds and swings. EPI has been able to target the right beneficiaries; by placing the play systems on the school compound, students are able to freely use the play systems. However, when play was used as a form of punishment, it was found that it could negatively influence students play choices and discourage some children from viewing EPI's equipment as play.

Findings also affirm the burden that reliance on children's play to produce electricity puts on students however, projects such as these continue to use the same design despite failures. A clear example of such is the PlayPumps by PlayPumps International discussed in Chapter three. However, due to the large student population at the Pediatorkope basic school, the pressure on students to use the technology is not as evident as compared to a school with a smaller population. This permitted a balance to develop between students who use the merry-go-round and swings and those who do not. The evidence from this research shows that the

design of such technologies may be more successful where the population is large, putting less pressure on the need for all beneficiaries to use the technology.

Furthermore, findings also revealed that students valued light over play because other options for play existed. Students regarded lamps as prized possessions and it was evident that students wanted ownership of a lamp; however due to capacity issues lamps are distributed by EPI to groups. It was found that these 'lantern groups' were no longer functioning properly, influencing the benefits students derived from the project. While some students benefitted from either play or light, others benefitted from both, creating inequalities in benefits derived, perpetuating disadvantage and diminishing the capabilities of some students while increasing the capabilities of others.

In determining the effect of the project on the educational outcomes of students, student's grades were not analyzed however students suggested that the lamps had a positive impact on their education. Teachers were of the view that motivation played a large role in improving student's grades because access to lamps did not directly mean that students would do well in school. The lamps only enabled students to do (study) however it was their decision to study and only those who utilized the lamps and studied showed improvements.

Technology, without taking into consideration the social and cultural context in which it is transferred and the resources available to augment the benefits derived may not be very successful in the long run. In order for technology to improve the educational outcomes of students, other basic resources such as books, qualified teachers, infrastructure must be readily available (UN Millennium Project,

2005). The study also demonstrated that in considering broader challenges with access to electricity and education, the project only provided short-term solutions. First lamps were returned when students completed Junior high school and secondly, it was only helpful to a certain degree. Where social, economic and educational opportunities did not exist for students to continue their education, it only supported minimal, short-term educational goals.

Finally monitoring and evaluation of EPI's project is needed to effectively handle challenges and issues with distribution of lamps, ineffective lantern groups and understanding students' pattern of play so that all students derive maximum benefits from the project. Because the organization has been unable to carry out an extensive monitoring and evaluation of its project, challenges such as those outlined above exist and have not been addressed. There is the need for the organization to do an overall evaluation of its project in all its communities and assess ways in which the project could improve educational outcomes and access to electricity in the long term. Evaluations are a must for development projects and must be seen as an extension of quality service delivery.

## **7.2 Recommendations**

**Despite the challenges discussed, EPI's project on the Pediatorkope Island does provide some benefits. The following recommendations could possibly transform weaknesses of the project into strengths, ensuring that all students enjoy full benefits from the project.**

## **Recommendations for Empower Playgrounds**

- 1) It would be worthwhile for EPI to organize periodic participatory workshops in the school communities in which they work so as to discuss problems, challenges and issues stemming from the use of their technologies and ways in which programmes can be better equipped to address the needs of students. This could facilitate the continuous acceptance of the project overtime. Findings suggested that what students found to be valuable to them were the lamps because they were able to enjoy access to light through this. Therefore, understanding students' needs and what they value helps to determine the relationship students and the community at large have with the project and also assist in the design and delivery of projects that can enhance benefits and relationships between the project and the beneficiaries of the project. These workshops must be diverse and also include a balanced representation of all genders, age groups, school authorities and parents.
  
- 2) As mentioned previously, one of the challenges that EPI has faced is the lack of any type of comprehensive project/program evaluation process. Evaluating program outputs and impacts is a must both for Pediatorkope Island and also in other communities where EPI operate. This will provide information on service delivery and also put beneficiaries' perspective about the project in focus. Likewise, this would be helpful in the implementation of other projects in similar communities and also in addressing recurring problems across board. Evaluations must however be designed in such a way

that children's views and options become an integral aspect of it since they are the main beneficiaries. Furthermore, evaluations could help the organization provide a better framework for educating the communities in which they work, regarding the aim of the project, who the target beneficiaries are and the benefits that will be derived from their active participation. In addition, evaluations should not only focus on assessing improvements in student's grades, where students are believed to be making progress when their grades go up and the project is considered to be successful rather, evaluations should also measure the improvements in the quality of life and well-being of students across board as improvements in students grades alone does not necessarily reflect increase in their functioning or improvements in their capabilities. The capability approach can serve as a guide in this area of research.

