The Integration of Environmental Education in the Secondary School Curriculum: A Case Study of a 10th Grade Junior Secondary School Curriculum in the Okavango Delta, Botswana

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This dissertation titled
The Integration of Environmental Education in the Secondary School Curriculum: A
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Abstract

VELEMPINI, KGOSIETSILE M. Ph.D., April 2016, Curriculum and Instruction

The Integration of Environmental Education in the Secondary School Curriculum: A Case Study of a 10th grade Junior Secondary School Curriculum in the Okavango Delta, Botswana

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This study explored how local environmental knowledge was integrated into the curriculum of a secondary school in the Okavango Delta of Botswana. Environmental education is important in engaging the public on resource management and developing a sense of place. The 1994 Revised National Policy on Education recommended the integration of environmental education into the school curriculum in Botswana. However, studies suggested that the integration of environmental education faces challenges. The studies that were conducted on environmental education failed to engage community people, whose experiences can be valuable. This study, which draws on place-based education, is bounded by the Okavango Delta and the school second-term. The study addressed these questions: what are the key elements of local environmental knowledge in the study area; to what extent is the local environmental knowledge present in the curriculum; how do teachers implement environmental education; and how do educational authorities perceive environmental education? This study employed qualitative research techniques to address these questions including document analysis, observations and semi-structured interviews. This study’s findings revealed the following. Local people have a lived experience with nature. The elements of local
environmental knowledge include crop and livestock farming, which are a cultural activity that is lived by community people. They cultivate a variety of crops, which continue to be destroyed by wild animals. The contents of environmental education that were integrated into the curriculum by teachers are based on the local environment. The implementation of environmental education was carried out using guided discovery learning strategies. Educational authorities believed local environmental knowledge could play an important role in environmental education. They advised teachers should invite local people who have historical experiences with environmental resources.

Effective School-Community partnerships are pivotal to improve the integration of environmental education. The results of this study hold important implications for the Ministry of Education and Skills Development in Botswana, Teachers at the schools, Partnership initiatives for local schools and Non-Governmental Organizations and the village authorities where schools are situated.
Dedication

This dissertation is dedicated to my parents and family members for their unending support of my education and unmeasurable love.
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Chapter One: Introduction

The purpose of this study was to explore how local knowledge in the area of environmental education is integrated during instruction at a junior secondary school, which is situated in the panhandle of the Okavango Delta of Botswana. The Okavango Delta is the largest wetland Ramsar site of international importance, which covers the Ngamiland west region in Botswana. It is a habitat to elephants, rhinos, and other wildlife (Mbaiwa, 2008; Songhurst & Chase, 2010; USAID, 2014).

Background Information to the Case Study

Botswana is one of the African countries with an abundance of natural resources that include wildlife, minerals and heritage sites (Debswana, 2010 – 2011; Keitumetse, 2011; Mbaiwa & Darkoh, 2006; Songhurst & Chase, 2010; USAID, 2014). It is among the top twenty countries globally with the highest proportion (18.1%) of land dedicated for biodiversity protection, natural and cultural resources (Weaver, 2008). As a result, the Government of Botswana attached more emphasis on biodiversity protection. For example, the Republic of Botswana (2013) stated as follows:

Government also ratified several multilateral environmental agreements, including: a National Action Plan under the United Nations Convention to Combat Desertification; a Biodiversity Strategy and Action Plan under the United Nations Convention on Biological Diversity; and the designation of the Okavango Delta as a Wetland of International Importance. Also, the Okavango Delta Management Plan was developed and adopted. (p. 18)
It is also worth noting that the Okavango Delta was inscribed on the list of World Heritage Sites as a natural heritage site in 2014 (UNESCO, 2014). In addition, the Okavango Delta is part of the regional Kavango Zambezi Transfrontier Conservation Area (KAZA TFCA), which spans five nations in Southern Africa, including Botswana, Angola, Namibia, Zambia and Zimbabwe. Environmental education and awareness is key in engaging the public in sustainable resource management, prevention of environmental degradation and developing a sense of place (Ardoin, Clark, & Kelsey, 2012). Effective environmental education is essential to preparing community people to effectively participate in the Community Based Natural Resource Management (CBNRM) policy the Republic of Botswana has developed to govern the resources in the Okavango Delta and other protected areas throughout the country.

According to the Republic of Botswana (2007), one of the objectives of the 2007 CBNRM policy is to promote communication, education and public awareness about the CBNRM. The Republic of Botswana (2007) stated that the framework of CBNRM “embraces democracy and good governance as it involves devolution of authority and the development of accountable and representative decision-making institutions at the community level” (p. 4). This statement harkens John Dewey’s ideas about the importance of an education to democratic participation in the affairs of a nation. With this approach in mind, it is essential that Botswana cultivate an environmentally literate citizenry if the CBNRM framework is to be an effective approach to governing the nations’ environmental resources. According to the Republic of Botswana (2013), environmental education has a key role in secondary education and should be integrated
into all subjects in the curriculum. Consequently, several researchers in Botswana have investigated the integration of environmental education (Ketlhoilwe, 2010, 2013; Molosiwa, 2010; Moreri, 2011; Mosothwane, 2002; Mosothwane & Ndwapi, 2012; Musisi & Nomalang, 2012).

Although the Republic of Botswana (2013) stated that environmental education focuses on raising awareness through workshops, commemoration of environmental days, the findings of several researchers above, suggested that the integration of environmental education into the curriculum of Botswana continues to face implementation challenges in secondary schools. Botswana Vision 2016 Council (2010) also cautioned that the challenge of preserving the environment and making wise use of the biodiversity and natural resource base is crucial to its survival and future prosperity. There are research studies that have been conducted on environmental education in Botswana. However, further research still needs to be conducted in order to contribute in bridging the implementation gap on how to integrate the local environmental knowledge in the school curriculum. On his part, Fullan (2007) encouraged that secondary school teachers could foster an understanding in learners about the realities and needs of local communities in which they are growing, learning and would probably work.

The 1994 revised national policy on education of Botswana.

The 1994 Revised National Policy on Education is one of the national programs that officially recommended the integration of environmental education in Botswana, thus showing a commitment to raising people’s (including learners) awareness about natural resource conservation and the environment. The policy stated: “Environmental
education has a key role in secondary education and should be incorporated into all subjects” (Republic of Botswana, 1994, p. 25). However, there appears to be a continuous disparity between Botswana’s commitment to conservation of its natural resources and the sufficiency of environmental education in Botswana’s schools. The revised national policy on education also recommended pre-service and in-service training in environmental education methodologies for all schoolteachers and educational authorities. The 1994 policy is the outcome of the 1992 National Commission on Education, whose 1993 educational report acknowledged the need for environmental education.

According to Tabulawa (2011, 2013), the 1994 revised national policy on education expressed disillusionment about the separation of classroom learning and employment in the world of work. Tabulawa (2011) argued that it is because of this separation that the public criticized the education of Botswana for producing graduates with insufficient knowledge about the workplace and real life. Consequently, the revised national policy adopted an integrated curriculum, which was supposed to integrate effectively, amongst other issues, environmental education. Integration (as explained by various researchers) is different from the ‘separate subject-by-subject approach,’ because collapsed boundaries of disciplines permit subject teachers to collaborate on cross-curricular issues (Tabulawa, 2009 & 2011). Drake (2012) explained that the definition of integration is elusive, however, it describes a curriculum that connects various disciplines in some way. Miraglia and Smilan (2009) advised that the first step toward an integrated curriculum is to identify common themes, goals and objectives within disciplines. For
their part, McFaden, Nelson and Randall (1996) observed that the clustering of Social Sciences and English, Science and Math shows students invaluable connections. However, these researchers wrote:

We believe that connections should not be restricted to the links already established in many schools. In fact, the more initially obscure and unconventional the connection, the more creative and innovative the links that the teachers may see between and among courses. (p. 3)

The Republic of Botswana (1993) emphasized that compartmentalization of subjects should be avoided and effort be made to establish integration between subjects. It stated: “The development of the curriculum and instructional materials should reflect the world of work by promoting integration across subjects” (p. 174). The emphasis above suggested the integration approach of interdisciplinary, whereby Drake (2012) explained that the interdisciplinary curriculum makes more explicit connection across subject areas. Other approaches of integration explained by Drake (2012) are fusion, multidisciplinary, and transdisciplinary. In addition to the revised national policy on education, the National Development Plan 10 (2009/2010 – 2015/2016) of Botswana reiterated that environmental education is important for engaging local communities in the sustainable management of natural resources. Correspondingly, the Republic of Botswana (1994) acknowledged the importance of local communities in the development of the education system. For example, it stated: “the participation by the community in the development and management of education is important for the purposes of its
democratization, quality assurance and relevance. It also reduces dependency on Government and promotes a spirit of self-reliance” (Republic of Botswana, 1994, p. 4).

The 1994 revised national policy on education for Botswana stated that one of the objectives for the education of Botswana is to improve partnerships between schools and the local community for purposes of developing the teaching and learning (Republic of Botswana, 1994). The importance of the local community and local knowledge is also recognized in the sub-sector of forestry and range resources. For example, Ministry of Finance and Development Planning (2013) stated: “The sub-sector aims to promote indigenous tree planting and intensify education and awareness of the communities” (p. 273). The Ministry of Finance and Development Planning (2013) continued to state that the Community Based Natural Resource Management (CBNRM) program “will be implemented as a rural development and conservation strategy to promote the sustainability of natural resources” (p. 273).

**Community based natural resource management (CBNRM).**

The government of Botswana officially embraced the CBNRM program in 1989 and eventually produced the CBNRM policy in 2007. The policy provides opportunities for local community participation in natural resource management (Mbaiwa, 2011; Rihoy & Maguranyanga, 2010). It is through the CBNRM that local people living adjacent to wildlife management areas are afforded the right to use their local knowledge and manage the natural resources (Phuthego & Chanda, 2003; Sebele, 2010; USAID, 2014). However, in using the modernization theory, Mbaiwa (2011) reported that in the villages of Khwai, Mababe and Sankoyo (situated in the Okavango Delta) tourism has
transformed the traditional economy to a cash economy as local people have found jobs in tourism facilities such as lodges. Mbaiwa (2011) suggested that some local people have started to shun their local traditional lifestyles.

Reporting on local community participation, Sebele (2010) indicated that community participation in natural resources management enables the use of local knowledge, which can be of major importance in ecotourism development as well. Community participation is important because it helps to facilitate the protection of cultural and natural resource attractions that serve as a basis for ecotourism. The National Development Plan 10 also emphasized the importance of local knowledge in agricultural resources, soils, and aquatic sources. According to Sebele (2010), community participation is a useful approach for educating local people about their rights and it is very important for public education (Sebele, 2010). The implication in this background is that teachers need to be creative and innovative in designing rich, challenging, and culturally relevant learning experiences for students in their schools. As Fullan (2007) argues, parents and other community members are crucial and largely untapped resources who have expertise on collaborations with teachers because they have understanding of their children and have committed interests in the success of their children.

**Local ecological knowledge in the Okavango Delta.**

Local people in the Okavango Delta of Botswana accrue financial gains from wildlife resources through engaging in the management of Controlled Hunting Areas (CHAs) and employing their local knowledge skills. The Okavango Community Trust in Seronga village manages the Controlled Hunting Areas of Ngamiland (NG) 22 and
Ngamiland (NG) 23 (concession hunting areas, where NG stands for Ngamiland district) for safari hunting, game viewing and photography (Eco-tourism support services, 2002). Local people from Mohembo (one of the catchment villages for the Junior Secondary School in this study) were observed catching various fish species (e.g. the tiger fish) from the panhandle of the Okavango River during fieldwork. Demotts, Haller, Hoon and Saum (2009) stated: “Benefits from tourism are more evident in Seronga village, although unevenly distributed and often reflecting elite capture of the gains from tourism while many residents face the costs of increasing human-wildlife conflict” (p. 570). According to Berkes and Folke (2002), local people who survive by hunting wild animals, catching fish and cutting down forests for energy and construction purposes create knowledge from their own observations and ecological experience. Berkes and Folke (2002) stated that this ecological knowledge is based on the accumulation of past trial and error experiences of local people.

Therefore, through interaction with nature, local people in the Okavango Delta have developed trial and error management practices, which they transfer to their children. This knowledge that is being transferred constitutes the traditional ecological knowledge, which children carry with them to classrooms in schools. According to Shaileshkumar and Gardner (2004) “most theorists and practitioners have argued that formal systems of education have been remarkably insensitive to indigenous conditions, cultures, languages and knowledge in many parts of the world” (p. 4). Therefore, this case study sought to explore the place of local knowledge in the area of environmental
education at a junior secondary school in the panhandle of the Okavango Delta of Botswana.

**Place-based education.**

The framework of teaching and learning that involves the local community and reintegration of the learner to study the local environment is called place-based education (Lane-Zucker, 2005). According to Sobel (2005), place-based education emphasizes practical skills, real world learning experiences, helps learners develop stronger ties to their local communities, and enhances learners’ appreciation for the natural world. Powers (2004) explained that place-based education “emerged from a 30-year foundation of environmental education in the United States and builds on the work of diverse community-based initiatives…” (p. 17). These initiatives include organizations such as the Foxfire Fund, the Rural School and Community Trust, and the Orion Society's Stories in the Land Teaching Fellowships. According to Powers (2004), place-based education is “grounded in the resources, issues, and values of the local community and focuses on using the local community as an integrating context for learning at all levels” (p. 17).

Place-based education involves all aspects of a particular locale, including stories of people, past and present (Lundahl, 2011). According to Smith (2002), Foxfire began in the 1970s in the State of Georgia and “spurred a national movement aimed at investigating and documenting regional cultures across the country. The Foxfire magazines and then books were successful, linked as they were to widespread interest in rural folkways and the culture of Appalachia” (p. 587).
Dewey (1891) argued that from the standpoint of the learner, the great waste in the school comes from the learners’ inability to utilize the experiences he acquires outside the school (i.e. the local community where the school is situated). Dewey (1891) advocated for a child-centered and holistic approach to learning, making education more responsive to the needs of children. The ideas of Sobel (2005) and Dewey (1891) compliment Lave and Wenger (1991) who introduced the approach of situated learning and stated that classroom learning is part of community and social practice. Therefore the approach of place-based education in classroom learning could encourage learners to utilize the natural resources wisely by understanding where they live and practicing sustainable action in their own backyards and communities. Powers (2004) wrote: “By fostering the growth of partnerships between schools and communities, place-based education works simultaneously to boost student achievement and improve a community's environmental quality and social and economic vitality” (p. 17). The above ideas of the theoretical framework, which is discussed in details in chapter two could be an ideal in reducing the problems that are inherent in the integration of environmental education in Botswana.

Statement of the Problem

The background information and the local literature that is discussed above indicated that Botswana is restrained by ineffective integration of environmental education in the curriculum. In conducting the research on Pre-service teachers’ conception of environmental education in Botswana, Mosothwane (2002) reported that the content of environmental education is taught mainly in social studies and science
subjects. According to Mosothwane (2002), although colleges of education in Botswana have initiated environmental clubs and wildlife clubs, about 16.7% of pre-service teachers indicated that colleges of education did not teach content and methods of environmental education. Fifty-five percent (55%) of pre-service teachers indicated that colleges of education partially taught content and methods of teaching environmental education. Only 28.3% indicated that colleges of education teach content and methods of environmental education. As such, schools have fallen short of the recommendation from the government of Botswana that environmental education should be incorporated into all subjects in the curriculum. Mosothwane (2002) wrote:

This is possibly evidence that environmental education is not being taught effectively in colleges of education. Thirty-three (55%) pre-service teachers reported that colleges of education partially taught content and methods of teaching environmental education. They stated that environmental education was taught in social studies and science but that this was not enough to build strong environmental education courses in teacher education programmes. (p. 36)

The above concern suggests pre-service teachers in higher education, whose specialization is neither social studies nor sciences, are precluded from learning the practices of environmental education. Correspondingly, Ketlhoilwe (2010) reported that 60% of teachers are involved in environmental education practices because it is incorporated in social studies. The findings from these researchers suggested that classroom instruction in colleges of education and secondary schools in Botswana composes of compartmentalized contents. The instruction from teachers lack connection
across the subject areas as advocated in progressive education and place-based educational approaches, which places emphasis on local elements of local knowledge.

The studies that have been conducted on environmental education in Botswana seem to have overlooked the importance of engaging local communities in learning from their experiences. For example, Ketlhoilwe (2003, 2010) engaged educational authorities and school heads in five regions of Botswana with the objective of finding out whether educational authorities and school heads are supporting the implementation of environmental education in secondary schools. Most recently, Mosothwane and Ndwapi (2012) administered a survey to sixty teachers to assess the extent on which the recommendation of training teachers in environmental education methodologies has been implemented. Musisi and Nomalang (2012) engaged students and teachers only in a questionnaire and face-to-face interviews, respectively, to evaluate the interpretation given to, and the impact of integrating environmental education in the curriculum.

In this case study the researcher bridged the gap in research through interviewing community elders (parents or guardians) about their local environmental knowledge. The study considered the extent to which the knowledge that they conveyed in their semi-structured interviews was consistent with what was being taught in the school. This allowed the researcher to determine the extent to which the local environmental knowledge is integrated into the curriculum. The Food and Agricultural Organization (FAO) report of 2013, compiled in Tanzania, stated that the local knowledge system of learning experience is transferred from community elders, who are knowledge bearers, to children who carry it to school. For example, the FAO report (2013) stated: “Parents or
elders in the family or clan sit [mostly in the evening] with the youth to warn them about playing with fire when performing assigned duties such as taking out livestock for grazing or when playing” (p. 14). Furthermore, UNESCO (2013) emphasized that formal education curricula, for both indigenous and non-indigenous students, should include teaching about and be based upon indigenous and local knowledge. It stated as follows: “Indigenous-based content relating to biodiversity should be taught alongside or as part of science education, but without science serving as a filter or gate-keeper for knowledge from other cultures” (p. 59).

**Purpose of the Study**

The purpose of this case study was to explore how local environmental knowledge is integrated in the area of environmental education during classroom instruction in the secondary school curriculum of Botswana. According to the Republic of Botswana (2007), a National Environmental Education Strategy and Action Plan, environmental education is undertaken in the formal and informal sectors in the context of Botswana. This case study focused on the formal sector (a school) to explore the integration of environmental education in the panhandle of the Okavango Delta.

**Research Questions**

This case study sought to answer the following four research questions:

1. What are the key elements of local environmental knowledge that exist in the study area?
2. To what extent is the local environmental knowledge present in the curriculum and instruction?
3. How do teachers implement environmental education in the curriculum and instruction?

4. How do educational authorities in Botswana perceive environmental education?

Significance of the Study

Republic of Botswana (2007) stated that effective learning about natural resources in secondary schools is important for learners to develop critical thinking and problem solving skills when interacting with nature. The government of Botswana views environmental education as a process in which individuals and local communities develop nature awareness and acquire skills which enable them to solve environmental problems (Republic of Botswana, 2007). Changes that occur in local communities demand corresponding changes in schools, colleges and departments of education. For example, Republic of Botswana (2013) stated:

It is accepted that Parents Teachers Associations provide an effective forum for schools to keep in close contact with the communities that they serve, and therefore ensure that parents take an interest in, and contribute to the education of their children. Government will therefore mobilize communities to form PTAs to assist schools. (p. 52)

One of Botswana's targets on Millennium Development Goals was to promote an environmental education that is able to minimize the degradation of environmental resources (Republic of Botswana, 2004). Furthermore, Botswana Vision 2016 Council (2010) stated that, economic growth and development in Botswana will be sustainable by the year 2016. Botswana Vision 2016 Council (2010) informed as follows: “Renewable
resources will be used at a rate that is in balance with their regeneration capacity. Non-renewable resources such as minerals will be used efficiently, and their depletion will be balanced by enhanced physical and labor capital” (p. 8). The emphasis on wise use of biodiversity resources indicates the need for effective implementation of environmental education. Botswana Vision 2016 Council (2010) continued to inform as follows: “the wildlife of Botswana will be managed for the sustainable benefit of the local communities, and in the interests of the environment as a whole” (p. 8). The government of Botswana is targeting ecotourism to diversify the mineral-based economy, hence the need to reorient approaches for strengthening positive values on learners about nature conservation. Swatuk, Motsholapheko, Mazvimavi (2011) and USAID (2014) also warn that the natural resources in the Okavango Delta are found in one of the fragile world ecosystems. Therefore, the Republic of Botswana (2013) advised as follows: “Many people, particularly in rural areas, are dependent on natural resources for their livelihoods. Hence, sustainable environment is a cornerstone of national development planning, requiring coordinated approaches” (p. 265).

Learning theorists such as John Dewey believed that knowledge must be reformulated (Cooney, Cross & Trunk, 1993). Thus, the lessons learned that are presented in this case study may be of value to educational authorities in the Ministry of Education, Skills and Development, teachers in higher education and secondary schools through engaging scholarly discussions, and school principals, environmental practitioners, and village authorities. The lessons learned may also be of value to authorities in the Ministry of Environment, Wildlife and Tourism (MEWT). This research
may facilitate rethinking of what it means to learn and encourage authorities to employ other approaches (such as place-based education) that may be appropriate to integrate environmental education in the curriculum. According to my knowledge, this is the first research that employed a case study design in the Okavango Delta, the major wetland tourist destination in Botswana to explore the integration of environmental education in the curriculum. Moreover, it is the first case study that employs the theoretical frameworks of constructivism such as progressive education, situated learning and placed-based education.

The lessons learned from the case study could inform the existing gaps in the literature, which does not exactly specify how integration should occur for issues such as environmental education. In conducting a study among educational authorities and school heads, Ketlhoilwe (2003) encouraged further research on environmental education to inform a feasible environmental education strategy. Botswana Vision 2016 Council (2010) also stated: “the strategy for protecting the natural resources of Botswana must be based upon sound domestically-based research” (p. 39). When presenting the results of two case studies of Ontario Environmental Studies Programs (ESP) in Canada that analyze the impact of ESP participation in students’ attitudes and relationship, Breunig, Murtell, Russell and Howard (2014) suggested further research should explore teachers’ beliefs and epistemology towards the content of environmental education.

**Limitations and Delimitations**

In this case study, there are no overarching claims about conclusiveness of the findings. The major limitation for this research is that the findings are context specific
and are not generalized to the larger population. Creswell (2013) and Flick (2009) stated that the outcomes from formulating research questions are that it helps to circumscribe a specific area or field, which the researcher regards as important. The data for this case study was collected only during the second term of the school year. It might have happened that in the preceding or ensuing school terms the teachers implemented some of the elements of local environmental knowledge that this case study did not capture.