- 3) Since play is a major component of EPI's project, there is the need for EPI to understand how children play and their patterns of play. As evident from this research, children on the Pediatorkope Island do not lack play rather they have various play options and like to make these choices themselves. Observing the patterns of play in communities where they work without being intrusive would be helpful in understanding the ways in which student's play can be maximized. Furthermore, it is recommended that EPI discourage teachers from using play a punishment especially during class hours as this could potentially influence students play choices.

- 4) EPI could consider increasing the power generating capacity of their play systems so that more lamps can be given to students. Alternatively, implementing additional electrification projects in such communities that do not rely on play will be beneficial in the long run, providing more households with access to renewable forms of electricity that can power smaller household appliances and educational technologies. Although the lamps are helpful, it is nowhere near the full benefits enjoyed by those in urban areas who have access to electricity and are connected to the national grid.

### **Other Recommendations**

- 1) Clearly students should be encouraged to learn; opportunities must be made available for all students to do so. Giving lamps to only students who are motivated to study may be more practical as lamps are limited and teachers cannot force students to study when they lack the motivation to do so. However, since the main aim of the project is to help students' study, giving lamps to only those who do well in school may further disadvantage struggling students. There could be a variety of unknown factors affecting a child's motivation to study and introducing another obstacle (no access to light) simply further exacerbates the situation. Rather, such students should also be given lamps and teachers could encourage students by helping and empowering them to study. The essence of the technology is to provide opportunities for all students and the technology must be used to empower students to be active contributors to their own well-being.

- 2) Using the capability approach in analyzing technologically oriented projects provides a unique lens through which benefits can be assessed. In light of this, further research in this area is needed as this approach has been mostly applied in the assessments of ICT projects (Fernandez-Baldor et al., 2014). If implemented well, using the correct approach, such play-focused technologies can increase opportunities for students and enhance individual capacities and their functioning as a result. In addition, I would suggest that the capability approach could also be very useful in assessing technologies that provide access to services such as safe drinking water and sanitation and also electricity. This view is supported by Fernandez-Baldor et al. (2014).
  
- 3) To ensure that projects similar to EPI's provide full benefits for it, there is the need for further research on play technologies designed to provide access to basic services such as electricity. Although these technologies are innovative, further research on its impact and overall benefits would be useful in making comparative assessments between stand alone technologies and play technologies in development, providing useful literature on the real benefits of these types of technologies.

### **7.3 Conclusion**

This research sought to understand children's interaction with technology, technology's influence on children's education and the benefits the education provided in improving their quality of life, well-being and their ability to do and to



be as a result. While the research focused on only one project community in Ghana, it is expected that findings from this research will be a useful guide in helping the organization understand its major challenges and areas in which they can make improvements. The findings of this study suggest that children do have views on interventions that affect them and these views must be taken in to consideration. Furthermore this study showed that EPI's project does targets the right beneficiaries although not all beneficiaries fully benefit from its project. To some degree the project has been successful in establishing its self in communities, technologies have been welcomed and mostly important, used by children. However challenges still remain in the continuous implementation of its project on the Pediatorkope Island. There is the need for the organization to evaluate its projects across board, organize periodic monitoring of its services in rural communities and also provide continuous education to teachers and school authorities while discouraging the use of play as punishment. These above mentioned recommendations would be helpful in ensuring that the project objectives are met in the long run.

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## **Appendix A- INTERVIEW QUESTIONS**

### **Section A (Ages 9-14)**

#### Demographical Information

1. What is your name?
2. How old are you?
3. What class are you in?

### **Section B**

4. Tell me about yourself and your school?
5. How long have you been attending this school?
6. Do you enjoy coming to school.
  - 6.1 If Yes/No, Why?
7. What do you like to do break time
8. Do you have anything to play with at school during break?
  - 8.1 If yes tell me about it?
9. Can you tell me what the two things behind the primary school building are?
10. Have you ever play on them before?
  - 10.1 If Yes/No please give reason (s).
11. Which one (merry-go-round and swings) do you enjoy using the most and why.
12. What do you like or dislike about the merry-go-round and swings?