Eight parents or guardians could not be reached for the semi-structured interview due to social engagements such as participating in funerals and burial ceremonies of relatives and friends, harvesting crops in the fields, visiting relatives in Namibia for an extended period of time, lack of transport to reach their homes, for example in the catchment village of Kaputura and some students not knowing the contact telephone numbers of their parents and not knowing where they could be reached during the time the researcher was in the field. During fieldwork in the village of Kauxwi one of the parents could not be interviewed because she travelled to Namibia to visit relatives for an extended period of time, while two parents in the village of Xakao could not be interviewed due to not being located and their children not knowing the telephone numbers. The other parent in Xakao village kept on traveling to Shakawe to attend family issues. Two parents in Mohembo were not interviewed because they attended funerals and also they attended the crop fields. One of the students did not know the telephone contact for her parents in Mohembo, while in Gani one of the parents did not stay in the village. Rather, he stayed at the cattle post, where the gravel road is not easily accessible due to thick sands.
The research study was conducted in the panhandle of the Okavango Delta, which is rich in biological diversity. The research focuses only in one Junior Secondary School for the purpose of obtaining thick descriptions from participants. Methodologically, the study employed qualitative methods because the purpose is to explore experiences of research participants on local knowledge in the area of environmental education. The next section in this chapter provide an overview of the chapters of the dissertation.

**Overview of Dissertation Chapters**

This dissertation research has seven chapters. Chapter two provides a review of the literature that surrounds environmental education, not only in Botswana, but globally. The theoretical framework of place-based education is explained in details in this chapter, which also elaborates on the meaning of curriculum integration. Chapter three presents the methodology for the case study. In doing so, the chapter presents the research design procedures, credibility techniques, ethics, and gaining access in the research site. Chapter four presents and discusses the thematic findings on the elements of local environmental knowledge that exist in the panhandle of the Okavango Delta. Chapter five presents and discusses the extent at which the elements of local environmental knowledge exist in the curriculum. This chapter discusses as well how teachers implement environmental education. Chapter Six presents and discusses the perceptions of educational authorities toward environmental education in Botswana. The last chapter is Chapter Seven. It presents the summary of the study, major findings of the case study, research implications, conclusion and ideas for further research.
Summary of Chapter One

This chapter discussed the introduction of the dissertation. First, it discussed that Botswana has abundance of natural resources that include wildlife. The integration of environmental education in the curriculum faces challenges with regard to its implementation. Research studies suggested that the integration of environmental education exists mainly in social studies and science subjects. This implies that the approach of integration is not extended to other subjects in the curricula. Therefore, the first research question that was asked in this case study is as follows: what are the key elements of local environmental knowledge that exist in the panhandle of the Okavango Delta in Botswana.

Second, this chapter discussed that the government of Botswana has shown a commitment to its conservation of natural resources by developing and launching the 2007 policy of Community Based Natural Resource Management (CBNRM). This policy provides opportunity for community people to engage and participate in the management of both natural and cultural resources. Mbaiwa (2011) reported that in the Okavango Delta there is a transition of the local traditional life style to modern lifestyle due to the influence of the tourism industry. The implication is that, in some communities of the Okavango Delta, local knowledge is losing its role of ensuring that the cultural practices are sustained.

Third, in the context of culture and community people, this chapter introduced the theoretical approach of place-based education. This approach emphasizes real world learning experiences and the practical skills. It helps students develop stronger ties to
their local communities, enhances students’ appreciation of culture and nature, and establishes strong commitment to serving as active citizens. The above experiential elements of place-based education also emerge from the learning approaches of progressive education and situated learning. Therefore, the second question asked is: To what extent is the local environmental knowledge present in curriculum and instruction?

Last, this chapter discussed that the government of Botswana views environmental education as a process in which individuals and local communities develop awareness and acquire skills, which enable them to solve environmental problems. With this process in mind, the third question asked is: How do teachers integrate environmental education in the curriculum? The fourth and last question explored the perceptions of educational authorities toward environmental education. The next section, in this dissertation, is chapter two, which provides a review of the literature that surrounds environmental education at the global and local levels. Chapter two continues to discuss in details the theoretical framework of place-based education, which is used to inform this case study.
Chapter Two: Literature Review

Introduction

The purpose of this chapter is to review the literature that surrounds environmental education, not only in Botswana, but globally. The review of the literature focuses on the ideas that are suggested by the following four research questions: (1) what are the key elements of local environmental knowledge that exist in the study area? (2) to what extent is the local environmental knowledge present in the curriculum and instruction; (3) how do teachers integrate environmental education? and (4) how do educational authorities in Botswana perceive environmental education?

First, the chapter begins by discussing the transition from local traditional lifestyles to modern lifestyles in the Okavango Delta as a result of the flourishing tourism industry, which relies on the abundance of wildlife resources in the region. The purpose of beginning with this discussion is to understand how local knowledge is changing in the panhandle of the Okavango Delta and discuss the transition in people’s traditional lifestyles to modern lifestyles. The literature that is related to local knowledge and modern scientific knowledge in schools follows the above discussion. Second, the chapter discusses environmental education in context by introducing educators and attempt to indicate how their historical ideas contributed to the origins of environmental education and provide a contemporary account of environmental education. Third, the chapter focuses the discussion on the 20th century publications and conferences that strengthened the origins of environmental education. Fourth, the theoretical framework of place-based education on which this dissertation is based, is discussed in details to
elucidate its principles that contributed in the analysis of the research data for this case study. Fifth, the notion of curriculum integration and its models as suggested by Fogarty (1991) are discussed to show differentiated ways of representing a curriculum. Finally, this chapter considers the literature that is related to environmental education at the regional level in Africa before discussing the development of environmental education in Botswana. The review of literature on environmental education in Botswana identified existing research gaps that need to be investigated through further research.

**Transition from Traditional Lifestyles to Modern Lifestyles in the Okavango Delta**

The Botswana government policy of Community Based Natural Resource Management might have contributed to a decline of people’s traditional livelihood activities in the Okavango Delta. According to Mbaiwa (2011) some of the traditional livelihood activities include the subsistence hunting of wild animals, gathering of veldt products, crop and livestock farming. DeMotts et al., (2009) also stated that in the Okavango Delta, local people from villages such as Ikoga and Seronga rely on mixed traditional livelihood strategies that include farming, fishing, collection of wild plants, and livestock (cattle and goats) farming. Mbaiwa, Stronza and Kreuter (2011) and Berkes (1999) stated that both indigenous and local people can and should play a significant role in resource management through the application of their knowledge. But, Kayira (2015) advised that while indigenous knowledge is important and needs a legitimate platform in education or environmental education policy and practice, it is not devoid of any shortcomings and should not be presented as uncontested and monolithic. However, it is
still important to be cognizant of the knowledge and practices (e.g. flood recession farming) of local people and encourage their participation in resource management.

In employing both the qualitative and quantitative research methodologies, Motsumi, Magole and Kgathi (2012) concluded that the flood recession farming (molapo farming) in the Okavango Delta has been historically practiced by local people. Therefore, it can be argued that due to its long term practice, flood recession farming has resulted in the development of knowledge (indigenous knowledge) among the local people who practice it. In their research on flood recession farming, Bendsen (2002) and Kgathi, Bendsen, Mbaiwa, Ngwenya, and Wilk (2004), reported that the sorghum grain crop grown under rain fed conditions can yield 500 kilogram per hectare. However, yields from the same crop under the flood recession farming can be as high as 2900 kilogram per hectare. This is despite the flood recession farming practice typically constituting a much lower hectarage than dryland farming. Maize is the main crop under the flood recession farming practice however, sorghum, sweet potatoes, millet and water melons are also grown and cultivated. Bernard and Moetapele (2005) also stated that the complex of channels, swamps, reed beds, open grassy floodplains, and islands of the Okavango Delta have historically been occupied by local people, who carried out fishing, hunting, collecting wild plants, “practicing flood recession agriculture, and moving often in response to the ecology of human and animal disease and a highly dynamic hydrologic and ecological system” (p. 260).

Motsumi et al., (2012) reported recently that focus group discussions that were carried out in the Okavango Delta showed there is a wealth of indigenous knowledge
among local molapo farmers. This knowledge exist on the following environmental aspects: “molapo farming calendar; land preparation; soil quality; crop selection; plant pests and disease control; storage and preservation of harvests; taboos and rituals related to molapo farming practice” (p. 189). Motsumi et al. (2012) explored whether indigenous knowledge was instrumental in molapo farming and whether land use policies of Botswana either support or stifle the practices of indigenous knowledge. In their study, Motsumi et al., studied indigenous knowledge using further qualitative approaches such as Participatory Rural Appraisals and semi-structured interviews. Moreover, Motsumi et al. (2012) conducted an analysis of policy content and process through document perusal and stakeholder analysis.

The lessons learned from Motsumi et al., (2012) suggests that in the village of Tubu, situated in the Okavango Delta, more than 50% of molapo farms are owned by women. This suggests that molapo farming plays an important traditional livelihood activity for the marginalized groups. The Ngamiland District Land Use Plan recognizes the significance of stakeholder participation and indigenous knowledge in land use management. However, Motsumi et al., (2012) stated “the use of indigenous knowledge is not evident in the plan and subsequent recommendations” (p. 186). Furthermore, molapo farming is considered a potential ecological threat to the Okavango Delta, because of the use of fertilizers and pesticides in molapo farming. Consequently, local farmers have been discouraged from practicing molapo farming on floodplains of the Delta.
Still in the Okavango Delta, in employing the modernization theory, Mbaiwa (2011) argued that the industry of tourism as carried out under the policy of CBNRM has changed the local traditional economy to a cash economy. He stated that residents from local villages such as Khwai, Mababe and Sankoyo have shifted from hunting wild animals, gathering forest products, livestock and crop farming to CBNRM activities such as employment in lodges and campsites, selling of thatch grass to tourism operators. One of the participants was cited by Mbaiwa (2011) stating as follows: “people are employed in CBNRM and other safari companies hence there is no time to go and collect veldt products” (p.1055). Equivalently, Botswana Vision 2016 Council (2010) argued as follows: “the rapidly changing lifestyle, characterized by urbanization and a higher per capita consumption of resources will place increasing strains on the environment” (p. 19). Moreover, Mbaiwa (2011) quoted one of the participants suggesting the gained benefits from the tourism industry as follows:

In the past people just hunted and ate meat like lions. The license was not helpful to us. Today, it is better because we generate income and we have managed to build houses for ourselves. We have cash to buy food and send our kids to school.

(p.1056)

In another study, Stronza and Gordillo (2008) also reported similar transition in the community-based lodges from the region of South America (Peru, Ecuador, and Bolivia). The newly introduced and modern community-based lodges encouraged reduced labor time for subsistence hunting, fishing, and farming in exchange for jobs in lodges to earn money.
The linkage of earning money through the tourism industry and CBNRM program and sending children with school supplies to school, as stated by one of the participants in Mbaïwa’s study, has also motivated this research to attempt in exploring the extent at which values of the local environmental knowledge from community people are taught to children by teachers at the school. In the Kgalagadi south district of Botswana, Phuthego and Chanda (2004) examined the integration of traditional ecological knowledge in the CBNRM project of KD 1 (Kgalagadi District 1), which is a controlled-hunting area. They argued that the CBNRM project in KD 1 has shown the utility value of traditional ecological knowledge in sustainable natural resource management. They reported that all respondents from the ethnic community groups of Basarwa (San) and Bakgalagadi felt that there was no integration between modern education and local knowledge. Phuthego and Chanda (2004) wrote as follows:

In their own observation, school children tend to disregard taboos. Primary school-going children who strongly believed that they are not overtly taught cultural values at school corroborated the elderly respondents’ observation. This is bound to occur as formal education is rooted in western values that are often in disagreement with local culture. (p. 69)

Phuthego and Chanda (2004) concluded that traditional ecological knowledge systems and institutions could serve as entry points into sustainable natural resource utilization and management. Therefore, this could be achieved as well through the exploration of local environmental knowledge of the community people and how it is integrated into the school curriculum.
Local Knowledge and Modern Scientific Knowledge

In his discussion of local knowledge and modern scientific knowledge, Da Silva (1996) acknowledged that community people need essential skills, such as reading and writing and the ability to understand arithmetic, which teachers in schools provide. However, one of the questions that remains unanswered is whether or not the same schools could also integrate local thematic elements and historically marginalized knowledge. This is also one of the questions that this case study, in the panhandle of the Okavango Delta of Botswana, explored with the community people. Da Silva (1996) expounds the problem of integrating environmental education by arguing that although efforts have been made to introduce environmental education into the curriculum, some obstacles exist. For example he wrote: “the structure of secondary schools themselves has proven to be a hindrance in the development and promotion of environmental education” (p. 119).

Da Silva (1996) explained that structure, in this context of the country of Tanzania, in the region of Southern Africa, refers to the boarding school management which disconnects learners from their surrounding social community. The paramount importance is placed on national testing (examinations) and the Tanzanian government focuses on a modernization theory in the educational system as described in policy documents (such as the 1995 Education and Training Policy of Tanzania). The structure of school management that is described in Tanzania by Da Silva (1996) is similar to the structure of educational institutions that exists in secondary schools of Botswana. Most secondary schools accommodate students in the boarding hostels. The students visit their
parents at home mainly after the end of the school term and sometimes on weekends and
during holidays. In characterizing the integration approach of environmental education,
one of the officials from Tanzania’s National Environmental Management Council is
cited as follows:

Existing concepts in the curricula are geared towards equipping a student to make
his / her living. Studies are pursued in order to pass examinations, obtain
academic certificates and hence earn a living. There are inadequate efforts to
make education something interesting and worth pursuing even without a
certificate, for example, the development of studies on environmental
conservation as an extra – curricula activity. (Da Silva, 1996, p. 120)

The problems (e.g. lack of experiential learning activities) raised in the above
citation suggested the need for further research to explore the local environmental
knowledge and examine how teachers integrated it during instruction as stipulated in the
Botswana’s 1994 revised national policy on education and the national environmental
education strategy. When writing about Traditional versus Progressive Education, in his
concise statement on education, Dewey (1938) stated that the general pattern of school
organization reflects the kind of school that is separated from other social institutions. He
suggested that this separation of the school and other institutions facilitates the lack of
experiential learning, which is place-based. Powers (2004) reported on the effects of four
place-based education programs, in Harvard Graduate School of Education for the Rural
Trust, on teachers, students, schools, and communities. He advised as follows regarding
place-based education:
There is intended to be, for the learner, an explicit connection between the school and the community in which the school resides. A broader hope on the part of the educators is to "tear down" school walls so that the community becomes integral to all facets of student learning—that is, that the school is open and inviting to the community and the community welcomes student learning occurring in many dimensions. (p. 18)

Although local knowledge systems have some weakness, they should not be discounted or marginalized. There is need for integration of the school and the community as suggested by Powers (2004). According to Da Silva (1996), secondary education systems have specialized and quickened to provide the modern tools that are needed for market economics, industrial development and technological innovation at the expense of intuitive ways of knowing. Anderson (2011) explained that in Latin, intuitus refers to the direct perception of knowledge, whereas, for his part, Jung (1933) explained that intuition, as an irrational, function-not because intuition is unreliable but because insights elude attempts to understand character or origins. The occurrence of intuition is elusive, unrepeatable by will, and understandable conceptually after a period of reflection and discernment. Therefore, the economically driven modalities of education are reflective of the rational, modern and scientific ways of knowing, culturally laden with the values and beliefs from the western societies and largely detached from the natural and local environment.

Recently, Kayira (2015) also stated that most education systems in Africa, such as Malawi, continue to be grounded in the Modern Scientific Knowledge, through the
Western viewpoints; thus marginalizing the local indigenous ways of knowing and being. Kayira (2015) stated:

In response to this colonial propagation, increasing numbers of African scholars are engaging in postcolonial counter-hegemonic approaches to decenter the dominant discourses, reverse relations of power and knowledge and reposition Indigenous ways of knowing and being as an equal part of education and knowledge. (pp. 106-107)

The hegemonic effects of the western powers were also highlighted by Whitehouse, Lui, Sellwood, Barrett, and Chigeza (2014), when applying the framework of Land Education Research on Torres Strait Islander in Australia. They indicate that colonization continues to have hegemonic effects on the ways in which Sea country is understood in Australian education. The Aboriginal peoples and Torres Strait Islanders consider Sea Country to be a vital interconnected web of social, ecological and spiritual relationships. Whitehouse et al., (2014) suggests further that Sea Country illustrate the way of living in and viewing the world that might be termed the relational ontology of Indigenous Australians. “Torres Strait Islanders deem Sea Country to be where ‘island, reef and ocean comprise a cultural and experiential continuum” (Whitehouse, Lui, Sellwood, Barrett, and Chigeza, 2014, p.58).

In relation to the hegemonic effects of the western powers, Da Silva (2006) advised as follows: “If we want to know how ecological practices can be designed which are more compatible with social systems, we need to embrace the epistemologies of indigenous people, including their ways of organizing their knowledge of their
environment” (p. 121). This advice suggest the gap in research that need to be bridged as well through exploring the local environmental knowledge with the purpose of understanding how it is integrated in the school curriculum. Da Silva (1996) still compared and contrasted knowledge about the environment in three local communities in Tanzania: Morogoro, Sameh, and Mtwara. The focus of this comparative study was on components of various curricula for environmental education. Da Silva (1996) conducted classroom observations and interviewed teachers and students in form five (grade 12) and form six (grade 13) levels. Classroom observations provided an understanding of teaching strategies employed by the teachers and elements of environmental education that are integrated in the curriculum. In the communities above, Da Silva (1996) focused on local people that live adjacent to schools, interviewing and observing primarily, elderly men and women.

The conclusion from Da Silva’s study above is that the structure of education in Tanzania has persistently promoted the aims and objectives of the modernization theory of development, which is employed by Mbaiwa et al., (2011) in the CBNRM policy of Botswana. This has resulted in the marginalization of local knowledge, particularly local knowledge about the environment that is place-based. Da Silva (1996) argued that the challenge posed by the modernization theory is to try and understand local knowledge in a way that permits its systematic translation to formal settings, without losing the intuitive integrity that is inherent in storytelling, songs, dance and metaphor. Da Silva (1996) recommended the design of an education curriculum and experimented with in terms of integrating classroom learning with place-based sources of knowledge such as
the local environmental knowledge. The next section for this chapter of literature review focuses on discussing environmental education in context. It does so by discussing environmental education at the international level.

**Environmental Education in Context**

In general, the origins of the issue of environmental education have seen a variety of emerging research from various theoretical and philosophical ideas. Some contemporary researchers such as David Sobel in the U.S.A, Ray Barnhardt in Alaska, USA, and Robert. B. Stevenson in Australia have widely contributed in the literature of environmental education. As a result, the awareness of resource management in schools (e.g. Antrim, New Hampshire) and communities (e.g. the Minto Community in Alaska) has experienced progress. In Canada, Breunig, Murtell, and Russell (2015) recently described the integrated Environmental Studies Programs (ESPs) in the province of Ontario, Canada. Regardless of the challenging times (in the 1990s) for environmental education in the province of Ontario because of the back-to-basics approach taken by the national government, the Ontario provincial government has continued to place more emphasis on environmental education. Breunig et al., (2015) wrote that in the integrated ESPs environmental topics are “integrated into a holistic and interdisciplinary curriculum model taught at the secondary school level to students who register for a package of courses and spend the full semester with one to two teachers and a single student cohort” (p. 1). Breunig et al. (2015) suggest that the development of the integrated ESPs is associated to the 1900s youth camps in North America. One example of such youth camps is the YMCA Camp Pinecrest near Toronto. The focus of the youth camps was to
cultivate among the participants the outdoor living skills, environmental education, cultural diversity and leadership development.

The origins of environmental education are also traced to the promotion of nature and outdoor study in elementary schools and later to the conservation movement. For example, Stevenson (2007) wrote that in Australia, nature study became famous through the school camps movement (as stated by Reid, 1980; Strom, 1980), while in Britain it became famous through rural studies (as stated by Wheeler, 1975). In the United States of America nature study became prominent, as well, through the publication titled, “Nature Study for the common Schools” by Wilbur Jackman in 1891 (Stevenson, 2007). One of the purposes of nature study was to develop, among the societal members an understanding and appreciation of the natural environment through experience (outdoor observation). Stevenson (2007) wrote as follows: “The conservation movement, which grew gradually during the first half of this century, introduced a concern for the preservation of species and areas of natural significance through sound management” (p.140).

Then this case study suggested that the actual concerns for environmental education emerged in the late 19th and 20th centuries. According to Stevenson (2007) the concern for the preservation of species was expressed in moral terms by Aldo Leopold, an American scientist and conservationist, in the paper titled, “A Sand County Almanac”, published in 1984 and in political terms by the International Union of Conservation of Nature. Stapp (1974), as cited by Stevenson (2007) suggested that conservation education has focused on helping the public to better understand the importance of natural resources
to community members. Then Stevenson (2007) suggested as follows: “these movements were rooted in the liberal-progressive educational philosophies of, for example, Dewey, Rugg and Counts” (p. 140). The next discussion specifically explores the ideas of some philosophers, in relation to nature and environmental education.

**Environmental education at the international level.**

This case study acknowledged that there are various educators (e.g. Wilbur Jackman, 1855 – 1907; John Muir, 1838 – 1914; and Aldo Leopold, 1887 - 1948), and activists (e.g. Rachel Carson, 1907-1964) whose ideas contributed to environmental education. This section of the study mainly discusses, in relation to nature and environmental education, the ideas of John Dewey (1859 – 1952) that include an integrated curriculum. Still in this section, the international conferences and publications that included environmental awareness are discussed.

**John Dewey.**

John Dewey promoted the educational approach of experiential learning and a curriculum that is integrated. In the book titled, *Democracy and Education: An Introduction to the Philosophy of Education*, Dewey (1916) stated as follows about the significance of the subjects of geography and history: “To learn geography is to gain in power to perceive the spatial, the natural, connections of an ordinary act; to ‘learn history’ is essentially to gain in power to recognize its human connections” (p. 246). The above statement suggested the integration of subjects in the school curriculum. Dewey aimed at linking the school with the society. He also aimed at linking processes of
teaching and learning with the actual issues of life through the use of practices of democracy.

In his famous declaration (My Pedagogic Creed, first published in The School Journal dated, January 16, 1897) concerning education, Dewey promoted a progressive framework of education and argued that school subjects that are removed from the life experiences of learners do not enable integration with social life (Dewey, 1897). In this promotion of progressive education and experiential learning the need to develop opportunities for reflection were compelling ideas for Dewey. Some of the educational principles promoted by Dewey in the 19th century were subjects’ integration and child centered learning. Dewey suggested that teachers should follow a sequence of subjects’ fusion (integration of subjects); thus creating flexibility and space to teach environmental contents. He argued as follows: “Business, politics, art, science, religion would all make at once a clamor for attention; confusion would be the outcome” (Dewey, 1916, p. 23 - 24).

As already stated, Dewey’s principles of education inform the theoretical framework of place-based education that is used in this case study. The principles span boundaries between children’s outdoor and classroom experiences. This could imply that boundaries between subjects should be traversed. Like Dewey (1916), some scholars in Botswana such as Tabulawa (2002) rejected the subject-matter boundaries. Tabulawa (2002) promoted a child centered learning by arguing that the organization of subject matter, in the geography curriculum of 1965-1982, was not based on any educational consideration of how children learn. Tabulawa (2009), who suggested that collapsed
subject boundaries permit teachers to collaborate on cross-curricula issues, also uses the word ‘traverse’ suggested under Dewey’s theoretical thinking. According to Tabulawa (2002), Dewey’s philosophy had been very popular and prevailing in the 20th century in North America compared to Britain. Therefore, it could be suggested that it is not surprising that Dewey’s philosophy rarely influenced Botswana’s educational curriculum in the late 19th and early 20th century. Botswana was still under the protection of Britain before 1966 independence. Hence this case study employed John Dewey’s ideas of progressive education. The educational philosophies of Rousseau, Agassiz and Dewey are important in contemporary pedagogies of progressive education, student centered education, and place-based education, which all call for an integrated curriculum.

Publications and Conferences on Environmental Education

Official publications and conferences, from the late 20th century, also contributed to the evolvement of environmental education and making it a formal discipline. According to Heimlich (2002), the sensitization of the 1960’s environmental pressures, which were felt by outdoor educators and conservationists, was due to the increased public awareness of air, water, and noise pollution and excess energy demands. Afterwards, several official publications and conferences about environmental education ensued. The 1962 publication of the book titled, Silent Spring by Rachel Carson, followed by the 1968 publication titled, The Population Bomb by Paul Ehrlich, and the 1970 Earth Day stimulated environmental awareness worldwide (Heimlich, 2002).

Rachel Carson argued that nature is compromised by synthetic pesticides such as dichloro-diphenyl-trichloroethane, commonly referred to as DDT, which penetrate the
biosphere, interact with food chain and could sicken children. She compiled environmental data and initiated the public movement that protested for environmental awareness. Paul Ehrlich is an American ecologist and demographer, who is known for the warnings on the growth of human population and the limited resources. Specifically, Ehrlich warned about mass starvation of people in the 90s and 80s because of overpopulation, and the integrated societal upheavals such as famine. Ehrlich advocated for immediate action to limit the growth of the population, such as starving countries that did not implement population control measures. However, some of Ehrlich’s ideas were criticized mainly by Marxists who indicated that the major problem is distribution of resources rather than population growth.

Then in 1969 the National Environmental Policy Act of the United States of America was passed with the purpose of (1) encouraging harmony between local communities and natural resources that are adjacent to their surroundings (2) promoting efforts which minimize damage to the natural resources and (3) enriching the understanding of the relationship between ecological systems important to the Nation of the United States of America and to establish a Council on Environmental Quality (National Environmental Policy Act of 1969). Palmer and Neal (1994) stated that the definition accepted in the 1970 Conference for Environmental Education in the school curriculum in the state of Nevada in USA integrated the recognition of values to develop attitudes for understanding and appreciating the interrelatedness of man, the local culture and biophysical surroundings. The above definition suggests the elements of place-based approach to learning. It includes linkage to the natural environment, ties to the local
community and resources, hands on activity, and learning by experience. According to International Union of Conservation of Nature (1970) the aims of the 1970 conference in Nevada were as follows:

1) to bring together specialists responsible for curricula design at primary and high school levels from both developing and developed countries; 2) to discuss curriculum innovation ideas and principles of potential use in environmental conservation education; 3) to allow delegates to participate in the local field ecology studies with the demonstration teams of students; and 4) to expose the specialists to a broad exchange of experiences and views. (p. 1)

In 1972, the United Nations (UN) Conference on Human Environment was held in Stockholm, Sweden from June 5th to June 17th. The conference declared that conservation of natural resources and their sustainable utilization is an importance issue that impacts the wellbeing of people and economic development worldwide. Therefore, it also important that all Governments worldwide commit to resource management. United Nations (1972) stated as follows:

To achieve this environmental goal will demand the acceptance of responsibility by citizens and communities and by enterprises and institutions at every level, all sharing equitably in common efforts. Individuals in all walks of life as well as organizations in many fields, by their values and the sum of their actions, will shape the world environment of the future. (p. 3)

The above 1972 UN conference on human environment also declared that environmental education and the integrated development planning is important. It is no
surprise that the Republic of Botswana (2007) also defined environmental education, in general terms as “education and communication activities within a broad range of environmental and social development programmes. Environmental Education, thus, embraces ecological issues, development practices and social concerns” (p. 14). The 1972 UN conference was followed by the establishment of the United Nations Environment Program and the International Environmental Education Programme in 1975, whose conference was held in Belgrade, Serbia. According to Palmer and Neal (1994), the objectives of the Belgrade conference included fostering awareness of social and ecological interdependence; conduct research about pedagogy and methods of environmental education, and training personnel through courses for pre-and in-service teachers and curriculum developers. The significance of the 1975 Belgrade conference seems to exist currently by providing the framework for the development of environmental education (Palmer & Neal, 1994).

According to researchers (e.g. Ketlhoilwe, 2013) in Botswana, the role played by some UN agencies on environmental education exposes power exercise. Ketlhoilwe (2013) argued as follows: “environmental conditions that have emerged are influencing international environmental education policy discourses directly through the UN agencies” (p. 2). With regard to the 1977 Tbilisi Conference in environmental Education, Pande (2001) stated that designers of the national school curriculum adopted the infusion approach, which is explained by Drake (2012) and Hungerford et al., (1994) under the section of curriculum integration. According to Pande (2001) the infusion approach
focuses on the belief that environmental concerns affect every discipline of life and each school subject must integrate an environmental orientation.

The evolvement of the formal discipline of Environmental Education was strengthened further by members of the Brundtland Commission, who produced the 1987 report entitled, “Our Common Future”, where education is seen as a focal point. For example, the Brundtland Commission wrote: “The changes in human attitude that we call for depend on a vast campaign of education, debate and public participation” (p. 8). The Brundtland Commission was formed following an urgent call made by the General Assembly of the United Nations to propose long term environmental strategies to achieve sustainable development by the year 2000 and beyond. It was led by the former Prime Minister of Norway, Dr. Gro Harlem Brundtland.

The debates from the Brundtland Commission led to the 1992 Earth Summit that was held in Rio de Janeiro, Brazil. The focus of the Earth Summit was on Agenda 21, which is an action programme that set out what nations should do to achieve sustainable development in the 21st century. It is important to note here that the Earth Summit recommended that environment and development should be incorporated as an essential part of learning by governments. The Brundtland Commission (1987) stated formally: “Governments should strive to update or prepare strategies aimed at integrating environment and development as a cross-cutting issue into education at all levels” (p. 136). This formal recommendation might have influenced the government of Botswana to develop the Environmental Education Strategy and Action Plans dated 1993 – 1997 and 2007 – 2012 (Botswana Department of Environmental Affairs, 2007). The publications
and conference procedures discussed in this section suggested that the discipline of environmental education plays an important role in secondary education and should be incorporated into all subjects in the curricula including the curricula of countries in the region of Africa. The next section in this chapter of literature review focuses on discussing the theoretical framework of this case study.

**Theoretical Framework**

The theoretical framework that informs this case study, in the panhandle of the Okavango Delta in Botswana is place-based education. This is the framework that aims at strengthening the school and the community and the reintegration of students to study the local environment, as introduced in Chapter One. In this case-study, the principles of place-based education are discussed in relation to the ideas that emerge primarily from the book written by David Sobel titled *Place-based Education: Connecting Classroom and Community*. David Sobel is an educator and currently a faculty member in the Department of Education at Antioch University, New England.

Sobel (2005) explained that place-based education places more emphasis on hands-on activities and real world experiential learning activities. It increases academic achievement for both the community people and the students. The instruction, which is informed by place-based education “increases academic achievement, helps students develop stronger ties to their community, enhances students’ appreciation for the natural world, and creates a heightened commitment to serving as active, contributing citizens” (p. 7). Sobel (2005) argued that if school teachers and administrators place more attention on the particularities of local place, local climate, existing community organizations,
environmental learning centers, and parental concerns, then several project-based learning activities are likely to evolve and engage students in real world experiential learning activities. These are some of the principles of place-based education that this case-study employed to analyze the data from classroom observations, semi-structured interviews and documents. Sobel (2005) wrote: “Place-based educators want to advocate for an integrated curriculum that emphasizes project-based learning, teacher collaboration, and extensive use of community resources and volunteers” (p. 19). This could suggest that the separation between the school and the community is often permeable to allow collaboration and utilization of resources from the local community. Community people also play an important role in classroom activities.

The framework of place-based education is not new. Smith (2002), for example, explained that “Jim Cummins and Dennis Sayers in Brave New Schools refer to the work of French educators in the early 20th century whose students collected and then compiled information about their own villages” (p. 587). The place-based results that were generated by the students were shared with other students in other parts of France, who engaged in similar place-based research activities. Smith (2002) wrote: “to ground learning in local phenomena and students' lived experience” (p. 586). For his part, Gruenewald (2003) suggested that place-based pedagogies are important so that the “education of citizens might have direct bearing on the well-being of the social and ecological places people actually inhabit” (p. 3).

Place-based education assists learners by providing a foundation for learning. “It initiates a process of social change by immersing students in local heritage, culture and
landscapes and the rich diversity of community-based opportunities and experiences where their actions can have the greatest impact” (Promise of Place, n.d, p. 7) This framework enables teachers and students to integrate the schoolyard, the local community, and public spaces in the curriculum content. Consequently, the student is able to use the experiences he or she acquires outside the school (that is the local community where school exist) into an integrated curriculum. On their part, Duffin, Powers and Tremblay (2004) stated that the Place-based Education Evaluation Collaborative (a group of educators with K-12 mostly in New England, USA) carried out an evaluation to determine the effectiveness of the place-based education framework.

The above collaborative group carried out over 800 adult interviews; over 200 student interviews; over 750 educator surveys; over 2,000 student surveys; document reviews and on-site observations (Duffin, et al., 2004). The researchers reported that place-based education cultivates a sense of connection to local places among students. Furthermore, it can promote partnerships between schools and communities. It can result in enhanced student achievement and by extension enhanced environmental, social and economic vitality. According to Powers (2004), place-based educators argue that “by grounding education in the local community, students can see the relevance of what they are learning and therefore become more engaged in the learning process” (p. 18). Students become more engaged in the learning process. This suggests that learners who are engaged in place-based learning stand a greater chance of success than those who learn equivalent material in more traditional educational formats.
Place-based education is aligned with the ideas of Dewey (1891), who helped in the initiation of progressive education movement by first testing his educational theories in 1896 at the University of Chicago Laboratory Schools in Illinois, USA. Dewey (1891) advocated for a child-centered and holistic approach to learning, thus making education more responsive to the needs of children. One of the elements of progressive education is learning by doing, in the social and cultural environment. Progressive education promotes an integrated and interdisciplinary curriculum, which is also referred to it by Bruce (2011) in the article titled, “Greening English: Voice Howling in the Wilderness?” According to Bruce (2011), “Place-based education uses the concept of place or environment as an integrating context across disciplines” (p. 21). He explained that it is characterized by “interdisciplinary learning, team-teaching, hands-on experiences that center on problem-solving projects, learner centered education that adapts to students’ individual skills and abilities and the exploration of local community and natural surroundings” (p. 21).

Bruce (2011) suggested the following four paraphrased ways through which the implementation of place-based education can be carried out in the curriculum of the subject of English: (1) considering the place-value of ideas provided for reading nature writing and environmental literature as a way of illuminating the particularities of one’s home place (2) engaging in writing projects centered in the local inquiry (3) engaging students in activities that lead them to do some nature writing of their own and (4) studying local indigenous literary traditions and conducting place-based writing of local indigenous significance in the local place. The above ways of place-based education were
also employed as guiding protocol during classroom observations and semi-structured interviews with teachers in the Okavango Delta.

This case study in the panhandle of the Okavango Delta of Botswana was also guided by the following principles, which were introduced by John Dewey in the 19th century: (1) flexibility of the school curriculum in order to interconnect the subjects with the local community (2) child – centered approach to learning. The approach of the ideal school curriculum, break down barriers between children’s community experiences and their experiences in the classroom (Flinders & Thornton, 2012). Dewey believed that the individual who is to be educated is a social individual, and that society is an organic union of individuals. In the same vein, Lave and Wenger (1991) wrote: “Thus, analysis of school learning as situated requires a multilayered view of knowing and learning are part of social practice” (p. 40). Lave and Wenger (1991) introduced situated learning, arguing that traditional schooling in Western societies is based on the assumption that knowledge can be decontextualized. According to Lave and Wenger (1991), traditional schools are linear and rigid socially and educationally.

Therefore, this social practice stated by Lave and Wenger (1991) is explored through the approach of place-based education, where Lane-Zucker (2004) also argued that schools and other educational institutions can and should play a central role in celebrating, empowering and nurturing the local cultural and spiritual resources of the local communities. The Republic of Botswana (2013) also indicated it is government policy for the local community to engage in the development and management of education through the local organizations such as Parents Teachers Associations. The
above indication suggest that the government of Botswana is committed to ensuring that community people are engaged effectively in the management of the schools. This indication concur the principles of place-based education as written by Sobel (2005).

Although place-based education situates learning, including environmental education, at the local level of culture and environment, this case study acknowledges a variety of literature which has revealed some shortcomings of place-based education, in some context. For example, Whitehouse et al., (2014) wrote that as for the Australian Aboriginal and Torres Strait Islander peoples, the approach of place-based education “do not and perhaps cannot, adequately capture the range and nuances of possible understandings and relations” (p. 57). One of the reasons is that any place in Australia has a colonist story. Moreover, the native people in Australia consider culture and land management practices as “one and the same, recent, popular, and Westernized” (p. 57). In their conclusion, Whitehouse et al., (2014) suggested that undoing the colonized curriculum structures in environmental education will be hard to achieve. They argue that there is lack of integration between existing curriculum priorities in Australia.

The above findings suggested that one of the contemporary problems that faces environmental education, in general, is communication breakdown between the educational authorities primarily in addressing priorities that concerns local knowledge and modern knowledge in the area of environmental education. The communication breakdown and lack of reaching consensus impact as well the instruction that relate to environmental education in classrooms. Strife (2010) had argued that environmental education “still seems to be stuck within the old environmental paradigm” (p. 179) and
still considered as supplementary education. In referring to the implementation of environmental education in U.S.A, Strife (2010) asked as follows: “More importantly, why is environmental education still considered supplementary education and not seen as a critical approach to developing a more sustainable society in the U.S?” (p. 180). The next section for this chapter of literature review focuses on discussing curriculum integration

**Curriculum Integration**

The definition of an integrated curriculum is elusive. According to Drake (2012) curriculum integration, generally, describes a curriculum that connects various disciplines in some way. On the other hand, Russell and Burton (2000) indicate that integrated curriculum programs consist of a block of courses in which cohorts of students enroll for a semester. Fogarty (1991) also wrote as follows: “To help the young mind discover ‘roots running underground whereby contrary and remote things cohere and flower out from one stem’ is the mission of both teachers and learners. Educators can achieve this mission, in part by integrating the curriculum” (p. 61). Fogarty (1991) described the ten models through which a curriculum can be integrated. The ten models are paraphrased below in this dissertation.

First, the Fragmented Model is the traditional design for organizing the curriculum and it stipulates separate and distinct disciplines. It offers one directed focus on a single subject such as Math, Science, Language arts, and Social studies. According to Fogarty (1991), these subjects are taught by different teachers in secondary schools, unlike in primary schools. Second, the Connected Model suggests “a close-up of the
details and subtleties, and interconnections within one discipline” (p. 61). It focuses on explicitly illustrating connections within subject areas and connecting topics, skills, and concepts to one another. According to Fogarty, the reason behind the Connected Model is to bring together themes that emerge from within the discipline and make it simpler for learners to understand. For example, in a junior secondary school, “the earth science teacher could relate the Geology unit to the Astronomy unit by emphasizing the evolutionary nature of each” (Fogarty, 1991, p. 61). Third, the Nested Model focuses on viewing the school the curriculum in three dimensions. According to Fogarty (1991), in an elementary lesson of the circulatory system the teacher could focus on explaining the concept of systems as well as facts and understanding about the circulatory system.

Fourth, the Sequenced Model “views the curriculum through eyeglasses: The lenses are separate but connected by a common frame” (p. 62). Fogarty (1991) explained that although the curriculum units are taught separately in a Sequenced Model, they are arranged to provide a wider perspective for concepts that are related. For example, “Charlotte’s Web (a children’s novel by American author, E.B. White) can accompany the unit on Spiders” (p. 62). Fifth, the Shared Model “views the curriculum through binoculars, bringing two distinct disciplines together into a single focused image” (p. 62). The Shared Model incorporates teaching in two disciplines of the curriculum (Fogarty, 1991).

Sixth, the Webbed Model “views the curriculum through a telescope, capturing an entire constellation of disciplines at once” (p. 63). Fogarty (1991) illustrated in this model by saying “once a cross-departmental team has chosen a theme, the members use it as an
According to Fogarty (1991) in various departments of the academic institutions, the Webbed curricular approach to integration is achieved through the use of a generic theme, for example patterns. “This conceptual theme provides rich possibilities for the various disciplines” (Fogarty, 1991, p. 63). Seventh, the Threaded Model “views the curriculum through a magnifying glass” (Fogarty, 1991, p. 63) and the model threads the various skills such as thinking, social, and study and multiple intelligence approach to learning throughout all disciplines in the curriculum. Eighth, in the Integrated Model, the curriculum is viewed through a Kaleidoscope, which is a tube that contains bits of colored glass and two mirrors at one end and that shows various different patterns as it is turns. This means that “inter-disciplinary topics are rearranged around overlapping concepts and emerging patterns and designs” (p. 64). According to Fogarty (1991) in using a cross-disciplinary approach, this model connect disciplines by finding the overlapping skills and concepts. The integration emerges from across a variety of disciplines and teachers make connections among them as commonalities develop.

Ninth, the Immersed Model considers the curriculum through a microscope. “In an intensely personal way, it filters all content through the lens of interest and expertise” (Fogarty, 1991, p. 64). In this model, integration takes place within learners, with little or no intervention from the teacher. Tenth, and last, the Networked Model of integration “views the curriculum through a prism, creating multiple dimensions and directions of focus” (Fogarty, 1991, p. 65). This model provides many ways for exploration and explanation during instruction. Fogarty (1991) noted that students direct the process of
integrating and targeting necessary curriculum resources as they reach out within and across their areas of concentration.

Drake (2012) suggested that an integrated curriculum is not a new phenomenon. He wrote as follows: “Influenced by the philosophy of John Dewey (1938, 1966), the progressive movement was popular in education and promoted an integrated curriculum that would motivate students because it was relevant and followed by the principles of constructivism” (p. 7). However, Drake (2012) applauded Fogarty’s models of curriculum integration. He stated that teachers could make sense of their own practices of instruction if they follow any of Fogarty’s models of curriculum integration. Moreover, Drake (2012) explained four approaches to curriculum integration.

First, the approach of Fusion is whereby a content is fused to the already existing curriculum. For example, environmental awareness being fused into different subject areas at all levels of the curriculum. Second, the Multidisciplinary approach is whereby disciplines remain distinct. There are deliberate connections existing between or among disciplines. For example, at the elementary level, students may visit different learning centers to study a common theme. The third approach is the Interdisciplinary approach. It makes more clear connections across the subject areas. In this approach, even though the curriculum revolves around a common theme or problem, interdisciplinary concepts are emphasized across the subject areas in order to promote collaboration. The fourth and last approach is the Transdisciplinary approach. It starts with a real-life context and does not start with the disciplines or common concepts (Drake, 2012).
The first approach of “fusion” as explained by Drake (2012) relate to what Hungerford, Volk and Ramsey (1994) defined as “infusion”. According to these authors, infusion is the integration of content and skills into existing courses, without jeopardizing the integrity of the courses. They illustrated as follows: “In the case of environmental education, the educator carefully analyzes existing courses for places where environmental content and associated skills could be incorporated into the existing course” (p. 59). This case study note that “integration” is used interchangeably with “infusion” and it encourages teaming among teachers; thus increasing the knowledge of other disciplines and provide unique skills to teachers of lesser abilities.

In the U.S.A, curriculum integration has also been illustrated by Sobel (2005) in one of the strategies of creating place-based schools. He explained that during the Community Arts Day in Antrim, New Hampshire Middle School, a Math teacher, who teaches the seventh and eighth graders carry out a survey on a school lunch program. The participants in the survey include the fifth and six graders about the school lunch program and the afterschool club offerings (experiential activities of extra-curricular) because they are using the school for real-life data analysis. In this place-based strategy illustrated by David Sobel other projects include integrating Art and Science. For example, the Art teacher joins up with the fifth grade teachers to create accurate and artistic maps of wildlife at the local McCabe Forest, in New Hampshire, U.S.A. This approach of integration incorporates the element of team teaching and cultivate the spirit of teaching across the discipline. The next section describes in detail, an example of place-based education project in the state of Alaska in U.S.A.
Integration of environmental education in Alaska, United States of America.

The integration of environmental education, among the native people of Alaska, as explained by Ray Barnhardt in the edited book titled, “Place-Based Education in the Global Age” is aligned to the philosophy of John Dewey, who stated that past experience is essential for integration in the present experiential activities (Dewey, 1938). Ray Barnhardt is the Emeritus Professor of Cross – Cultural Studies at the University of Alaska. Barnhardt (2008) describes a 10-year educational restoration activity that brought the local knowledge, which have long sustained the native people of Alaska, into the forefront of the educational curricula to serve the students of Alaska and local communities. Barnhardt (2008) described how “Native people have begun to reintegrate their own knowledge systems into the school curriculum as a basis for connecting what students learn in school with life out of school” (p. 113). He argued that the process of re-integration has “sought to restore a traditional sense of place while at the same time broadening and deepening the educational experience for all students” (p. 113). The process of re-integration incorporated the discussion with the native people about cultural mapping of natural resources, traditional values, experiential learning and cultural standards. Barnhardt (2008) wrote:

All serve as the basis for pedagogy of place that shifts the emphasis from teaching about local culture to teaching through the culture as students learn about the immediate places they inhabit and their connection to the larger world within which they will make a life for themselves. (p. 113)
Barnhardt (2008) suggested that the main goal for encouraging experiential learning has been the design of curriculum materials that help by guiding teachers on how to integrate the local environment and cultural resources into student learning experiences. It was through the Alaska Native Knowledge Network that the local environmental knowledge has been embedded in the school curriculum. In Alaska, learners studied in partnership with the local community elders to identify contents of local interest and develop projects that illustrated the importance of science in everyday life, in their local community (Barnhardt, 2008). The partnership of learners with community elders suggested how a place-based approach to learning could be implemented in real life situations with local people. Barnhardt (2008) stated that in the partnership above “the science project opportunities have been unlimited as elders shared their accumulated knowledge derived from living on the land over many generations” (p. 126). For example, the Minto Elders “identified 72 uses of birch trees, many of which provided intriguing opportunities for students to test the scientific principles imbedded in the Elders’ knowledge (e.g. Why is the bark for baskets harvested at a certain time of the year?)” (p. 126).