### **Section C**

13. Apart from playing on the merry-go-round and swings, what else do use them for?
14. Can you tell me how the merry-go-round generates electricity?
15. Do you have one of the EPI lamps in your house? If Yes, How did you receive one?
  - 15.1 If No, Tell me why?
16. When did you first receive a lamp?
17. How long does the lamp last when you take it home?
18. What is the EPI lamp used for at home?
19. Are you part of a lantern group?
  - 19.1 If yes, how often do you meet? If No, Why.
20. Since you got the lamp have you noticed any changes in your school work? If Yes, What are the changes?
21. If you could choose something you can play which will also give you electricity, what would you choose and why?
22. Have your grades improved since you started using the lamps?
  - 22.1 If Yes /No please provide reason (s)

### **(EPI COUNTRY DIRECTOR)**

1. Please tell me a little bit about yourself?
2. How did you get involved with this project?
3. How long have you been involved with this project?

4. What are your duties and responsibilities as the EPI director?
5. How many communities are you currently working in?

**Section B**

6. What is the aim of this project?
7. What have been some of the highlights of this projects and what has this project been able to achieve in communities in Ghana?
8. How do you measure these achievements?
9. What assessments have you done since you began building play systems in communities in Ghana?

**Section C**

10. Describe briefly, how the play systems are used to generate power?
11. Why does this project target school children rather than the general community?
12. What processes did you go through before beginning this project on the Peditorkope Island?
13. Have you implemented this project in any community recently?  
13.1 If Yes, Where?
14. What would you say to those who assert that instead of a merry-go-round and lanterns would it have been more practical to use provide solar panels for the entire community's electricity use.

**Section D**

15. What processes do you go through before introducing this project in other communities?
16. At any point during the planning and implementation of the project did you consider the views and opinions of the students at the school regarding the project?
17. What are some of the concerns you have regarding how the project is received and used by students at the school?
18. How has the school, students and community members on the Peditorkope Island received this project?
19. Based on your experiences how will you rate this project over 100 percent?
20. How has this project impacted the students, their families and the entire community at a large
21. What would you say to those who assert that instead of a merry-go-round and lanterns would it have been more practical to use provide solar panels for the entire community's electricity use.

**(TEACHERS)**

1. Introductions

Questions:

2. How long have you been at this school?
3. What can you tell me about the Empower Playgrounds project in your school?

4. Explain briefly how the play systems work.
5. How the lamps are distributed to the students?
6. Which group of students use the merry-go-round the most?
7. Does the school have any program in place which monitors how the lamps are used?
  - 7.1 If Yes, How does this program work?
  - 7.2 If No please explain
8. Based on your observations, how often do students use the merry-go-round?
9. How often are the lamps charged for each student?
10. Has there ever been a situation where there is no power to charge the lamps?
11. From your observation, what are some of the benefits students receive from this project?
12. Have you noticed any improvements in the academic performance of students since they started using the lamps?
  - 12.1 Why do you think this is so?

**(Headmaster)**

1. Introductions

Questions:

2. How long have you been at this school?
3. What can you tell me about the Empower Playgrounds project in your school?
4. Explain briefly how the play systems work.
5. How the lamps are distributed to the students?
6. Which group of students use the merry-go-round the most?
7. Does the school have any program in place which monitors how the lamps are used?
  - 7.1 If Yes, How does this program work?
  - 7.2 If No please explain
8. Based on your observations, how often do students use the merry-go-round?
9. How often are the lamps charged for each student?
10. Has there ever been a situation where there is no power to charge the lamps?
11. From your observation, what are some of the benefits students receive from this project?
12. Have you noticed any improvements in the academic performance of students since they started using the lamps?
  - 12.1 Why do you think this is so?



**APPENDIX B: The Soccer and the Pulse by Uncharted Play**  
(Source: Uncharted Play)



**APPENDIX C: Play Pumps by Play Pumps International**  
(Source: Stellar, 2010)



**APPENDIX D: EPI'S Merry-go-round and Swings on the Peditorkope Island.**



**APPENDIX E: Lamps distributed by Empower playgrounds on the Peditorkope Island**