The place-based approach to learning in Alaska suggested that during the implementation of research projects, community people and scientists participated in assessing students’ projects (Barnhardt, 2008). They used “two sets of criteria to ensure that the students have incorporated both culturally accurate and scientifically valid principles and practices” (Barnhardt, 2008, p. 123). This showed that experiential inquiry, in a traditional camp environment, can assist in guiding the teaching and learning. It was
through the Alaska Native Network, that the Compact Disk Read only memory (CD-Rom) containing village science has been used in schools and professional development programs in the state of Alaska (Barnhardt, 2008). The CD-Rom offered the school teachers the advantage of improving the curricula and integrates the place-based approach to learning. The next section for this chapter discusses environmental education at the regional level in Southern Africa before discussing environmental education in Botswana, which is the focus of this study.

**Environmental Education at the Regional Level in Southern Africa**

The status and implementation of Environmental Education in the region of Africa is facing unprecedented challenges in the 21st century. According to the literature, the challenges are due to the nebulous approach of integration in the curriculum (Moalosi & Chikumu, 2011; Moreri, 2011; Sehlola & Jita, 2013). In the Southern region of Africa, where Botswana is situated, environmental education has its origins in the conservation of public protected areas (Obol, Allen, & Bach, 2003). Some of the protected areas in Botswana include the Chobe National Park and the Moremi Game Reserve. Ketlhoilwe (2010) suggested that some of the international environmental organizations such as the United Nations Environment Program, International Union for Conservation of Nature, and World Wildlife Fund facilitated the integration of environmental education into the curricula.

Obol et al., (2003) also argued that the 1992 Earth Summit and Agenda 21 influenced the approaches for environmental education in Southern Africa. He acknowledged that countries in the region of Southern Africa have problems in policy
design and implementation for environmental education. Other constraints such as the national and household poverty and HIV / AIDS occupy national planning strategies more than environmental concerns. The problems in policy implementation are also underlined by Sehlola and Jita (2013) who argued that in South Africa, most of the policy changes “do not address themselves specifically to the issue of how environmental education should be provided to learners of different backgrounds” (p. 260). They suggested that it remains the duty of teachers in classrooms to provide the knowledge of environmental education to learners who have various backgrounds.

Environmental education association of southern Africa (EEASA).

The Environmental Education Association of Southern Africa (EEASA) is a regional initiative that was formed in 1982 at a conference that was held at Treverton College in Natal-Midlands, South Africa (EEASA, 2015). The association covers the entire region of Southern Africa, where Botswana is situated. According to EEASA (2015), participants of the association include “educators, students, field workers, academics, development workers, resource developers, conservation officials, industry trainers, extension workers and others from throughout the SADC region” (Membership, para. 4). The role of EEASA is to support environmental education in the region of Southern Africa. Furthermore, EEASA “endeavors to achieve this by providing opportunities for the exchange of ideas and opinions on environmental education through its publications, the annual national conference and workshops as well as the activities of working groups in the regions” (EEASA, 2015, About Us, para. 3). For example, the 2014 conference of EEASA was held in Namibia, while the 2015 conference was held in

**Environmental Education in South Africa.**

The government white paper on Education and Training (1995) and the National Environmental Management Act of 1998 guide the processes of environmental education in South Africa. According to Obol et al., (2003), the institutionalization of policy for environmental education in South Africa entails influencing the development of policy by enabling “support to initiatives of the Ministry of the Environment; support to the Ministry of Education … and a pilot ‘EcoSchools’ project to encourage schools as institutions in the community to adopt environmental management systems” (p. 28). Obol et al., (2003) stated that the project, which has influenced the policy to ensure that the environment is integrated to the curriculum, was established through financial support from the European country of Denmark. For example, Obol et al., (2003) wrote “The regional environmental education programme and the support project work in 14 member states of Southern Africa and are funded mainly by Swedish and Danish governments” (p. 22).
As indicated earlier, the integration of environmental education in South Africa has also been recently investigated in a study of primary school curriculum (Sehlola & Jita, 2013). The researchers aimed to explore, among other areas, “the availability of teachers who are qualified to teach environmental education, the availability of teaching and learning resources; the amount of time available to learn; the organization of the classroom (Sehlola & Jita, 2013, p. 260). Sehlola and Jita (2013) stated that the qualitative methodology was employed in order to help understand the occurrence of fieldwork activities in the natural settings and how research participants discussed environmental education from their lived perspectives. For example, Sehlola and Jita (2013) wrote as follows:

Semi-structured interviews with teachers and learners were used. This involved direct observations of classroom lessons and also an analysis of documents, such as handouts from environmental education workshops, school environmental education policy, and other relevant environmental education documents used by the school. (p. 261)

Sehlola and Jita (2013) reported that professional development of teachers constitute one of the most important strategies in developing the capacity to teach about the environment. Teachers normally attended environmental education workshops that are organized by the South African Biodiversity Institute. Unlike ineffective professional development workshops in Botswana, Sehlola and Jita (2003) reported that leaners benefited from the partnership of the school with the private institutions for workshops
and this “enabled the provision of structured learning opportunities about the environment” (p. 267).

*Environmental Education in Namibia.*

In Namibia, which is also located in the Southern Africa region, the protection of the environment is a constitutional mandate (Republic of Namibia, 2010). The constitution of Namibia came into existence “on Independence Day, March 21 1990 and has been hailed to be one of the most democratic and liberal constitutions in the world” (Republic of Namibia, 2010, Namibia Constitution, para 1.). The constitution has three environmental clauses that are relevant to the sustainable use of natural resources, which are owned by the state. For example, Article 95 (1) stated that the state shall “actively promote and maintain the welfare of the people by adopting, *inter alia*, policies aimed at (i) maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilization of living natural resources on a sustainable basis” (p. 45-46).

The Namibia Environmental Investment Fund is one of the programs that assist schools to engage in sustainability projects through provision of loans and scholarship that is accessed by youth from early childhood. The funds are also availed to higher education institutions for the benefit of students, faculty and staff in green projects. Kanyimba (2011) argued that despite Namibia education system’s efforts to raise the profile of sustainability education the need for empowering communities through education has been re-emphasized by the Presidential Commission on Education, Culture and Training. Kanyimba (2011) reported that various constraints affect the integration of
Sustainability Education in Namibian Colleges of education. The constraints relate to the following:

- rules, schedules and systems that are established in Namibian Colleges of education… teachers’ education thoughts, skepticism and perceptions about the integration of sustainability education…personal circumstances such as lack of abilities and lack of ability to infuse sustainability education in teacher education subjects. (p. 134)

**Environmental Education in Tanzania.**

After gaining independence in 1961, the government of Tanzania, through the late President Julius Kambarage Nyerere, was able to produce the policy called, “Education for Self-Reliance” (Makundi, 2003, p. 135). The purpose of this policy focused on “development of enquiring mind, the ability to learn from others, the ability to contribute to the society… and the ability to appreciate and develop national culture” (Makundi, 2003, p. 135). The focus of the Tanzanian policy relates to place-based approach of learning from others and relation to societal members. Makundi (2003) suggested that the policy encouraged what is emphasized in environmental education for sustainable living.

Similarly, the government of Botswana has adopted educational principles that are similar to the policy of Tanzania. The Republic of Botswana (2003) and Tabulawa (2009 also stated and discussed, respectively, the tenets of social and intellectual skills and real life situation which are part of the policy of Education for Self-Reliance. Makundi (2003) stated that different conceptions of the policy among research scholars in Tanzania “made it difficult to agree on what and how to teach in schools” (p.135). This
predicament was also reported by Kanyimba (2011) in Namibia that various educational thoughts, perceptions, and skepticism of college teachers impact the integration of sustainability education.

Makundi (2003) stated that in Tanzania environmental education was integrated in the subject of Social Studies as a response to international concerns. Although Makundi (2013) did not state examples of the international concerns, the national concerns in Tanzania were related to “nature, land degradation, and water and air pollution” (p. 136). These concerns were “integrated in other subjects such as science and vocational skills as cross-curricula issues. The assumption was that equipping learners with these values, knowledge and skills would reduce unemployment and improve the skills of the youth” (Makundi, 2003, p. 136). Makundi (2003) informs that to date, there has been a rare reduction of unemployment and improvement of skills for the youth. Therefore, this problem calls for research into the effectiveness of the implementation of the ‘integration’ based model in several countries of Africa. Makundi (2003) reported that when comparing students who “had been exposed to environmental education in the school curriculum, and a group of learners who had not received environmental education, it was found that there was no difference in the ways in which they approached an environmental problem” (p. 138).

The criticism raised by Makundi (2003) corroborated Da Silva (1996), who argued that most attempts of environmental education in Tanzania have sought to introduce environmental issues within existing disciplines, rather than to create new interdisciplinary environmental education courses. Da Silva (1996) stated that in
Tanzania researchers criticized the compartmentalization of subject matter in schools. Researchers pointed out the inappropriateness of such an approach due to the interdisciplinary and holistic nature of environmental problems. Da Silva (1996) wrote: “The environmental education found in geography, biology and civics, for example, lacks coherence, integration, and practicality” (p.120). He argued that in Tanzania, the practices of environmental education make very little use of the actual environment as a teaching resource.

**Environmental Education in Botswana**

The plan to integrate environmental education into Botswana’s curriculum emerged in 1984 at the workshop titled, “Management of Botswana’s Environment.” According to Cooke and Campbell (1987), this workshop aimed at teaching participants the ways of preserving the local environmental resources. Participants suggested that environmental education should first be introduced into higher education and then integrated in secondary school subjects. They asserted that the teaching of environmental education would influence local people in Botswana to support the implementation of environmental legislation and practice responsible environmental behaviors.

In 1984, international organizations [e.g. Southern African Development Committee (SADC), United Nations Environment Program, (UNEP) and United Nations Development Program (UNDP)] collaborated for the environmental workshop held in Botswana. It was through the 1984 workshop that Botswana realized the need for the preparation of a National Conservation Strategy. Five years later, the Republic of Botswana officially embraced the Community Based Natural Resource Management
(CBNRM) program, as discussed in Chapter one and Chapter two. The need for the National Conservation Strategy emerged from the cooperation between the government of Botswana and UNEP about the sustainability of future development and needs of future generation. The impacts of development have become visible through pressure on water resources, rangeland degradation and depletion of wildlife resources. These environmental pressures are similar to the national concerns that are discussed under the previous section of Environmental Education in Africa explained by Makundi (2003) in Tanzania.

The government of Botswana invited the World Conservation Union in 1985 to develop the conservation strategy. Funds from the Norwegian Agency for Development Cooperation (NORAD), Swedish International Development Agency (SIDA), European Economic Community (EEC), United Nations Development Program (UNDP), United States Agency for International Development (USAID), and the Netherlands, were provided to develop the National Conservation Strategy (Cantrell & Nganunu, 1992). In 1987, the government of Botswana facilitated the seminar on the conservation strategy. In 1990 the National Conservation Strategy was finally approved. One of the aims was to promote environmental conservation and sustainable development. In response to the provision of funds from the above several institutions, Ketlholwe (2013) wrote as follows: “funding became regulating technique, as the recipients were obliged to fulfill agreements entered into founders and the recipients (mainly developing countries).”
Botswana’s curriculum integration.

Tabulawa (2011) discussed how the curriculum (pre-1994) of Botswana continued to the integration model. He stated that the 1993 educational report of Botswana expressed disillusionment on the separation of learning and real life (i.e. work outside the classroom). This suggested that there was the existence of a fragmented model, which Fogarty (1991) explained that it stipulate separate and distinct disciplines. According to Tabulawa (2011), the momentum to transform educator programs to successfully prepare learners to thrive in the future work force is rapidly increasing worldwide. He argued that it was because of this separation and distinct disciplines that local people criticized Botswana’s education for producing graduates who have insufficient work-based knowledge and skills. Consequently, the 1994 Revised National Policy on Education (RNPE) adopted an integrated curriculum, which this case study, in the panhandle of the Okavango Delta, investigated with a focus on environmental education. As discussed earlier, Drake (2012) indicated that in an integrated curriculum the interdisciplinary topics are arranged around overlapping concepts, emerging patterns and designs.

The 1993 educational report of Botswana recommended that efforts be made to establish linkages between subjects. Botswana Government (1993) stated: “The development of the curriculum and instructional materials should reflect the world of work by promoting integration across subjects” (p. 174). Integration also incorporates traversing subject boundaries, thus allowing team teaching and collaboration on cross syllabi contents.
**Implementation of integration.**

Despite the government’s efforts for curricula integration, several studies in Botswana suggested that it is the responsibility of only a handful of teachers to integrate elements of environmental education during instruction. For example, Ketloilwe (2010) questioned pedagogical practices for institutions of higher learning in Southern Africa. He argued that most educational institutions of learning are grappling with effective implementation of environmental education. The specialization of subjects by teachers influences their instruction. Consequently, teachers do not devote much time on environmental education. There is misalignment and continuing confusion on what the Botswana’s 1994 policy on education and 2007-2012 National Environmental Education Strategy and Action Plan (NEESAP) stipulates and how implementation is accomplished in schools. Ketloilwe (2003) advised that further empirical research should contribute into developing a feasible environmental education strategy. This could be attempted through the theoretical framework of place-based education, which is informed partly by the ideas of educational thinkers such as Rousseau, Agassiz, and Dewey.

**National development plan 10 (2009 – 2015) of Botswana.**

The National Development Plan 10 (NDP 10) emphasized the importance of professional development and teacher management as critical areas for quality improvement in education and training. In order to improve the quality of education, the Republic of Botswana (2013) stated that the school curriculum is diversified to integrate emerging issues, such as environmental education. Therefore, integration exists in the
NDP 10 of Botswana. This suggests that environmental education is key in engaging local people in Botswana on sustainability.

The Chief Education Officer in the Department of Curriculum Development and Evaluation, Molaodi Menyatso stated as follows: “without the involvement of children in environmental issues, sustainability would be compromised, noting that environmental education helped learners to appreciate the interdependence of the society, environment and the economy” (Motswagae, 2014, March, 10). The NDP 10 indicates that environmental education since its beginnings has focused on raising environmental awareness through professional development workshops and the commemoration of environmental days. Akin to Ketlhoilwe (2003), NDP 10 cautioned that the level of awareness has not been measured. Moreover, there is a need to upgrade the knowledge and skills of teachers so that they can effectively deliver the curriculum and enhance the morale to integrate environmental education.

Apart from the precautions given above, NDP 10 barely stated how schools should access educational resources, particularly vehicles for use during experiential outdoor activities, after procurement and distribution to educational departments. Similarly, Botswana’s 1994 educational policy stated that the government has fairly provided schools with educational resources. However, textbooks that include elements of environmental education are quite limited. As of now, in Botswana, there is one textbook (Environmental Issues – A handbook) written by Atlhopheng, Molebatsi and Toteng (1998), which has only three pages that discuss environmental education in Botswana. The pages focused on: “The Rationale for Environmental Education” and have
sub-contents of (1) Environmental Education versus Traditional Education (2) Values in Environmental Education (3) Environmental Education and the Learning Process.

Empirical research on environmental education in Botswana.

The empirical research studies, on environmental education in Botswana discussed problems that emanate from integrating environmental education into the curricula (Ketlhoilwe, 2003 & 2010; Molosiwa, 2010; Moreri, 2011; Mosothwane, 2002; Mosothwane & Ndwapi, 2002; Musisi & Nomalang, 2012). As discussed in Chapter one, Mosothwane (2002) conducted a study on pre-service teachers’ conception of environmental education in Botswana. He reported that the content of environmental education is integrated in Social Studies and Science, thus challenging the recommendation from Republic of Botswana (1994) that environmental education should be integrated into all subjects. Therefore, the suggestion is that pre-service teachers, in higher education (such as Colleges of Education), whose specialization is neither Social Studies nor Sciences, are precluded from learning the methods, philosophies and practices of environmental education. In another empirical research study, Ketlhoilwe (2010) reported that sixty percent of teachers are involved in environmental education practices because it is incorporated in the subject of social studies. This shows that specialization in particular subjects influences teacher’s instruction in classrooms. Therefore, in assessing the effectiveness of environmental education until now, this case study demonstrated that there are educational constraints in the efforts of integrating environmental education in Botswana. Additionally, in-service and pre-service professional development of teachers has been shown to be inadequate
The ineffectiveness of educational authorities, including teachers, contribute into a weak integration of the elements of environment in the curriculum in order to bring about change in pedagogy.

**Constraints to implementing integrated approaches to environmental education in Botswana.**

This section attempts to elaborate on the lack of clarity, the lack of resources support and the lack of stakeholder dialogue, which hampers the integration approach adopted by the Republic of Botswana. First, education officers and school heads are not clear on whether classroom teachers integrate environmental education or not. It seems there is lack of understanding concerning environmental education among educational authorities. Ketlhoilwe (2003) reported that when asked why teachers were not taking environmental education in an active way, educational authorities responded that teachers have duties to teach other curriculum subjects. This report indicates contradiction and lack of adequate consultation between classroom teachers and curriculum designers. Furthermore, it also demonstrates a lack of understanding of integrated approaches of curriculum design among the school heads and administrators.

Second, to complicate the uncertainty above, schools face a lack of resources that supports the integration (for example, the transport for outdoor experiential activities, sufficient time to teach environmental content, and teachers trained in integrating environmental concerns and issues across the curriculum). Teachers in Botswana are barely equipped with sufficient resources to advance them in integrating environmental content into the curriculum. Relatively, in a pilot study, of measuring the knowledge and
confidence levels of Family and Consumer Science (FCS) professionals in presenting sustainability concepts within the FCS curriculum, Harden, Friesen, and Thompson (2014), reported that FCS professionals in Indianapolis entered the study with a high level of knowledge about key sustainability concepts. However, the FCS professionals had a low level of confidence in their ability to plan and teach sustainability as part of their curriculum.

According to Harden et al., (2014) above, following the presentation and an opportunity to share ideas, a statistically significant gain in overall knowledge and confidence was observed. The results from the pilot study showed that confidence levels grow after in-service workshops training. This suggested the importance of effective in-service workshop in equipping teachers with knowledge. In his study of interviewing secondary school teachers and education authorities, Ketlhoilwe (2003) reported that teachers in Botswana are barely equipped with adequate learning resources to advance them in integrating environmental content into the curriculum. According to Ketlhoilwe (2003), authorities reiterated that teachers do not give environmental education adequate attention because it is not examined or timetabled in the curriculum. They are not sure whether teachers take learners for outdoor experiential activities. Ketlhoilwe (2003) argued that despite the fact that educational authorities and school heads are supposed to offer teachers professional development support some do not understand the challenges faced by teachers in schools. This indicates a loophole for effective dialogue between educational stakeholders.
Ntsatsi and Adeola (1995) conducted a review study that assesses the local organizations of National Conservation Society, Kalahari Conservation Society, Forests Association Board, Thusano Lefatsheng and Botswana Society in promoting environmental awareness in Botswana. Some of the problems that are reported in this assessment include lack of reliable facilities such as electricity. This is an indication that schools are under-resourced. Some remote schools in Botswana still rely on a generator power supply, which is ineffective and not conducive for learning due to periodical shortage of diesel or petrol, unreliable manpower operator, and breakdown of generator. For example, the Junior Secondary School, where this case study was conducted relied on a generator power supply. According to another report from Ntsatsi and Adeola (1995), some secondary school teachers are untrained in the environmental field and they barely appreciate the importance of environmental education. These authors argued that the efforts of formal education to promote environmental education in Botswana have been ineffective partly due to the issue of schools being under resourced.

**In-service training.**

Literature suggest that the department of teacher training and development in Botswana has not provided effective environmental education training workshops (Ketlohiwe, 2003). One of the objectives of teacher training and development is to set training standards for the development of teachers and linking processes of teacher training with those of curriculum and development evaluation so that effective teacher training programs are developed (Republic of Botswana, 2011).
According to Ketlhoitwe (2003), teacher training rarely leads to change in integrating environmental contents across the curriculum. Ketlhoitwe (2003) reported that educational authorities and school heads indicated that teachers have attended in-service training in environmental education “from two days to two weeks” (p. 79). However, it was also found that the effectiveness of some teachers attending the training workshops did not change (Ketlhoitwe, 2003). This case study argues that in-service professional development is indispensable. The lack of effectiveness of some teachers who attended in-service trainings was attributed to a lack of guidelines for teaching environmental contents, clear knowledge from authorities and self-efficacy towards change in the teaching field.

Contrary to the case illustrated above, Sehlola and Jita (2013) reported that in South Africa, teachers at the Sechaba primary school have been able to advance their teaching of environmental education through professional development workshops. Sehlola and Jita (2013) wrote:

We normally attend environmental education workshops organized by the South African Biodiversity Institute (SANBI), Rhodes University, and the Walter Sisulu Environmental Center. I attended three National Workshops organized by Rhodes University, one tutorial organized by the South African National biodiversity Institute and two organized by the Walter Sisulu Environmental Centre. These three organizations are helping us to integrate environmental education into the school curriculum. From the workshops we attended, we have learned quite a number of aspects like the compost issue. (p. 263)
Pre-service training.

Literature suggested that pre-service teachers are also inadequately trained in Botswana to teach contents and methodologies of environmental education (Mosothwane and Ndwapi, 2012). Yet, the primary purpose of the department of teacher training and development is to offer leadership in teacher training at pre- and in-service levels (Republic of Botswana, 2011). Mosothwane and Ndwapi (2012) conducted a survey of 60 teacher candidates to assess the extent to which colleges of education train teachers in methodologies of environmental education. The results of their study indicated that teacher candidates are not competent in teaching environmental education. They do not perceive environmental issues as academic content that could be used to help develop environmental literacy in schoolchildren. Mosothwane and Ndwapi (2012) noted: “We are not being adequately trained in environmental education because our lectures do not have the expertise to do so” (p. 31). They suggest that environmental education could be strengthened through providing pre-service teachers with training in philosophies and pedagogical content knowledge related to environmental education.

Teachers’ reluctance.

Mosothwane and Ndwapi (2012) also demonstrated that classroom teachers are reluctant to integrate environmental education into the curriculum because it is not integrated in textbooks and not specifically evaluated during testing. This means that there are rare questions, during examinations or testing of students, which ask on the content of environment. One of the teacher candidates was quoted as follows: “There are no EE teaching materials, no EE textbooks for us in our college because EE is not taught
or offered as a course in colleges of education” (Mosothwane & Ndawi, 2012, p. 33).

Introducing new topics, which are not covered by textbooks, is also a problem. For example: “At the senior level, some teachers were antagonistic to the idea of introducing topics which were not in their textbooks” (Musisi & Nomalang, 2012, p. 23). Musisi and Nomalang (2012) distributed a questionnaire to sixteen Primary, Junior and Senior Secondary Schools to evaluate the interpretation given to and the impact of the environmental education. In the study of secondary school principals, Kethoilwe (2003) stated as follows:

Environmental education is treated as an additional burden and teachers are not willing to concentrate on it. Some respondents are playing a minimal role in environmental education activities because they feel it is not necessary to infuse it at secondary school level. (p. 78)

The findings from the research studies discussed above contribute to the knowledge about the nebulous approach of integrating environmental education in Botswana. Moreover, the findings of studies indicated that there is a need for educators to change and design new approaches of integrating environmental education in the school curriculum with the purpose of placing the curriculum in the social and ecological environments where schools are situated. This calls for in-depth examination of the relevance of local environmental knowledge systems, which are part and parcel of the theoretical framework of place-based education.
Summary of Chapter Two

This chapter provided a review of the literature that is related to environmental education. First, the chapter discussed how traditional lifestyles of community people living adjacent to ecotourism destinations and biodiversity hotspots, such as the Okavango Delta, are impacted by the influence of modern scientific knowledge. Some of the impacts included the shift from the traditional economy (e.g. the gathering of non-timber forest products) to the cash economy (e.g. working in tourism facilities and earning cash). This shift has implications for the school curriculum and motivated the researcher to reflect and explore the extent at which conservation values, from community elders, are integrated during instruction in school by the teachers. Research studies (e.g. Barnhardt, 2008; Da Silva, 1996; Phuthego and Chanda, 2004) suggested that local knowledge play a crucial role in the sustainable management of environmental resources.

Second, the chapter discussed the hegemonic effects of the modern scientific knowledge in the curriculum of several countries of Africa such as Tanzania as explained by Da Silva (2006) and Malawi as reviewed by Kayira (2015). These authors suggested that teachers in schools should include the local thematic issues and the historically marginalized local knowledge during classroom instruction. Da Silva (1996) recommended the design of an education curriculum and experimented with in terms of integrating classroom learning with community-based sources of knowledge such as the local environmental knowledge. Third, the chapter discussed in detail the theoretical framework of place-based education, which informed this case study in the panhandle of
the Okavango Delta of Botswana. The place-based education is discussed primarily in relation to the ideas of educators such as David Sobel and also John Dewey. Fourth, the chapter discussed, under the section of Environmental Education in Context, the ideas of Jean Rousseau, Louis Agassiz, and John Dewey in relation to nature and environmental education. To some extent, the ideas of these educators contributed into forming the basis of place-based education, which is the theoretical framework of this case study. In this section, the Environmental Studies Programs in Ontario, Canada are discussed as well to illustrate the origins of the experiential outdoors that contributed to the development of environmental education in North America.

Fifth, the chapter discussed the definition of Curriculum Integration and the ten models of integration that were introduced by Fogarty (1991). The four approaches to Curriculum Integration that were introduced by Drake (2012) were also discussed. The integration of some elements of environmental education and place-based education in Alaska exemplify the environmental education restoration activity that brought the local knowledge into the forefront of the educational curricula to serve the students of Alaska and local communities. A variety of publications (e.g. 1962 Silent spring) and conferences (e.g. 1972 UN Conference on Human Environment) were also discussed in relation to environmental education. Sixth, this chapter also discussed the problems encountered during the implementation of environmental education in other African countries. In South Africa, for instance, environmental education programs were implemented without determining how to accommodate learners from various backgrounds (Sehlola & Jita, 2013). Still in Africa, the integration of environmental
education in Namibia and Tanzania faces diverse problems about the stakeholders who are holding unique perceptions about curriculum integration.

Seven, this chapter discussed that the development of environmental education in Botswana was motivated by the 1984 and 1987 workshops, entitled the Management of Botswana’s Environment and Developing our Environmental Strategies, respectively. Moreover, international organizations (SADC, UNEP, UNDP, SIDA, EEC and USAID) have also been active, in Botswana, during workshops and assisted in the design of the National Conservation Strategy. The integration of environmental education in the curriculum is incorporated in governments’ policies such as the 1994 National Revised Policy on Education, National Environmental Education Strategy and Action Plan and the National Development Plan 10.

Eight and last, this chapter discussed that empirical research studies reported constraints in the efforts of integrating environmental education. Moreover, in-service and pre-service professional development of teachers is inadequate. The ineffectiveness of environmental education contributes into eliciting the teacher’s resistance to integrate environmental contents in the curriculum. The next chapter, in this dissertation, focuses on presenting the research methodology that was employed in this case study.
Chapter Three: Methodology

Introduction

The purpose of this chapter is to explain the research methodology and procedures that were followed in collecting the data and employing the theoretical framework of place-based education, in the panhandle of the Okavango Delta of Botswana. The chapter begins by explaining the Research design and Site selection, Socio-economic status of community people, sampling procedures for the study site, the school and the participants. The data collection methods are discussed followed by explaining (1) how data collection on local environmental knowledge was carried out with the local people (2) how data collection on the presence of local environmental knowledge and integration in curriculum and instruction was carried out with the teachers and (3) how data collection about perceptions toward environmental education was carried out with the educational authorities. Thereafter, data analysis procedures are discussed. Last, the chapter discusses the credibility techniques of the case study.

Research Design

A case study approach was used to address the research questions around which this study was framed. A case study focuses on investigating one or more cases within a bounded system (a setting or context). This case study is bounded by the following (1) the place of the panhandle of the Okavango Delta (2) the catchment villages of a Junior Secondary School (3) and the class of form 3 students. The Junior Secondary School consists of classes of form one, form two and form three. Moreover, this case study is bounded by the school’ second term of 12 weeks. The school midterm was from June 2 to
August 15, 2014. This is the period that the researcher was stationed at the Junior Secondary School.

The study explored how the local knowledge in the area of environmental education is integrated in the curriculum. Therefore, a case study is preferred in exploring the following reiterated questions (1) What are the key elements of local environmental knowledge in the study area? (2) To what extent is the local environmental knowledge present in the curriculum and instruction (3) How do teachers integrate environmental education in the curriculum and (4) How do educational authorities in Botswana perceive environmental education?

In a case study, the researcher should explore a bounded system (a case) or multiple bounded systems (cases) over time (Creswell, 2007). Moreover, the researcher should also provide detailed and in-depth descriptions of data collection that involves multiple sources of information such as observation, interviews, and document analysis. Stake (1995) emphasized that a case is an integrated system because it has a boundary and working parts. A case study research design provides an in-depth understanding of a case. The researcher for this study deemed a case study suitable to explore the above four research questions. The research uses multiple methods and the themes are emergent and interpretive.

**Selecting the site for the case study.**

Flick (2009) advised that researchers interested in observing practices in the institutional contexts must conduct research from within the institutional context. Accordingly, this case study took place at a Junior Secondary School, which is situated in
the panhandle of the Okavango Delta in Botswana, which happens to be a RAMSAR ecological site. Photo 1 below shows buildings and blue portable toilets of the Junior Secondary School where classroom observations were made and teachers interviewed.

Photo 1 Some buildings of the Junior Secondary School in the Okavango Delta
Source: Kgosietsile Velempini, 2014

The rich flora and fauna of the Delta have made the site a popular tourist destination, where there is safari and photographic tourism (Central Statistics Office, 2005). The Okavango Delta features large expanses of open water, grasslands, and savannas and is rich in biodiversity. According to Thakadu and Tau (2012), the Okavango Delta and its immediate spatial environs are home to multiethnic groups of people (i.e., Bayei, Hambukushu, San / Khoikhoi, Batawana) and is a vital source of livelihood by providing water, fish, timber and thatch-grass for house construction. The
selection of the Okavango Delta, as a research site is also based on the emphasis by Botswana Vision 2016 Council (2010) that:

The wealth of the Delta is a heritage which Botswana must understand, but also manage and develop. The tourist potential of the Delta is a vital component in efforts to diversify the economy and to place the importance of the natural resources at the forefront of national thinking. (p. 39)

The Okavango Delta is the major tourist destination in Botswana due to the abundance of wild animals, forests and aquatic species. Figure 1 below shows the recommended land use zoning in the Okavango Delta of Botswana.

*Figure 1* Map of the recommended land use zoning in the Okavango Delta. Courtesy of Dr. Cornelis Vanderpost, former researcher in the Okavango Research Institute, Maun
The panhandle of the Okavango Delta and selection of the Junior Secondary School make it an intrinsic place for conducting the study because the Okavango Delta is ecologically unique. The researcher investigated how environmental education was integrated during instruction by the teachers at the Junior Secondary School. Berg and Lune (2012) suggested that in the intrinsic case study the role of the researcher is to understand better the intrinsic aspects of the particular case.

In 2003 and 2004 the researcher taught the subject of Social Studies in another junior secondary school, which is also situated in the panhandle of the Okavango Delta. Consequently, the researcher is familiar with the local culture, biophysical environment, indigenous languages, and social and economic lifestyles of the local people. Some of the cohort learners that the researcher taught in 2003 are originally from the catchment villages that are situated in the panhandle of the Okavango Delta.

According to the knowledge of the researcher, this is the first case study in the Okavango Delta of Botswana that focused on local environmental knowledge and employed the theoretical research framework of place-based education. Thakadu, Irani and Telg (2013) did not employ place-based education, but employed the theory of “reasoned action and the responsible environmental behavior framework” (p. 572). The aim was to investigate “the relative contribution of selected predictors of knowledge-sharing behaviors among local community leaders involved in natural resources management programs within the Okavango Delta” (Thakadu, Irani & Telg, 2013, p. 572). In the above investigation, 13 Community Based Natural Resource Management
(CBNRM) boards of trust (comprising of 120 participants) participated in the “quasi-experimental design” (Thakadu, Irani & Telg, 2013, p. 582). In another related investigation, Thakadu and Tau (2012) reported that they explored environmental communication strategies within the Okavango Delta by administering a survey to participants in four villages (Sankuyo, Boro, Xaxaba and Khwai).

**Overview of the socio-economic status in the Ngamiland West region.**

**Population.**

The panhandle of the Okavango Delta, where the data collection took place for this case study, is situated in Ngamiland west district of Botswana. Indeed the Okavango Delta is home to a diverse ethnic population. Fourteen multiethnic groups with different cultural backgrounds occupy the Okavango River basin (Kgathi, Kniveton, Ringrose, Turton, Vanderpost, Lundqvist, & Seely, 2006). These multiethnic groups include the San (Basarwa) people, “who are among the most marginalized people in southern Africa, not only in terms of limited access to education, health, and economic benefits, but also in terms of their cultural identity” (Kgathi et al., 2006, p. 4). The total population of Botswana is estimated at 2,024,904 (Statistics Botswana, 2014a). Statistics Botswana (2014a), an Analytical report of Population and Housing Census 2011, shows that the population of Ngamiland west district was 49642 in 2001 and increased to 59421 in 2011 with a population increase of 19.7%. Comparatively, the population in the capital town of Gaborone 186007 in 2001 and it increased to 231592 in 2011 with a population increase of 24.5%.
Kgathi et al. (2006) cautioned that the pressure, which might also arise from the increasing population, on the Okavango River and its natural resources will increase in the future. They explained it is because of the “demographic changes and the increase in socio-economic needs that take place in the basin” (p. 4). For example, Statistics Botswana (2013), a *Comparison of 2011 Census with Population Projection and Postcensal Population Estimates for Districts*, shows increasing population projections for Ngamiland west as follows: 60,538 for 2012; 61,675 for 2013 and 62,835 for 2014. Also, the development initiatives taking place in the countries of Angola and Namibia will also increase the pressure on the resources that are found in the Okavango Delta. Apart from the caution above, the findings that are presented in the analytical report of Population and Housing Census also indicate that majority of the population prefer to live in towns and cities instead of living in rural villages. One of the reasons could be the push and pull factors such as unemployment, lack of entertainment in the rural villages and hope to secure better job opportunities in towns and cities.

**Education.**

According to Statistics Botswana (2014b), a *Secondary education stats brief 2012*, the Northwest region, where the Okavango Delta is situated, has 15 Government schools and six private secondary schools compared to the Central region with 92 Government secondary schools and five private secondary schools. Statistics Botswana (2014) explains, “The higher concentration of Government secondary schools in Central region is mainly due to its vast geographical spread and high population in the region” (p. 2). Regarding the Secondary Education Enrolment by School Ownership per Region, the
Northwest region had a total of 10,584 students (5,131 male and 5,453 female) compared to the Central region with 60,516 students (29,225 male and 31,291 females) in Government secondary schools. This could also imply that the secondary school where data collection was carried out has a lower enrolment rate compared to a secondary school in the central region.

The government of Botswana is committed to offering education for all its citizens and produce a literate citizenry. Statistics Botswana (2015), a literacy survey 2014 stats brief, shows the Ngamiland west district has a literacy rate of 80.2 % for the population aged from 10 – 70 years. Men have a literacy rate of 80.6 %, while women alone in the same age category have a literacy rate of 79.9 %. In the entire country of Botswana, the highest literacy rate was recorded in the capital town of Gaborone (97.7 %), with men having a literacy rate of 98.8 % and women having a literacy rate of 96.7 %. The methodology used to determine the literacy status above included a basic test of ability to read written statements as well as to write legible communication (Statistics Botswana, 2015). Furthermore, the survey included tests of numeracy where participants, during the census collection, were assessed on their ability to interpret mathematical and graphical presentations.

The highest transition rate from primary (elementary) to junior secondary school occurred in Gaborone (80.1%) and was at its lowest in Kweneng West (45.9%). Statistics Botswana (2014) explain that these two geographic locations represent the extremes of poverty and wealth in Botswana. The Okavango Delta had a transition rate of 75.3%. It is surprising to note that Gaborone (80.1%) was followed by the Central Kalahari Game
Reserve (76.5%) census district, an area dominate by the minority groups of San (Basarwa) who also occupy some villages in the Okavango Delta. Previously, Kgathi et al., (2006) stated that the san are among the marginalized groups who have limited access to education, health, and economic benefits. It was learned, from village authorities in Kauxwi and Xakao, during field work that the villages in this case study and currently dominated by the Hambukushu ethnic tribe were previously dominated by various groups of the San ethnic tribe. The majority of San people are now living in the village of Tobera and nearby settlements where there are thick sands and scarce government facilities.

Wealth.

Statistics Botswana (2014) presented the wealth status by census district in Botswana. It shows that the district of Ngamiland west recorded a household poorest rate of 63.9 % and a household richest rate of 5 %. Comparatively, the capital city of Gaborone recorded a household poorest rate of 0.6 % and household richest rate of 45 %. One of the possible explanations for the difference in wealth provided by Statistics Botswana (2014) is that the observed pattern could be employment opportunities that are mainly found in urban areas than in rural areas. Also, Ngwenya and Magole (2009), wrote a Final Report titled, *A Socio-economic profile of river resources and HIA and AIDS in the Okavango basin, Botswana*. With reference to wealth, they reported that arable and livestock farming, formal employment, government social safety nets, remittances and fishing, constitute important sources of livelihood opportunities for members of various households in the Okavango region.
Notably, Kgathi et al., (2006) stated that “a substantial proportion of the population in the countries of Angola, Botswana and Namibia that live in the Okavango Delta region were still living below the poverty datum line” (p. 4). As a result, majority of local people depend on natural resources, such as water, that are freely available from the surrounding environment to sustain their livelihoods. Furthermore, Kgathi et al., (2006) stated that in northern parts of Botswana and Namibia there is high dependency on water from the Okavango Delta mainly “for irrigated agriculture and tourism related activities, which in turn requires the sustainability of wildlife habitats” (p. 4). The increasing population, social and economic demands, and less job opportunities in the Okavango Delta of Botswana suggest the importance of an effective place-based education in the region that is rich in natural resources.

**Sampling procedure.**

In order to answer the four research questions in this case study, three different target groups were sampled. These are the teachers, community people, and educational authorities. Each group provided a unique perspective based on the research question that the study investigated.

**Sampling of Teachers and the subjects in form 3.**

All public Junior Secondary Schools in Botswana follow a synonymous curriculum. The Ministry of Education (2010) stated that the following fifteen (15) subjects are offered in Junior Secondary Schools: Agriculture; Art; Commerce; Computer Awareness; Design and Technology; English; Home Economics; Mathematics; Moral Education; Music; Physical Education; Religious Education; Integrated Science;
Setswana; and Social Studies. Then in order to manage the data collection and analysis, this case study purposefully focused on Social Studies, Science, English, Agriculture and Mathematics. Previous studies conducted in Botswana, asserted that environmental education is mainly integrated in Social Studies and Science subjects (Mosothwane, 2002; Ketlhoilwe, 2010). English, Mathematics and Agriculture were selected because they are compulsory subjects in addition to Social Studies and Science.

Ministry of Education (2010) stated: “Some of the emerging issues which should be infused in the teaching and learning of Mathematics include: HIV/AIDS, Environmental Education, Voter Education, Road Accidents, Disaster Management and passion killings among many” (p. iv). Other subjects (apart from Setswana, a national language in Botswana) in the school curriculum are classified as optional subjects. Then, in this case study five teachers were observed teaching and then they were interviewed following a semi – structured method. The coordinator of the Environmental Education Club was also interviewed. Patton stated: “Studying information rich-cases yields insights and in-depth understanding rather than empirical generalizations” (p. 230). This case study focused in the class of form 3 students. This is the final grade in a Junior Secondary School before students proceed to high school. The focus of the study on form 3 indicated the extent at which the instruction of environmental education is imparted to students essentially the form 3 students who prepare to proceed to high school. Patton (2002) stated that purposeful sampling provides an information-rich case for a study.
**Sampling of Community People.**

The case study also employed purposeful sampling of community people, who were either parents, guardians or siblings of students in the class (form three South) of form three that was observed. In this category of participants, the study used the opportunistic (emergent) sampling strategy, which requires “on - the – spot decisions about sampling to take advantage of what emerges during actual data collection” (Patton, 2002, p. 240). Patton (2002) also cautioned that emergent qualitative studies should include the option of adding to a sample in order for the researcher to be prepared for unexpected opportunities after fieldwork has begun. Patton (2002) stated: “Being open to following wherever the data lead is a primary strength of qualitative fieldwork strategies” (p. 240). In the context of this case study, community people included parents, guardians or siblings of students who were observed during classroom instruction. Community people were residents of the following villages located in the panhandle of the Delta: Kauxwi, Xakao, Sekondomboro, Mohembo and Gani.

**Sampling of Educational Authorities.**

Purposeful sampling was also employed to select ten educational authorities who participated in the semi-structured interview. This included the School Principal, one regional education officer responsible for environmental education, two representatives of teachers at the regional level and two educational authorities responsible for environmental education at the national level and three researchers at the Okavango Research Institute and one official from the Department of Wildlife and National Parks in the division of Community Extension and Outreach in Maun.
**Sample Size.**

Regarding the sample size, Patton (2002) advised that there are no rules for sample size in a qualitative study. Sample size is determined by what the researcher wants to know and the purpose of the study, what will have credibility and what will be achieved with available time and resources in the field. As stated in the sampling procedure, five curriculum subjects were included in this case study. This implies that five teachers were observed and interviewed, including the coordinator of the environmental education club. Although the number of students in the classroom determined the number of local people to interview, the village chiefs were also interviewed. There were 34 students in the classroom of form 3 south, but 26 local people were interviewed following the semi-structured interview. The details of this semi-structured interview are described in this chapter in the section titled, *data collection with local people on local environmental knowledge.*

**Data Collection Methods**

In qualitative research, three primary methods of data collection are observation, interviewing research participants and analyzing documents. In the context of this case study, examples of official documents are government policies and programs. Lincoln and Guba (1985) stated that the official documents are a stable source of information because they reflect situations that occurred at some time in the past. Moreover, official documents are written in the natural language of the setting.
Document analysis.

The following official government programs were analyzed: (1) National Development Plan 10 (2) Botswana vision 2016 (3) 1994 Revised National Policy on Education (4) CBNRM Policy document of 2007 and (5) 2007-2012 Botswana National Environmental Education Strategy and Action Plan 2. The lesson Plans from the teachers were also read to understand the lesson objectives that were employed by the teachers. During classroom observation, the textbooks that teachers used during instruction were also read to understand the written content that relate to environmental education. Marshall and Rossman (2011) stated that case studies rely on historical and document analysis for data collection. In this case study, some of the protocol guidelines for document analysis include how was the program created and when; who are the target audience and what does the document say about environmental education. As stated by Patton (2002), the protocol guidelines help frame inquiry into the history of the program to illuminate thick descriptions.

Observation.

Classroom observations in Social Studies, Science, English, Agriculture and Mathematics were conducted. The purpose for conducting classroom observations was to see and write, in the notebook for fieldwork how teachers teach the elements of environmental education. An audio recorder (the Sony Digital Flash Voice Recorder) was used to capture the proceedings during teaching. With the consent from the teachers, photographing (using the Canon Power-Shot A470) was done in the classroom to capture the classroom settings and other interior features of the classroom and the proceedings.
Semi-structured interviews with teachers were conducted toward the end of the school term after some observations were made. This approach provided an opportunity to ask and probe on some practices of teaching that were observed. Bernard and Ryan (2010) affirms that probing is the key to successful in-depth interviewing and it has been the focus of qualitative research since the 1920’s.

Stake (1995) wrote: “qualitative or interpretive data have meanings directly recognized by the observer” (p. 60). Therefore, in this case, the teachers’ writing on the green board was observed to understand if it contains environmental contents. Some questions from the teachers and the responses from students were listened to and written in the notebook. One lesson took 40 minutes. For example, the Ministry of Education (2010) stated: “The syllabus has been developed on the assumption that science will be allocated 4 periods per week on a 40 minutes period, five-day timetable. The syllabus also indicates approximate period allocation per unit” (p. v). Regarding Mathematics, the Ministry of Education (2010) stated: “The syllabus was designed on the basis that Mathematics has been allocated 5 periods per week on either a 40 periods x 40 minutes per week timetable or a 45 period x 35 minutes per week timetable” (Ministry of Education, 2010, p. iv). In the process of observation the researcher remained open to understand how teachers think about elements of environmental education. Stake (1995) wrote:

The qualitative case study researcher keeps a good record of events to provide a relatively incontestable description for further analysis and ultimate reporting. He
or she lets the occasion tell its story, the situation, the problem, resolution or irresolution of the problem. (p. 62)

Moreover, Creswell (2007) advised that qualitative researchers are the ones who gather the information and do not rely on questionnaires.

Semi-structured interviews.

A qualitative researcher can choose to use semi-structured or unstructured interviewing for in-depth exploration of experiences when interviewing participants. The researcher learns to see the world from perspectives other than his or her own perspective. Rubin and Rubin (2012) stated that in a semi-structured interview, the researcher has a specific topic to learn about, prepares questions in the form of guidelines in advance and plans to ask follow-up questions (probing). In unstructured interview, on the other hand, the researcher has a general topic and the questions are constructed as the conversation proceeds. Comparatively, Kvale and Brinkman (2009) defined semi-structured interview as follows: “an interview with the purpose of obtaining descriptions of the life world of the interviewee in order to interpret the meaning of the described phenomena” (p. 3).

In this case study, semi-structured interviews were conducted with teachers, local people and educational authorities on environmental education. According to Stake (2010), one of the advantages of interviews is that unobserved data could also be captured. The purpose of employing semi-structured interviews was to obtain thick descriptions on the integration of environmental education. The six teachers who were observed were also interviewed; thus incorporating the triangulation credibility technique
of qualitative research. The duration of each interview was about one hour (60 minutes). Panchanadeswaran and Koverola (2005) also conducted semi-structured interviews of 60 minutes to 90 minutes with Tamil-speaking women in India. Patton (2002) developed open ended interview (taking about 30 minutes to 2 hours), for elementary students, consisting of questions such as: “what do you like most about school?” In this case study, the interviews were transcribed after audio recording with the participants. The transcription of interviews during fieldwork was continuously interrupted by electricity cuts that occurred in the panhandle of the Okavango region, which was not connected to the national electricity grid. The region relied on electric generators that were set up in the village of Seronga, which is about 80 kilometers away from the Junior Secondary School.

The interview protocol, which was used as an interview guide is attached in this dissertation as shown in Appendix G. Bernard and Ryan (2010) emphasized that the semi-structured interviews are based on an interview guide, which is a list of questions and topics that have to be discussed. The interviews with local people, whose children were present in the form 3 class, took place at the time of interviewing the teachers. The purpose of interviewing local people was to understand the local environmental knowledge and explore how teachers are integrating this kind of knowledge in the curriculum. Yavetz, Goldman and Pe’er (2014) advised that students “enter the learning process with a complex collection of understandings, experiences, beliefs and values regarding their world” (p. 355). The arguments for learning experiences above are corroborated by Motsumi et al., (2012) who reported that the local community farmers in
the villages of Tubu and Shorobe, in the Okavango Delta, stated that children acquired the indigenous knowledge from their parents through active participation at the farm. Motsumi et al., (2012) explained: “According to the farmers children participated differently in farm work, for example boys worked closely with their fathers while girls worked with their mothers. Thus indigenous knowledge transfer took place by a process of learning through socialization” (p. 192).

In this case study, the interview with parents explored the elements of local environmental knowledge. Semi-structured interviews also explored if local people possess conservation ideals that are reflected in the Community-Based Natural Resource Management (CBNRM) program that has been established by the government of Botswana. Furthermore, this case study attempted to understand the environmental related themes in the daily lives of the communities. Bernard and Ryan (2010) wrote that in 1945, the Anthropologist, Morris Opler, stated “In every culture are found a limited number of dynamic affirmations called themes, which control behavior or stimulate activity” (p. 54). On his part, Barnhardt (2008) explained as well that the purpose behind the Alaska project (of taking teachers to the cultural village for a cultural immersion experience) has been to encourage teachers to consider the ways of integrating cultural camps and local elders’ expertise into the classroom instruction.

The semi-structured interview with local people explored as well what they understand about environmental education (such as responsibility regarding village litter picking, participation in tree planting as resource users of fish, grass, and water in the Okavango Delta). In their book chapter titled *Back to the future: ecosystem dynamics and*
local knowledge. Berkes and Folke (2002) also explained that local people (the resource users) depend on wildlife, fish and forests. As a result, they “create knowledge from their own observations and ecological understanding, based on the accumulation of generations of trial-and-error experience” (Berkes & Folke, 2002, p. 122). Therefore the advantage of semi-structured interviewees is that researchers understand the themes of the lived experiences from the participants’ own perspectives. Kvale and Brinkman (2009) emphasized that semi-structured interview seeks to obtain thick descriptions of the interviewees’ lived experiences with respect to the interpretation of the meaning of the described phenomena.

Data collection with local people on local environmental knowledge.

This section essentially describes how data was collected with local people. Semi-structured interviews were conducted with twenty-six local people who are either biological parents or guardians of form 3 south students. The students were asked by their class teacher to provide contact telephone numbers of their parents or guardians.

Making appointment for interviews with local people.

The telephone numbers were written by the students on a printed A4 white paper. An appointment with a parent or guardian in the catchment villages of Kauxwi, Mohembo, Gani, Xako and Sekondomboro was made through the telephone call. Thereafter, telephone calls and mobile phone messages were sent to confirm the appointments. Confirmation of appointments was also made by word of mouth.
**Gaining access in the catchment villages.**

It is culturally appropriate, in Botswana, to meet and discuss first with the village authority (normally the chief or headman of the ward), who also offer access, usually by word of mouth, to interview the local people in the village. Therefore, in this case study the headman of the ward was contacted first for interview before walking to the homes of parents and interview them. The first meeting with the headman of the ward was led and guided by the Junior Secondary School teacher of Guidance and Counseling (Senior teacher and a member of the School Management Committee), who is also a resident in the Okavango Delta and known to local people. He accompanied and introduced the research and researcher on June 10, 2014 to the headman of the ward, where the school is situated. Detailed information was explained to the headman that the Botswana Ministry of Environment, Wildlife and Tourism offered a research permit (Reference EWT 8/36/4 xxvi (95) and Ohio University issued the IRB (14E121) for the case study to be conducted in the panhandle of the Okavango Delta focusing on the integration of environmental education. In situations where the village authority was absent arrangements were made to meet with the Chairperson, Secretary of Village Development Committee or one of the headmen of village wards. This happened in Mohembo, Gani and Sekondombo villages.

**Reaching the catchment villages.**

The classroom teacher for form 3 south voluntarily offered his 4 x 4 wheel Toyota car to be driven to reach parents in the villages of Gani and Sekondombo. Other parents were reached by asking for a car ride from private cars that drove past the school to the
direction of the catchment villages. The classroom teacher, who teaches the subject of Social Studies, accompanied the researcher to the villages of Gani and Sekondomboro, and another female school teacher, who teaches the subject of Moral Education, accompanied the researcher to the village of Gani. The classroom teacher is also a resident of the Okavango region and a native speaker of the Hambukushu language. Although the local people understand the national language of Setswana, the classroom teacher explained and translated in details the guiding questions and probes to the Hambukushu language and the responses to Setswana. The interviews with local people were conducted in Setswana language.

The two teachers were able to respond in details to some parents who also asked, towards the end of interviews, to know the reasons behind the following: (1) theft of students’ property in the school dormitories (2) why the students in the school are not scoring satisfying test marks and (3) why there are rumors and concerns that the students are engaged in the habit of sniffing glue. This case study suggested that the above emerging issues could relate to the subject of power and politics as explained by Wertz, Charmaz, McMullen, Josselson, Anderson and McSpadden (2011) in their book titled “Five ways of Doing Qualitative Analysis” that interdisciplinary scholarship by critical theorists and feminists has shown that each research method involves not only intellectual assumptions “but also social positioning that is often taken for granted” (p. 84). Specifically, Wertz et al., (2011) stated that participants have been invited to play increasingly key roles in defining research problems, collecting and owning data and in some cases becoming core researchers.
The setting and administering questions from the protocol.

The exact location of the homes and whereabouts of the interviewees was inquired by word of mouth on arrival in the villages. The semi-structured interviews took place outside the house. For example, Photo 2 below shows an interview taking place in the shade behind a mud-built hut in one of the homes in the village of Gani.

Photo 2 Semi-structured interview in Gani village
Source: Kgosietsile Velempini, 2014

Other semi-structured interviews were conducted at the work place such as in Xakao Primary School kitchen area and Xakao tuck-shop. At the Primary School, permission to conduct the interview was requested by word of mouth as well from the supervisor in the kitchen area.

The draft interview protocol had eight main guiding questions (see Appendix F attached) including the introductory remarks made by the researcher. The interview
guiding questions were less-structured. Clarifications were made as interviewees requested that the question be repeated. Probes were often made during the interviews depending on the nature of the responses. The interviews were conducted starting from June 16, 2014 to July 28, 2014. The interviews with local people were conducted after classroom instruction from 13:00 P.M. until 17:00 P.M. and during the weekends on Saturdays and Sundays, depending on the availability of the interviewees. In interviews where both parents were present for the interview, such as in the villages of Mohembo and Gani, the time taken to carry out interviews was longer than 45 minutes. Culturally, in Botswana, during meetings or any form of discussion where both parents are present, the voice of the man (husband) is the one that is mostly heard because he is traditionally regarded as the head of the household.

An audio recorder was used to capture the voices of the interviewees, notes were written in note book of the fieldwork, and with the consent of interviewees, the pictures and video clips were taken showing their thatched huts, common grass reeds (*Phragmites australis*) as the fence of the yard, backyard gardens, women weaving baskets, and other household livelihood assets such as the plow tool and donkey cart.

**Data collection with teachers on local environmental knowledge and its implementation in curriculum and instruction.**

Five teachers who teach form three south (Form 3 South) class were observed during their classroom instruction from June 3rd to August 5th, 2014. The teachers taught the following subjects: Agriculture, Social studies, Mathematics, English and Integrated Science. The coordinator for the Environmental Education Club was also interviewed.
However, his class was not observed because he does not teach students in the class of form three south. The use of observation method in this case study was mainly for emphasizing the triangulation of research methods. In order to maintain anonymity, the data that was acquired by the use of audio recorder was not shared with any other user, apart from the research committee. Furthermore, to maintain this anonymity, the pseudonyms of all participants were used in this case study.

**Access to the teachers.**

During the design of the study, in the spring of January – March 2014, the researcher liaised and discussed with the former Deputy Principal, Mr. Tina, from another Junior Secondary School in the Okavango Delta, where the researcher used to teach. The purpose of this liaison was for the Deputy Principal to introduce the researcher to the other former Principal of the Junior Secondary School, where the study was initially designed to take place. The principal responded that if the research permit for the project is offered by the government of Botswana, the researcher is welcome to conduct the research.

The research permit from the government was received on February 03, 2014, from the Research and Development Division under the Ministry of Environment, Wildlife and Tourism. However, the study site changed to another Junior Secondary School, which is also in the panhandle of the Okavango Delta. The change of study site was due to the unexpected lack of accommodation for the researcher in the junior secondary school and in the village. Access was sought for this case study because Stake (1995) wrote: “Most educational case data gathering involves at least a small invasion of personal privacy” (p. 57). This explains why the request to the Ministry of Environment, Wildlife and Tourism
was made and stating the nature of the case study, and the time span. The request for change of research site was also made and it was approved by the authorities from the government of Botswana. Moreover, Creswell (2013) wrote:

Qualitative research involves the study of a research site (s) and gaining permission to study the site in a way that will enable the easy collection of data. This means obtaining approval from University or College institutional review boards as well as individuals at the research site. (p. 151)

**Access into the classroom and science laboratory.**

During the first three weeks of teaching, the researcher walked together with the teachers from the administration building to the classroom and science laboratory where the instruction took place. After the first three weeks of teaching, the researcher walked alone from the Guidance and Counselling office to the classroom and science laboratory. The School Management Committee offered the researcher a research space in the guidance and counselling building. On arrival in the classroom, the researcher usually used an extra table and chair to sit at the back of the classroom and kept a record of events in the notebook, monitored the audio recording and took video clips and pictures with a digital camera as the teaching continued. The researcher allowed all students the opportunity to secure table and chair first. Sometimes the researcher would look for another table and chair in other classrooms because the school had a shortage of intact furniture. Photo 3 below shows students in the class of Form 3 South facing the white board during one of the lessons.
Credibility of data from teachers and classroom observation.

In order to strengthen the credibility of data from the teachers and the entire case study member checking was carried out with all six teachers interviewed. The researcher explained the purpose of doing the member checking and requested the teachers to read the interview transcripts, correct, update and confirm the interpretation of their recorded and transcribed voices. The teachers spent different times in correcting and updating the transcripts. They were continuously reminded to return the hard copies of the transcripts. The teacher of Mathematics misplaced the original transcript and the researcher printed another transcript from the computer laboratory. According to Stake (1995), a good interviewer can reconstruct and submit the transcript to the participant for accuracy and improvement. Member checking offer the participants the opportunity to advise the researcher on the likelihood of wrong interpretations. In this activity of validating the
collected data, teachers corrected the representations of their lived experiences and culture of teaching and their understanding about environmental education.

The semi-structured interviews, with teachers who were observed during instruction, contributed to the triangulation of research methods in this case study. It enabled the researcher to examine the record of events from observations versus the responses that were offered by the teachers during the semi-structured interviews. Consistency was maintained in employing the observation method, that is to say the researcher attended all the lessons during instruction according to the timetable. However, in some days the teachers (for example in Social studies and Mathematics) were not available to teach due to traveling with a group of students to participate in regional and national sports activities.

*Classroom observation.*

The field notes, written during the observation of each subject, were consolidated in one file that mainly consists of the following headings: lesson objectives, teaching materials used by the teacher, classroom interior; how instruction relate to local knowledge; and environmental contents integrated by the teacher and whether the lesson was indoors or outdoors. The themes emerging from the observation were recognized and identified through repeated reading of the field notes. Copies of textbook for each subject (except English) were borrowed from the teachers and photos of relevant pages were captured using the digital camera. The content of lessons taught by teachers was read continuously to identify elements of the local environmental knowledge.
Data collection with educational authorities.

This section discusses how data was collected with educational authorities on how they perceive environmental education in Botswana. The semi-structured interviews with the authorities were guided by the research questions and the lessons learned from interviewing the local people and teachers and conducting the classroom observations. An interview protocol guide was followed in asking nine semi-structured questions (See Appendix H) such as: “Could you start by explaining to me who you are and the position you occupy in the office? What do you understand by environmental education? Could you explain some of the strategies that you believe teachers should use to integrate environmental education?” The interviews took place in the following different places: Maun (Okavango Research Institute, Maun Educational Centre, Tsodilo Junior Secondary School, Department of Wildlife and National Parks); Kauxwi village; and in Namibia with two educational authorities who also attended the international conference of Environmental Education Association of Southern Africa (EEASA) held in Windhoek in September, 2014.

Data Analysis

Stake (1995) stated that there is no particular time when data analysis begins. Patton (2002) addressed the question of When Does Analysis Begin? by stating that “Recording and tracking analytical insights that occur during data collection are part of fieldwork and the beginning of qualitative analysis” (p. 436). However, the researcher for this case study also adhered to Patton (2002), who advised that “Too much focus on analysis while fieldwork is still going on can interfere with the openness of naturalistic
inquiry, which is its strength. Rushing to premature conclusion should be avoided” (p.436).

In the process of analyzing the emerging themes, the researcher read repeatedly the field notes from participants in order to gain understanding of the themes. The reflection on the principles of place-based education assisted the researcher to understand the emerging themes. Some of these principle are: (1) learning should focus on the local community themes (2) learning should compose of hands-on activity (3) during instruction learners should have some ties to the local community (4) learning take place on the natural (authentic) environment (5) learning by experience and learning should be supported by varied partnerships with local organizations and agencies and (6) John Dewey’s principles (particularly, the Curriculum flexibility and Child centered learning).

According to Saldana (2013), the act of coding, as explained later in this section, requires that the analyst put on the researcher’s analytic lens. In this case study, the lens of analysis were the tenets of theoretical framework of place-based education and the principles of progressive learning.

The handling of data, from the field in the panhandle of the Okavango Delta, was made easier by saving the electronic files in the Nvivo 10 for Windows Software. The official government documents were saved and uploaded in the folder called Intervals in Nvivo for easy retrieval. Notes from the classroom observations were also saved in interval’s folder named Classroom observations. Transcripts from the interviews were saved in the intervals folder named interviews. This also applies to selected photographs. However, the software of Nvivo was not entirely employed for the data analysis.
Manual analysis, in relation to the four research questions, mainly directed the emerging themes, as well, in this case study. The manual data analysis procedure also followed the five steps suggested by Rubin and Rubin (2012) and paraphrased as follows: (1) transcribing each interview that was conducted (2) manually coding excerpts that indicate examples, events, concepts and themes (3) sorting the interviews that have excerpts with the same code (4) resorting the material within each file and comparing the excerpts between different subgroups and (5) integrating the descriptions from different interviewees with the purpose of creating a holistic understanding that is in relation to the four research questions in the context of this case study.

The transcription of interviews began on the month of June, 2014 at the field. The researcher transcribed the recorded audio files from semi-structured interviewees in the evenings and sometimes during the night hours. The finding and marking of texts that have relevant concepts was initially done in the printed transcripts with a pencil. This is also what Saldana (2013) called 1st phase of coding (preliminary coding). During the period of the preliminary coding, four manila charts were used to write the four research questions in each Manila paper. Then, through reading repeatedly the transcripts and finding the texts that respond to the research questions, relevant concepts were as well written on the Manila paper. Regarding this process of coding, Nvivo 10 Manual (2014) stated: “is the process of gathering material by topic, theme or case. For example, selecting a paragraph about water quality and coding it at the node water quality” (p.7).

The second phase of coding (writing blocks of raw data in columns and aligning each block with an emerging concept and category) occurred when texts were further
written in the notebooks for the fieldwork. The third phase of coding and revisiting the
coded texts was done through saving the coded texts, and creating categories, in the
Nvivo 10 software program. Essentially, the entire processes of developing codes and
recognizing the emerging themes was through reflexivity on the four research questions
and theoretical framework of Place-based Education.

Recordings on the notebooks, from the observations were titled and written, in a
visible way, that support re-reading in order to identify issues that are worthy of attention
and answering the four research questions. The next section in this chapter focuses on
identifying and developing the themes of local environmental knowledge.

Identifying and developing the themes of local environmental knowledge
from local people.

The themes from the transcripts of local people were recognized through the
repeated reading of twenty-six transcripts, writing in four Manila charts for each research
question while at the field, coding in the two note books and with the help of the Nvivo
10 for Windows Software. Audio files of semi-structured interviews were downloaded
into the laptop computer folders for each catchment village. Transcribing the
interviewees was done manually by listening from the voice of the interviewee, pause the
play button in the Windows Media Player and at the same time typing the entire question
and probes made by the researcher and the responses given by the interviewee.

Each research question of the case study was written on one chart and pasted on
the inside wall in the school teacher’s house that accommodated the researcher. As
repeated reading of transcripts were done the responses (initial interviewee responses that
could form a code), that suggested an answer to a research question and are in relation to the elements of placed-based education and progressive education were written on the manila chart using a permanent marker. Photo 4 and 5 below shows two of the manila charts with some identified responses to the research questions.
Informal Knowledge systems

- Existence of certain tree species (eg Morula) in the communal gallery
- The historical origins of Gowa Settlement during the 2nd WW.
- Mass Tourism
- Preferred locations of Settlement (Munlu tree, River banks).
- Traditional land allocation system through Tax payment
- Water as a source of transport e.g from Gowa to Shabwre using Conoes (mokoro) to attend community events
- Human-Wildanimals Conflict e.g hipoos
- Names of animals (Thakady/Warthog) used for place (e.g Goga) names. Goga is now Gowa.
- Magomoyi (San ethnic group) traditionally survived from tswiwi, Fish and later adopted field cultivation practices
- Burial practices inside Cattle Kraal
- Ancestral River Valleys (Sharikhuve, Khomiva)
- Importance from environmental resources (income generation through tourism, and then construction of govt. facilities for the same)
- EE: No throwing of litter in water sources
- Fishing during designated periods
- Teachers should be taught the Local Env Knowledge and training practices by Community elders.
- Design of timber tools
- Traditional cutting of tree branches for Afforestation

*Photo 4 Preliminary recognition of concepts for research question one
Source: Kgosietsile Velempini, 2014*
Integration of Env. Edu in the Curriculum

- Some vegetables (e.g., cassava) were stopped in Gwanda T.S.S. during practical sessions because they are not favored by the climatic and agronomic regions of Gwanda.
- Outdoor teaching is preferred (e.g., chicken production, constructing a brooding unit, growing of crops (e.g., corn) that do well in the region.
- Not much is done to include EE in each subject.
- Planning and syllabus and textbook content guide lesson plan.
- In Agri traditional/ local prairies are mainly categorized as negative.
- Examples given in class that landscape in Vaparure has sandvibes, where poor yields from fields.
- Students advised not to spread Rights in the fields due to roaming wildlife like lions.
- EE occurs in topics like fruit production and forestry.
- Encourage learners to join Environmental Clubs.
- Encourage learners to pick litter.
- Fieldwork activities with learners.
- Engaging Local People to teach learners on Local Env. vectors, e.g., weeds, canoes.
- Teaching content of IKS & Fishing equipment.
- Local experimental knowledge is important.
- Guided discovery, from doing and probing.

Photo 5 Preliminary recognition of concepts for research question two
Source: Kgosietsile Velempini, 2014
The preliminary jottings above are advised by Saldana (2013), who wrote:

Start coding as you collect and format your data, not after all fieldwork has been completed. When you are writing up field notes, transcribing recorded interviews, or filing documents you gathered from the site, jot down any preliminary words or phrases for codes on the notes, transcripts, or documents themselves, or as an analytic memo or entry in a research journal for future reference. They do not have to be accurate or final at this point; just ideas for analytic consideration while the study progresses. (p. 20)

Saldana (2013) advised that although other qualitative research methodologists such as Strauss (1987) and Wolcott (1999) felt that it is important to consider every recorded fieldwork data because it might contain unknown messages that might pull everything together, he feels secure to code only what rises to the surface and is indicating to be relevant text. Saldana (2013) stated: “rarely will anyone get coding right the first time. Qualitative inquiry demands meticulous attention to language and deep reflection on the emergent patterns and meanings of human experience” (p. 10).

Therefore, in some nodes wording was continuously revised such as the nodes from ‘Significance of natural resources’ to ‘Lived experiences about the importance of natural resources’; ‘Local history of place’ to ‘Lived descriptions on the History of place’; ‘Human wildlife conflict’ to ‘Lived experiences on the issue of Human wildlife conflict; ‘Tourism’ to ‘Local descriptions about tourism’. A combination of nodes was created such as ‘local knowledge about plant species’ and local knowledge about tree planting’
Credibility of the Study

The diverse approaches to qualitative study suggest to the audience that issues of quality and credibility are important to the audience and the purpose of the study (Patton, 2002). The credibility of qualitative study depends on elements of inquiry such as rigorous methods employed during field work, credibility of the researcher in terms of training, experience and self-presentation, and philosophical belief in the value of qualitative research (Patton, 2002). In this case study, the following activities speak to the credibility of the case study, in the panhandle of the Okavango Delta of Botswana.

Reflexivity.

Continuous revision for the appropriate title of the case study, research questions, and methodology was part of reflexivity in this case study. In the context of this case study, reflexivity also involved thinking about the classroom teachers, local people in panhandle of the Okavango Delta, educational authorities, and the audience who will have access and read the final dissertation. Some of the questions of reflexivity that occurred to the researcher were as follows: (1) how do the teachers know what they know about environmental education? (2) How do they perceive the integration of environmental education? (3) How does the researcher perceive the participants? (4) How does the researcher make sense of what will be produced as the final dissertation in the panhandle Okavango Delta? With the above questions, the researcher emphasized self-
awareness and social consciousness of the case study in the panhandle of the Okavango Delta, in Botswana. The self-awareness and social consciousness relate to what Wertz et al., (2011) write in their book titled “Five ways of Doing Qualitative Analysis” that qualitative researchers emphasize the importance of incorporating into normal scientific practice “a self-critical disclosure of the researcher’s interests, traditions, preconceptions, and personal relationship with the subject matter” (p.84). Similarly, Patton (2002) stated that self-awareness has become a requirement of qualitative inquiry.

In selecting the research site, the researcher had the knowledge that during the periods of 2003 and 2004 he taught the subject of Social Studies in another junior secondary school, which is also situated in the panhandle of the Okavango Delta. Consequently, the researcher is familiar with the local culture, biophysical environment, indigenous languages, and social and economic lifestyles of the local people. The researcher had in mind that some of the cohort learners he taught in 2003 are originally from the catchment villages that are situated in the panhandle of the Okavango Delta.

**Prolonged engagement in the study area.**

The researcher arrived in Maun (the district town) on May 24, 2014 and spent the first half of the week reporting to and interacting with the regional and district educational officers. The researcher arrived in the Panhandle of the Okavango Delta on May 29, 2014 and spent the first five days interacting with teachers and the local people before the teachers commenced teaching on June 3, 2014. The interaction with participants enabled continuous learning of the culture and strengthens rapport with both teachers and the community people. Stake (1995) advised as follows: “opportunity should
be taken early to get acquainted with the people, the spaces, the schedules, and the problems of the case” (p.59).

**Member checking.**

The researcher asked the teachers (e.g. the teacher of Maths and the Social Studies teacher), and educational authorities (e.g. Maun educational authorities) to read the transcripts, correct and confirm the recorded data. According to Stake (1995), a good interviewer can reconstruct and submit the transcript to the interviewee for accuracy and improvement. Member checking offered the participants the opportunity to advise on the likelihood of wrong interpretations. Member checking strengthened the validity of this case study. In this activity, participants corrected the representations of their worlds (their experiences of Environmental Education) (Marshall and Rossman, 2011; Stake, 2010). Member checking is a type of triangulation which makes the researcher more confident that the qualitative data was collected correctly. Using the same participants (teachers), for classroom observations and interviews, was also one way of triangulation in this case study.

**Triangulation of methods.**

The term triangulation refers to use of a combination of multiple observations, theoretical frameworks, data collection methods and analysis and data sources in a research study (Nastasi & Schensul, 2005). The use of multiple sources was employed in this case study. The purpose was to improve the probability that the findings and the interpretation remain credible. The use of observations, semi-structured interviews and documents analysis enabled the generation of thick descriptions of data that answer the
research questions. Figure 1. 2 below shows the triangulation of the data collection methods employed in this case study.

Method triangulation assisted the researcher to gain confidence during the interpretation of the findings of the case study. Reference to various approaches of pedagogical learning such as place-based education, constructivist views of learning, and situated learning contribute to theoretical triangulation.

Furthermore, triangulation in a case study assists the researcher by providing different ways of investigating the same issue and to thereby enhance the credibility of the study. Triangulation adds to credibility by strengthening confidence in the conclusions of the study. According to Maxwell (2004), triangulation also “reduces the risk of a systematic biases because of a specific source or method” (p. 258). Furthermore, in this case study, triangulation of data sources is about comparing and cross-checking the consistency of information that is obtained at different times through different
approaches. For example, comparing teachers’ instructional observations with the semi-structured interviews; and checking the interviews against program documents; and comparing the local people’s perception on environmental education with responses obtained via teachers’ semi-structured interviews.

**Peer-debriefing.**

This included engaging a peer in discussing the data process, reading the analysis report and making further observations that should be attended by the researcher. In this case study, the peer debriefer, Dr. Moren Tibabo Stone is now a PhD holder, and graduated from Arizona State University. He was employed at the Okavango Research Institute (ORI) in Maun, Botswana. Lincoln and Guba (1985) stated: “the debriefer should be someone prepared to take the role seriously, playing the devils’ advocate even when it becomes apparent that to do so produces pain for the inquirer” (p. 309). Towards the end of fieldwork in August, 2014, the researcher met with the debriefer in ORI, Maun. The debriefer emphasized that in carrying out qualitative research, it is essential for the researcher to also reflect on the unexpected and emerging issues (such as the local political issues that transform the local communities) that are found in the panhandle of the Okavango Delta. He also stated that the researcher should understand the elements of the theoretical framework of place-based education that is employed in the study.

**External auditing with the advising committee.**

After data collection, external auditing was carried out with members of the advising committee (Dr. Bruce Martin, Professor John Henning, Professor Adah Ward Randolph and Dr. Thomas Smucker) for this case study. This process enabled the
advising committee to examine the fieldwork process and the emerging themes. The purpose for meeting with the advising committee was to evaluate the accuracy of the study and whether or not the lessons learnt, interpretations and conclusions are supported by the data.

**Researcher’s experience.**

The researcher’s qualitative experience enabled the carrying out of the fieldwork, in the panhandle of the Okavango Delta, and writing this dissertation. Shenton (2004) refer to this experience as “background, qualifications, and experience of the investigator” (p. 6). The researcher has experience of qualitative research for a Bachelor degree and two Master Degree programs (in collaboration with the World Conservation Union, United Nations Development Program and the USA National Science foundation). This experience shows that the researcher, as an instrument for qualitative research, has the capability to conduct a case study that is believable and writing a convincing report. Furthermore, the researcher has One year and Six months teaching in Secondary Schools in Botswana. Three months were spent in teaching Geography in Maun Senior Secondary School and One year spent at a Junior Secondary School teaching Social studies in the Okavango Delta region. Finally, the researcher is from Botswana and a product of its school system. Consequently, my graduate school preparation and my lived experience as a teacher and member of a similar community supported the credibility of this study.
Research ethics.

The researcher was granted a research permit by the government of Botswana (Ministry of Environment, Wildlife and Tourism) to conduct the research in the panhandle of the Okavango Delta (See the Appendix B and C). The researcher was also issued an IRB (Ohio University Research Permit on Human Subjects) from the Office of Research (Institutional Review Board, See Appendix A). Practices of ethical research are central to the trustworthiness of the study. Creswell (2012) stated:

Gaining access to sites and individuals also involves several steps. Regardless of the approach to inquiry, permissions need to be sought from a human subjects review board, a process in which campus committees review research subjects for their potential harmful impacts on and risk to participants. (p. 152)

Moreover, all participants were given a lay summary of the purpose of the study. Participants in this study were given pseudonyms and were asked for informed consent to record the interviews. These activities ensured the ethics and credibility of the research.

Research bias.

Stake (2010) advises that all researchers have biases. Researchers work hard to recognize and constrain hurtful biases. The purposeful sampling strategy poses some biases to other Secondary Schools that were not selected for data collection. The case study intended to generate and discuss thick descriptions from the teachers, local people and educational authorities. Additionally, the study acknowledges that the curriculum of Botswana is centralized. Therefore, engaging more than one teacher of a subject (such as science) was not going to be efficient in time and the research budget. In this procedure
of not engaging more than one teacher of a subject, the researcher avoided missing some classroom lessons. Environmental Education is one of the emerging issues that the 1994 education policy advocates for integration. Other issues include HIV/AIDS, population and culture. The study was conducted by the researcher who is a former secondary school teacher in Botswana and has a qualitative environmental science research background and hence the focus on the integration of environmental education in the panhandle of the Okavango Delta.

**Summary of Chapter Three**

The purpose of chapter three was to present the qualitative research methodology that is employed in the case study. In the context of this case study, the methods that were used to collect the data are documents analysis, classroom observations and semi-structured interviews. This chapter discussed, extensively, the research procedures that were followed to collect the data about the local environmental knowledge with community people; the presence of local environmental knowledge in curriculum and instruction with teachers and how they implement environmental education in the curriculum and the perceptions of educational authorities toward environmental education. The chapter concluded by discussing the procedures that were followed to ensure that the case study is credible and trustworthy. The next chapter in this dissertation is Chapter four, which starts to present the thematic findings of the case study in the panhandle of the Okavango Delta of Botswana.
Chapter Four: Elements of Local Environmental Knowledge

Introduction

This chapter presents and discusses the thematic findings on the elements of local environmental knowledge that exist in the panhandle of the Okavango Delta of Botswana. The thematic driven findings are presented with quotations from the interviewees and the classroom observations that were made during the fieldwork. Reiteratively, in this case study, local environmental knowledge is understood from the terms of local knowledge and indigenous knowledge. Drawing on Mathias-Mundy (1993) and Berkes (2008), local knowledge suggests a cumulative body of knowledge about relationships of living beings with their environment. This knowledge is generated through observation of the local environment and is held by a specific group of people such as “indigenous people, who live off wildlife, fish and forests” (Berkes & Folke, 2002, p. 122). Warren, Slikkerveer, and Brokensha (1995) referred to indigenous knowledge as the local knowledge that is held by indigenous people or local knowledge that is unique to a given culture of people. The overarching element in the above definitions is the existence of a process of a culture (practices of local people) that holds the local experience.

This case study acknowledges that some of the practices learned from local people are also practiced in other regions of Botswana. For example, the crop cultivation of Maize, Sorghum and Millet grains. The local environmental knowledge that is presented in this study is not static. Studies (e.g. Bock and Johnson, undated; Mbaiwa, Thakadu and Darkoh, 2008) have indicated the dynamism of indigenous knowledge and
skills that takes place in the Okavango Delta. For example, Mbaïwa et al., (2008) discussed in detail the authenticity change that takes place in basket weaving and production in the Okavango communities of Shakawe, Xhaoga, and Nxamasera. These authors write:

Commercialization of basketry, according to Terry has led to the problem of cultural loss and has negatively impacted on the traditional nature of basketry as some of the old designs are no longer produced. However, the changes in design and patterns of baskets produced for the tourism market can also indicate that skills and knowledge are dynamic and not static. (p. 69)

The demographic profiles of community people, with pseudonyms, is summarized in table 1 and table 2 to indicate their gender, village of residency, occupation and relationship to the student.
Table 1

Demographic profiles of community people in Kauxwi & Xakao

<table>
<thead>
<tr>
<th>Pseudonyms</th>
<th>Gender</th>
<th>Village of residency</th>
<th>Occupation</th>
<th>Relationship to student</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mahu</td>
<td>M</td>
<td>Kauxwi</td>
<td>Village authority</td>
<td>N/A</td>
</tr>
<tr>
<td>Teta</td>
<td>M</td>
<td>Kauxwi</td>
<td>Security Officer at JSS</td>
<td>Father</td>
</tr>
<tr>
<td>Biki</td>
<td>F</td>
<td>Kauxwi</td>
<td>Police Officer</td>
<td>Mother</td>
</tr>
<tr>
<td>Nama</td>
<td>F</td>
<td>Kauxwi</td>
<td>Stay at home</td>
<td>Guardian</td>
</tr>
<tr>
<td>Kava</td>
<td>F</td>
<td>Kauxwi</td>
<td>Stay at home</td>
<td>Guardian</td>
</tr>
<tr>
<td>Sika</td>
<td>M</td>
<td>Kauxwi</td>
<td>Village authority</td>
<td>N/A</td>
</tr>
<tr>
<td>Nchi</td>
<td>F</td>
<td>Xakao</td>
<td>Cook at Primary School</td>
<td>Guardian</td>
</tr>
<tr>
<td>Jana</td>
<td>F</td>
<td>Xakao</td>
<td>Housewife</td>
<td>Grandmother</td>
</tr>
<tr>
<td>Kura</td>
<td>F</td>
<td>Xakao</td>
<td>Housewife</td>
<td>Mother</td>
</tr>
<tr>
<td>Moro</td>
<td>F</td>
<td>Xakao</td>
<td>Street Vendor</td>
<td>Mother</td>
</tr>
<tr>
<td>Ruka</td>
<td>F</td>
<td>Xakao</td>
<td>Village Clinic Assistant</td>
<td>Mother</td>
</tr>
<tr>
<td>Sondi</td>
<td>M</td>
<td>Xakao</td>
<td>Cook at Center for RADS</td>
<td>Father</td>
</tr>
<tr>
<td>Ketho</td>
<td>F</td>
<td>Xakao</td>
<td>Street Vendor</td>
<td>Mother</td>
</tr>
<tr>
<td>Xaka</td>
<td>M</td>
<td>Xakao</td>
<td>Village authority</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Note: M = Male, F = Female, JSS = Junior Secondary School, N/A = Not Applicable, RADS = Remote Area Dweller Settlement
Table 2

Demographic profiles of community people in Sekondomboro, Mohembo & Gani

<table>
<thead>
<tr>
<th>Pseudonyms</th>
<th>Gender</th>
<th>Village of residency</th>
<th>Occupation</th>
<th>Relationship to student</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kamba</td>
<td>F</td>
<td>Sekondomboro</td>
<td>Housewife</td>
<td>Mother</td>
</tr>
<tr>
<td>Makga</td>
<td>F</td>
<td>Sekondomboro</td>
<td>Housewife</td>
<td>Mother</td>
</tr>
<tr>
<td>Seya</td>
<td>M</td>
<td>Sekondomboro</td>
<td>Stay at home</td>
<td>Guardian</td>
</tr>
<tr>
<td>Twiku</td>
<td>F</td>
<td>Sekondomboro</td>
<td>Housewife</td>
<td>Mother</td>
</tr>
<tr>
<td>Twire</td>
<td>F</td>
<td>Sekondomboro</td>
<td>Housewife</td>
<td>Mother</td>
</tr>
<tr>
<td>Haika</td>
<td>M</td>
<td>Mohembo</td>
<td>Member of PTA</td>
<td>Father</td>
</tr>
<tr>
<td>Phetu</td>
<td>F</td>
<td>Mohembo</td>
<td>Housewife</td>
<td>Mother</td>
</tr>
<tr>
<td>Xoromo</td>
<td>M</td>
<td>Mohembo</td>
<td>Stay at home</td>
<td>Guardian</td>
</tr>
<tr>
<td>Maka</td>
<td>F</td>
<td>Gani</td>
<td>Housewife</td>
<td>Mother</td>
</tr>
<tr>
<td>Mosu</td>
<td>M</td>
<td>Gani</td>
<td>Village authority</td>
<td>Father</td>
</tr>
<tr>
<td>Vidi</td>
<td>M</td>
<td>Gani</td>
<td>Secretary of VDC</td>
<td>N/A</td>
</tr>
<tr>
<td>Thugi</td>
<td>F</td>
<td>Gani</td>
<td>Housewife</td>
<td>Mother</td>
</tr>
</tbody>
</table>

Note: M = Male, F = Female, PTA = Parents Teachers Association, N/A = Not Applicable, VDC = Village Development Committee

The interrelated themes below are presented basing on the principles of place-based education, which is the approach to school where the local community and local environment are used as starting point to teach curriculum subjects (Sobel, 2005).

Therefore, the general theme presented in this chapter is that there is a lived experience, through recurrent land use and observation (Davidson-Hunt and Berkes, 2003), of
community people with nature, in the panhandle of the Okavango Delta. Seven interrelated themes are presented with sub-headings as categories in some themes.

**Lived Experiences on Crops and Livestock Farming Practices**

**Dryland crop farming.**

In the panhandle of the Okavango Delta, local people from the five communities that were interviewed mainly survive through the harvests from cultivation of crops, which include maize, sorghum, millet, beans, watermelons, pumpkins, and peanuts. The cultivation of crops is largely carried out without the use of irrigation implements and there is limited soil moisture. Although most farmers in the Okavango region use cattle and donkeys to pull the plow during cultivation, Kura (one of the interviewees) from the village of Xakao stated that she uses a hoe (an ancient agricultural implement) for crop cultivation. Kura explained that she does not have modern implements, such as a plow, for cultivation. Moreover, Kura added that she does not have cattle or donkeys.

The above shared lived experiences relate to the discussion by Kayira (2015) titled *Colonization of the Indigenous mind*. Kayira (2015) used the phrase *Internalized Colonization* and argued that African people were made to believe that they had no indigenous culture or that their African culture was worthless and “something to be ashamed” (p.108). In this discussion, Kayira (2015) cited Wane (2004), who quoted an elderly woman in rural Kenya, East Africa region, saying “what could you learn from me, an old woman with no education? I cannot speak English. What do I know except to hold my hoe” (p. 109). Most African people hold onto the belief that a person gains wisdom and knowledge with age (Kayira, 2015). The elderly woman quoted by Wane (2004) did
not feel that she has the knowledge because she does not have formal education. Similarly, the interviewee (Kura) in the village of Xakao did not appreciate the use of a hoe, instead she wished to have modern implements for crop cultivation.

In Gani village, one of the female interviewees who was present during the semi-structured interview, under a camel thorn tree (mogotlho, Acacia Erioloba) also explained: “We are people who survive from crop cultivation. If cattle get inside our fields and eat the crops, there would be nothing left for us” (Personal interview, July 26, 2014).

The guiding question inquired what people in Gani village normally do during the course of the day. Some members of a household in Gani carry out dryland crop farming in the fields called Rukonga, which are located some distances away from the main village. Thugi, a female interviewee who was in the process of getting married, shared her views: “If you are a housewife and have children and a husband, you then search for piece of land to cultivate crops. The money that you generate from selling the crops is the one that you use also to purchase school supplies for the children” (Personal interview, July 26, 2014). According to the interviewees, the size of their crop fields ranges from one to nine hectares (three to 22 acres). In the process of the dryland crop farming, some farmers in the five communities that were interviewed employ other local people, on part-time basis, to cut and clear the bushes from their fields in preparation for crop cultivation. In return, the employees are paid, mainly in monetary terms. The semi-structured interviews with community people suggested that the unexpected rainfall changes negatively affect the crop farming in their place.
Rainfall variation and low crop harvests.

The interviewees, from the five communities, explained that the variation in rainfall amounts, that occurs intermittently, is causing crops in their fields to dry and rot. Although one of the interviewees in the village of Gani stated that they experienced increased crop yields in the year 2014, Teta who was a security Officer at the junior secondary school, complained that the seeds of water melons, in his field, did not germinate as anticipated in the year 2014. Teta explained: “Millet and Maize germinated. Watermelons did not germinate well this season. The problem is rain. We received heavy rains and then the water melons started to rot again” (Personal interview, July 10, 2014).

The question, which was a probe, asked Teta why he suggested that the watermelons did not germinate as expected. Incidences of low crop harvests were also ratified by Phetu in the village of Mohembo as follows:

Here at home we survive through cultivation of the fields and planting crops. We use cattle to pull the plow. This year we did not harvest a lot of crops. Our farm products from the fields were quite low. There is nothing that we can do apart from believing in God. (Personal interview, June 22, 2014)

Furthermore, the experiences of rotting of crops were also ratified by Makga in Sekondomboro village, who stated: “Only a few water melons germinated this year, but we did not get anything from them because they rot due to heavy rainfalls.” It was learned from the interviewees that not only variation in rainfall amounts led to low crop harvests, but cultivating after the plow season was also a contributing factor. For example, Twire in Sekondomboro village explained: “according to me, my mother
cultivate late, after the cultivation season has ended. She does not have cattle and the machinery for cultivation. She is forced to wait and then request other farmers to cultivate for her.”

In the village of Sekondomboro, one of the interviewees explained that the germination of beans and groundnuts did not take place as anticipated. She explained further that there is low rainfall and at times, when sufficient rains occur the elephants enter the fields and trample, eat and destroy the crops, including beans and groundnuts. Makga further explained that they cultivate and harvest sorghum, maize, and millet in the unfenced dry-lands. When asked about other crops such as water melons, Makga reiterated only a few water melons germinated and rot due to unexpected heavy rainfalls.

The concerns of variation in rainfall amounts and unsatisfying crop harvests were also reported by some researchers. For example, the findings of a technical report by Kolawole, Wolski, Ngwenya, Mmopelwa, and Thakadu (2012) indicated that all 592 farmers, from eight major farming communities, interviewed in the Okavango Delta, linked reduction in farm production mainly to “change in weather patterns and the environment, which are reflected in delayed or low precipitation or its scarcity and extreme high temperature conditions; damages caused by livestock and wildlife (e.g. cattle, elephants, hippopotamus, and kudus, etc.), pests and birds” (p. 50). According to the findings that are presented in the technical report, there is a well-defined inter-annual variability as well as multi decadal variability that confront local communities in the Okavango Delta. Ngweya, Mosepele and Magole (2012) also stated that the extent and duration of flooding in the Okavango Delta is determined by “climatic and environmental
variability and creates a dynamic, interlinked aquatic-terrestrial system with high biological productivity and diversity. Subsequently, local populations around the Okavango Delta have adopted livelihood strategies to optimize their utilization of resources from this dynamic system” (p. 110). As a result, community people around the Okavango Delta have adopted livelihood strategies to optimize their utilization of resources from the dynamic environmental resource. The local practice of borrowing cattle and the implements for crop cultivation, from other community people (e.g. in the village of Sekondomboro) as stated earlier in this discussion has been explained as well by some researchers. Oosterbaan, Kortenhorst, and Sprey (1986) concurred that in the Okavango Delta farmers prepare land in different ways, depending on the wealth of the household. For example, “The very poor use the hand hoe, the poor use donkeys, and the relatively wealthy use oxen-traction and a moldboard plow” (p. 6). Oosterbaan, et al., (1986) proceeded to suggest:

Many farmers who do not own draught animals may borrow a span of oxen and the required equipment to till their land, in exchange for money or a labor contribution to the agricultural activities of the owner. As a rule, these farmers will be late with planting since the owner of the oxen will prepare his own fields first and sometimes call in the labor contribution of the borrower before providing the oxen. (p. 6)

The concerns about climatic changes that were raised by community people are confirmed by literature (e.g. Kolawole et al., 2012). Mbaiwa et al. (2008) noted that in the Okavango Delta, some of the factors that contribute to poverty include drought,
“which makes agricultural crop yields to fail” (p. 63). The community people are faced further by the government restrictions of developing crops fields in some areas of the Okavango Delta as discussed below.

**Restriction in flood recession farming (Molapo cultivation).**

There are a lot of communities, in the Okavango region who are situated on the fringes of the Delta and have, in the past, cultivated crops on the loamy and moist soils that are on the banks of the river. Although research (Molefe, Cassidy, Chimbari, Magole, 2013) suggested that cultivating along the river channels (often called *molapo* in the Setswana language) is a risky practice due to the unpredictable flooding, reports from the interviewees, in this case study, suggested that some local people have continued to cultivate crops along the river. These local people have not been allocated the crop fields by the Land Board Authority (a Botswana Government department that oversees the land allocation process). They cultivated crops without certificates of land, issued purposely, for crop farming. Mahu, one of the village authorities, explained:

> When they apply for certificates, they are told that the government does not allocate land and offer certificates in this side of the land. They are cautioned that they can take risks and cultivate, but if wild animals destroy their crops they would not receive compensation from the government. (Personal interview, July 29, 2014)

When probed to explain his views about the cessation of allocating field crops Mahu inferred that the Government authorities are considering to improve resource conservation in the place of the panhandle of the Okavango Delta and encourage eco-
tourism based activities on the banks of the Okavango River. Biki, the Police Officer, corroborated that there are some community people, who still cultivate close to the Okavango river channels, although this system is discouraged. Biki explained further that local people survive basically from aquatic resources such as catching fish and harvesting water-lily (*tswii*) from the river.

The above shift could also suggest that the government of Botswana is pushing towards a continuous implementation of modern approaches of natural resource conservation, which might contradict the traditional values of the local place in the Okavango Delta. Kava stated that they cultivated millet grains. Also, she explained that they do not cultivate near the river and that their crop fields are situated in the drylands, which is the land zoned for arable and pastoral farming. When probed why she does not cultivate near the river, Kava explained: “Our crop fields are in the sandy soil area. There are no crop fields allocated close to the side of the panhandle. It is only residential plots that are allocated near the river.” Haika, in the village of Mohembo, alluded that they cultivated in the drylands. He said that the soil type, in their crop field, is much suitable for sorghum and millet grains. He only cultivates maize for trial purposes. Haika descriptively added: “the soil type is suitable for the seeds of sorghum and millet grains. The color of the soil has white particles. It is not really suitable for maize, but only for sorghum and millet” (Personal interview, June 22, 2014).

Kava is a single mother in the village of Kauxwi. She explained that she cultivated crops in the dryland area, where the government officials allocate land for farming. With regard to maize not growing as expected in the dryland areas, Kava
explained that she cultivated sorghum, but when she cultivated maize, it did not germinate because the soil type is not suitable for maize. Some farmers suggested that the local soils are also not suitable for exotic trees that are delivered by forestry officials. In Gani village, Thugi explained: “The problem is that our soil is not suitable for exotic trees. Sometimes trees are delivered and we plant them. The tree that you see in that yard delayed to grow. The soil is not good. The water table is deep” (Personal interview, July 26, 2014).

In addition to the shift from cultivating along the river channels to dryland cultivation, Kamba in Sekondomboro village, explained that she was instructed to stop gardening on the banks of the river. Kamba lamented: “All the past years, I have been cultivating vegetables down there in the wetland area” (Personal interview, July 5, 2014). Kamba had been cultivating vegetables such as spinach, rape, and carrots. When probed why she did not cultivate in the year 2014, Kamba responded: “I abandoned the field where I did the cultivation. The village authorities told me that the field belongs to the Village Development Committee of Sekondomboro village. Then I abandon it.” This case study note that every village in Botswana has a Village Development Committee (VDC). Seya, who is the uncle to the student in the class of form 3 south, and cultivate crops close to Tobera settlements, in the dryland, said:

What we are looking at is that in this village-life of Sekondomboro, we do not use irrigation machines and water sprinklers. We follow the suitable soils for cultivation. When we use the Oxen we harvest sufficient crop products. The soil type that we found is suitable for cultivation. (Personal interview, July 5, 2014)
The free roaming of cattle, by the Okavango River, was also stated by some interviewees as one of the reasons that explains their preference to cultivate crops in the dryland area. Makga, who also said they received insufficient crop yields, explained that they cultivate in the drylands. Makga said: “it is better in the drylands because we cultivate in the open fields where there is no fence. In the wetlands there are a lot of cattle roaming” (Personal interview, July 22, 2014). For example, Photo 6 below shows cattle along the Okavango Delta panhandle, close to the Pontoon station in the village of Mohembo.

*Photo 6 Cattle grazing and drinking water from the panhandle of the Okavango Delta in Mohembo East
Source: Kgosietsile Velempini, 2014*
In the village of Xakao, Kura argued: “As you can see I am sitting on top of the bags of grain crops that I carried from the fields in Nyamukura settlement, at the sandy soils area” (Personal interview, June 30, 2014). When probed to explain if she is not scared of walking alone to the fields in the dryland area, Kura responded as follows: “I cannot be scared because we have now given our lives to crop cultivation. We survive from cultivation. If we allow ourselves to become scared we cannot eat”. In relation to the cultivation of crops, Biki lamented that community people in the Okavango Delta think that the cultivation of crops is the only option for survival. Biki said: “This explains why they do not perceive education as being important and they do not take care of the education of their children. They do not encourage their children to study hard” (Personal interview, June 21, 2014). The question probed her to explain how cultural practices in Kauxwi village are different from cultural practices in Sehithwa village, which is her home village.

This data suggested that local farmers have the local knowledge and experience of which soil type is suitable for cultivating particular crops in the panhandle of the Okavango Delta. The responses above suggested that generally, community people have accepted the decision taken by Government authorities to shift the allocation of crop fields from the Okavango River to the dryland place. The above descriptions about the crop cultivation practices suggested that local farmers in the panhandle of the Okavango Delta places more value on crop cultivation. Their wide experience with environmental resources is also illustrated when they recognize that the soil type is not suitable for maize, but for sorghum and millet. They use their local knowledge to recognize that
variation in rainfall amounts and the unpredictability of floods make the water melons to rot. Some of the farmers understand that the cultivation of crops out-of-season lead to low harvests as compared to cultivating the crops well on time.

**Livestock farming practices.**

The preceding section also highlighted that local farmers from the five communities that were interviewed rear goats, donkeys, and cattle that drink water principally from the Okavango River. During the fieldwork cattle and donkeys were often observed in Kauxwi village gathering around a leaking public water standpipe. The livestock is usually driven inside the kraal at night and let-out at mid-morning (around 9:00 A.M. to 10:00 A.M.) to graze in the communal grazing lands. Interviewees suggested that the practice of livestock farming is a lived practice that is inherited from their ancestors. For example, Mahu, one of the headmen explained: “In the past many people did not adhere to and acquire the modern teaching and learning style because they did not perceive the importance of it. They only had the education of herding cattle and crop cultivation. This was the education of our ancestors” (Personal interview, June 16, 2014).

Like in most regions of Botswana, livestock farmers in the Okavango region make sure there is a tree growing in the center of the kraal. The common purpose of the tree is to provide shade for animals during hot weather. Ruka, in Xakao village responded: “My son likes to spend time at the cattle post because there are cattle there. He can set time for doing school work and at the same time ensuring that cattle are trekked into the kraal” (Personal interview, June 30, 2014). Foot and Mouth disease and
cattle lung disease are some predicaments facing the livestock farming system in the
Okavango Delta. For example, some cattle suffered from cattle lung disease in 1996 and
1997 were slaughtered and buried around the ward of Gowa.

Thereafter, the survey department drilled three wells and labelled them in areas
where the burial occurred. According to Mahu, the purpose of drilling the wells was to
continuously monitor the passage of fat from the slaughtered cattle to underground water.
Mahu recalled: “I think more than 20 cattle of mine were slaughtered. After the cattle
were slaughtered some White people came here. They wanted to see if the cattle that
were slaughtered and buried have contaminated the water table with their fat” (Personal
interview, July 29, 2014). The above discussion integrated the elements of the topic of
cattle production, which was taught by the teacher of Agriculture at the secondary school.
It was learned during fieldwork that the practice of livestock farming in the panhandle of
the Okavango Delta is also destructed by some wild animals. Teta, in Kauxwi village
stated:

Over there in the river channels we also experience hippopotami. They sometimes
walk close by our house and graze here. After grazing, they walk back to the
waters. They graze at night. They are just like elephants…If you trouble them
they attack you. Crocodiles are also present in the river. They also kill our cattle
that graze mainly by the river. (Personal interview, July 10, 2014)

Consequently, the inhabitants of this area now only have knowledge passed down from
the ancestors related to farming, but have common knowledge about how their farming is
impacted by the local wild animals.
**Lived Experiences on Human-Wildlife Conflict (HWC)**

According to the Ecoexist trust, the largest (about 200,000) population of elephants on the planet lives in Botswana, where they roam freely through the Okavango region’s waterways, mopane (colophospermum) forests, reed beds and grasslands (Elephant database, 1995–2015). In the village of Gani, the elephants are mainly encountered during rainy season, which runs from the month of October to the month of January. They need water from the streams. Interviewees stated that the elephants trample, eat, and destroy crops in the fields. They roam periodically in the village of Gani during the cultivation season, which also runs from the month of October to the month of January. This is the period that there would be water in the streams of the Okavango Delta. During the dry seasons, the elephants retreat to the main wetland area. When asked to explain if wild animals sometimes roam in the village, Vidi responded:

> The elephants are sometimes seen during the cultivation season. Currently, they have returned to the wetland area because this side there is not enough water. When there is enough water here in Gani, the elephants walk around drinking from the streams and eating the crops of some people from their fields. (Personal interviewee, July 26, 2014)

Incidents of people being killed by elephants are also common in the Okavango Delta. One of the interviewees in Gani explained that his cousin was hit and killed by an elephant outside his crop field. The victim had trekked the elephant away from the crop field because it was trampling and eating some crops. The government officials concluded that there would be no compensation because the wild animal killed the victim.
outside the crop field, and not inside the field. During fieldwork, it was also learned that other wild animals that destroy people’s crops are wild dogs (matlhalerwa). Also interviewees reported guinea-fowls (dikgaka) as some birds, in addition to quelea birds, feast on people’s crops. For example, Mosu in Gani stated: “As I am talking now, the birds (dikgaka) walk in and out of my field. If we can go now, maybe we can find them. They are now used to that place” (Personal interview, July 26, 2014). Mosu continued to explain: “I also walk on the other side and just abandon them there. When some people decide to trouble the guinea-fowls I stop them.” It seems that although guinea-fowls might often be feasting on people’s crops, they also receive some form of protection from the owners of the fields.

Some interviewees have the knowledge about government rules regarding human and wildlife conflicts. For example, Mahu explained: “Currently, the government has introduced the law which says that no one should kill a wild animal, so they are again dangerous and have increased in numbers and chasing people” (Personal interview, June 16, 2014). Although this is the case, Botswana Wildlife Conservation (hunting and licensing) Regulations (2001) stated that a farmer can kill a wild animal only when it has entered and destroyed the crops. The meat cannot be taken and used by any person, but must immediately be reported to the nearby officials who should decide whether the local people take the meat or not. One of the interviewees in the village of Kauxwi lamented:

There are some hyenas that I sometimes hear at night troubling our donkeys and goats. There is nothing that we can do because hyenas are not being compensated
for when they kill livestock. Hyenas are not listed for compensation under the
government law. (Personal interview, July 10, 2014)

In addition to the above wild animals, hippopotamus are other animals
encountered by local people and heard bellowing at night. Haika in the village of
Mohembo stated as follows during his arrival for the semi-structured interview: “I had to
make sure that people do not destroy my fishing equipment. But I found that the hippos
have destroyed my equipment” (Personal interview, June 22, 2014). Furthermore,
crocodiles have killed cattle that drink from and graze by the river.

Some interviewees in the village of Mohembo argued that wildlife officials have
now separated wild animals from local people. For example, Haika argued: “In the past
the wild animals could be seen everywhere. But today, Wildlife officers have separated
them from where people live. In the past people could easily kill and eat the meat”
(Personal interview, June 22, 2014). This response suggested that although some wild
animals still continue to walk and graze in nearby places, many of them are now residing
in game reserves and national parks, such as Moremi Game Reserve and Chobe National
Park. Moremi game reserve is entirely situated in the Okavango Delta, while Chobe
National Park is situated on the Northern borderline of the Delta. Regarding the
compensation Haika complained: “We report to the wildlife officers. The compensation
for one elephant is too low. It is about 60 – 100 BWP. It is not much money” (Personal
interview, June 22, 2014). The researcher probed regarding what action did the
interviewee take after realizing the elephants destroyed the crops in her field.
In the village of Sekondomboro, Twire stated: “during these times at 13:00 P.M. you can find them close to where we cultivate our crops. Wild animals destroy our property. Elephants are destroying our crops. In the past they destroyed the field crop of my mother.” The question asked by the researcher aimed at finding out if the interviewee had seen wild animals in the village. The interviewees in the village of Sekondomboro did not only raise concerns with wild animals, but they also raised concerns of low rainfall. For example, Twiku also said: “there is low rainfall. And when there is promising germination of crops, the elephants would arrive to destroy the crops. We report to the wildlife officers. The compensation is just too low to feed us” (Personal interview, July 5, 2014).

During fieldwork in the panhandle of the Okavango Delta there were regular reports of elephants walking from the dryland area to the wetland and walking close to the secondary school. They walked close to the main gate of the school. There are some students who were not accommodated inside the hostels of the school. The students commuted from their villages. The elephants roaming presents a danger to students who must commute from their villages to the secondary school. Photos 7 and 8 below show foot prints and elephant dung, respectively. According to the interviewee, the elephants had passed by the school in the morning at around 5:00 A.M.
Photo 7 Elephant’s foot print in Kauxwi village
Source: Kgosietsile Velempini, 2014
Moro, a street vendor in Xakao village, also explained: “As for wild animals, we mainly see elephants here. They like to walk closer to our house to the river. According to us, it is an animal that destroys human property and dangerous to our lives” (Personal interview, June 30, 2014). Below is what Ruka, a Village Clinic Assistant, stated about her son who likes to trek their cattle from the forests to home in the evening:
Sometimes he complains that when walking in the bushes to track cattle, the elephants might arrive at any time in the river channels. He sometimes suggests scaring them away using a gun. Then we would advise him that it is not necessary to use a gun. Even you, when you see elephants do not scare them or make noise. (Personal interview, June 30, 2014)

Elephants do not only destroy crops in the fields. They also destroy beneficial tree species, such as the Camel thorn, which local people rely on for timber to construct houses. Sondi, a cook at the Center for Remote Area Dwellers in Xakao, stated “currently, the veldt products are scarce. Wild animals, mainly elephants, have gone into destroying the trees. When people go to the forests they found that the animals have destroyed trees and veld products” (Personal interview, July 28, 2014). The competition for space and resources by local people and wild animals was also raised by Sondi as follows:

We are currently saying that they should be protected and not be killed unnecessarily. The elephants are increasing in numbers. But people and wild animals are all in the same environment. All of us are increasing. Then when you and I say that we need to protect the environment, we should consider the population increase of both people and wild animals. Who will determine this place for people and this other one for wild animals? All species would be looking for what to eat and survive. The elephant walk-in as it wants. You can only take a stick and hit on an object, maybe it will move away to a distance. (Personal interview, July 28, 2014)
Still in Xakao village, one of the village authorities by the name Xaka reacted as follows regarding elephants:

Even now they are destroying. They really destroy and myself I kill them. I have the gun in the house. When I wake up in the morning sometimes I find that they have eaten crops in the field. The next day I go to the field and wait for them. When they come, I shoot and report to the wildlife that I killed a wild animal in my field crop. (Personal interview, July 28, 2014)

This is one of the indications of the role of local people toward wild animals that destroy their property. When asked about the response from Government officials, after a report has been sent Xaka explained:

Yes, they do come. In the past they would take the meat, but now they do not take the meat. If it is an elephant, they take the tusks. The meat is given to the local people. The one who has power to cut a larger piece can do that for his or her family members. (Personal interview, July 28, 2014)

There are various local ways of scaring elephants some of which are known to the local people. Xaka explained: “I also hear people saying they use chilies. I have not used it before. They say you take chilies and mix with the elephant’s dung. You then place the mixture in the corners of the field.” In addition to wild animals that destroy crops in the fields, buffalos have also been mentioned that they harm people. One of the interviewees in Xakao stated: “Elephants destroy our property. They kill people. Buffalos also kill people.” Statistics Botswana (2014) also stated that although the tourism industry has become important and thriving in the Okavango region and Chobe district of
Botswana, due to the health (malaria) improved situation, subsistence crop farming is constrained by the destruction on crops that is due to wild animals. Other environmental related constraints corroborated by Statistics Botswana (2014) include floods and endemic diseases, such as foot and mouth.

**Lived Experiences about the Importance of Natural Resources**

The rich biological diversity in the Okavango region has enabled local people to continue benefitting from the natural resources, some of which were explained by the interviewees during fieldwork. In this thematic finding the chapter discussed people’s attitude towards non-timber forest products, plant species, wild animals and vegetation and firewood cultivation.

**Harvesting non-timber forests products (NTFPs).**

Shackleton (2004) stated that people throughout the world make use of biological products from the forests. These products are harvested for both subsistence and commercial utilization. They add to peoples’ livelihood security, especially for rural people. Non-Timber Forest Products (NTFPs) also have cultural significance and value. Therefore, it was learned from the fieldwork that in the Okavango Delta, grass is mainly harvested from the adjacent forests and used for thatching huts and sometimes sold to local people and visitors. Mosu, in the village of Gani, had this to say: “One bundle of grass for thatching is 30 BWP (3 USD); however it depends, if you want it for 20 BWP (2 USD), I reduce the price” (Personal interview, July 26, 2014). Photo 9 below shows freshly harvested bundles of grass that was ready to be sold. The grass is tied in the shape of cones and or triangles, which is also what students learn in Mathematics during topics
such as Angle of properties of triangles and quadrilaterals and Geometrical Constructions (Mokakapadi and Timile, 2010).

Vidi, the secretary of the Village Development Committee in Gani, also explained that local people harvest and sell some fruits in nearby villages such as Shakawe, which is a peri-urban place. Blue Sour Plums (moretologa) are some of the fruits that are harvested either for subsistence purposes or sold to people. In affirming the importance of natural resources, Phetu in Mohembo village added: “these resources are part of our lives because we continue to survive from them. Actually, we cut trees for timber and construct houses. This same applies to grass. We survive on these resources” (Personal
interview, June, 22, 2014). Berries from tree species are harvested by local people and consumed by members of the household. Berries are also harvested from trees such as rough leaved raisins (mokgomphata, Grewia flavescens); Manketti tree (Mongongo Schinziophyton rautanenii) and Wild fig tree (mochaba, ficus Gnaphalocarpa). In the village of Kauxwi, the researcher and one of the headmen met five women carrying buckets (about 20 liters each bucket) of African Jackal berries. In Gani, one of the interviewees explained in details about the Manketti berries:

We harvest Manketti berries for children. They eat together with corn, sorghum or millet grains. Manketti tree produces some fruits. We eat the outer part and also crush the fruit to remove the contents that we eat together with corn, sorghum or millet grain meal. We take the nut and crush using a dry wood pole inside the wooden container (kika). Then we pour a little bit of water inside after which we take out that water again. The water which we take out is the one that we boil until it is ready to be eaten with some grains of sorghum or millet meals. It produces some soup and become spray-oil as well. (Personal interview, July 26, 2014)

Other fruit trees that are harvested by local people include wild orange, motsentsela (Brown Ivory tree, Berchemia discolor) and Sandpaper raisins (motsotsojane, grewia flavescens). The wild orange become ripe around the month of October, November, and December. Mosu in Gani village explained: “You can eat it as if it is an orange. You eat in the morning, afternoon and evening. It has nutrients. It is not like eating the regular foods” (Personal interview, July 26, 2014). Other fruit trees that are
harvested are African mangosteen (Tsaudi, Garcinia L Mangosteen tree), black monkey orange (mogamana, mogwagwa, Strychnos madagascariensis), makokothi, maka, mukokompa, and maroro. In the village of Xakao, Ketho explained: “We harvest brown Ivory tree especially from the month of February to March. We also use grass reeds to make the yard of the houses. The reeds also depend on water supply.” Sondi, also stated: “In Beetsha we rely mainly from veldt products such as the African mangosteen, sycamore fig tree, and African jackal berries. During the drought periods people walk to the forests and harvest these veldt products so that they can eat and survive” (Personal interview, July 28, 2014).

Shackleton (2004) argued that there are uncertainties regarding the Non-Timber Forest Products particularly for the drier savannas of Southern Africa. This is despite the growing international appreciation of the role of NTFPs in rural subsistence and development. Neudeck, Avelino, Bareetseng, Ngwenya, Teketay, and Motsholapheko (2012) also noted that edible wild fruit trees in Botswana play important roles for local people living in rural areas. However, there is limited documentation of existing local knowledge and values of edible wild plants and Non-Timber Forest Products. Meanwhile, Keakabets (2015) from the Mmegi Newspaper of Botswana reported that an excursion into the Kazungula forest to gather wild plants turned tragic when a 68-year-old traditional doctor was trampled to death by an elephant. Keakabets (2015) wrote:

The elephant reportedly charged at the man, who was in the company of his 50-year-old friend while the two were digging for healing plants. The latter man managed to escape and flee for safety, while the traditional doctor failed to run
away… Kasane police station commander, Superintendent Silton Fidzani said that the traditional doctor who hailed from Parakarungu within the Chobe District, but was stationed in Kasane…He advised members of the public in Chobe to be careful when accessing the thickets because they are infested with wild and dangerous animals. (Elephant tramples traditional doctor to death, para. 1)

The above incident confirms that indeed there is conflict between people and wild animals as alluded by one of the interviewees in the village of Xakao. Thus, while this was a tragic occurrence, the knowledge that the traditional doctor knew about traditional healing plants died with him. Fortunately, there are others in the villages who have similar knowledge.

**Local knowledge regarding plant species.**

The responses from the interviewees, suggested that community people have the local knowledge and a lived experience of plant species that are found growing in the Okavango region. Regarding the harvesting period of grass, Vidi in Gani village stated: “Grass is harvested starting from July 15 until October. During this time, the seeds would have fallen on the ground and ready to germinate again” (Personal interview, July 26, 2014). This suggested that grass harvesters understand and ensure that the grass is not cut before the seeds fall on the ground. Makga, in Sekondombokoro village, echoed the harvesting period as follows: “we harvest the African Jackal berries and Brown Ivory berries on specified periods, for example right now it is time to harvest and feed from the African Jackal berries.”

Ruka, in the village of Xakao explained that the plant called *motsentsela* (Brown Ivory tree) is harvested in the months of February and March. Tree growth is also
understood by some local people. Mahu explained that the fig (Mumu) tree naturally grows where there are other trees and then overpowers them by spreading its long roots underneath the soil. He said: “as it spread roots that way, it swallows the tree that it finds. It covers the original tree.” Although the berries from Sycamore fig are also eaten by people, some wild animals such as monkeys eat them. Wild date palm is one of the local plants known by local people. It is found alongside the river banks.

**Perceived importance of wild animals and vegetation.**

The data from interviewees suggested that future generations should also have the abundance of and experience of wild animals such as buffalos and elephants. Mahu, who is one of the village authorities explained: “They should not only read about them in books, but should see them with their eyes. The abundance of wild animals attracts tourists and they are a source of income, which is channeled towards the development of public projects” (Personal interview, June 16, 2014). This response suggested that future generations should also have access to natural resources just like the current generation. One of the rationales offered by the interviewee is the recognition of tourism benefits that emanate from proper wildlife management. This suggestion is also in line with the definition of Sustainable Development, by the World Commission on Environment and Development of 1987 which is development that “meets the needs of the present without compromising the ability of future generations to meet their own needs” (p.8). Botswana Vision 2016 also stated as follows: “Communities will be involved in the use and preservation of their environmental assets, and will benefit directly from their
exploitation. The attitude toward natural resources will pay attention to a fair distribution between present and future generations” (p.8).

Mahu recognized that the tree called moremosetlha (fever tree or sulphur bark, Vachellia xanthophloea) has a thick bark and it is used to make a wooden canoe that floats in the river. The tree is invariably found near a source of water. Local people mainly use the wooden canoes in the river for fishing and as form of transport to cross the river streams to some other islands in the Delta. According to Biki, the Police Officer, trees also assist in reducing the desertification of the land. She stated that local people mainly cut grass reeds (lethaka), papyrus reeds (koma, cyperus payrus), and fish and harvest water-lily plants (tswii, Nymphaeaceae) from the river. Some interviewees mentioned that forests help to provide firewood that community people collect for household cooking. In the ward of Gowa some women were observed carrying logs or bundles of firewood on their heads. Photo 10 below shows how timber is cut and erected around a public water standpipe, which is installed close to a primary school.
Moreover, local people cut down trees (such as camel thorn) to construct fence for the compound. The long roots of Mogonono (silver Terminalia) and strings from rough leaved raisins tree are also used for tying the timber that supports the thatch grass. One of the local authorities in Kauxwi explained that local timber trees are cut and used to construct a community gathering place (kgotla). The cutting and use of grass for thatching and reeds for fencing the compound was stated by majority of the interviewees in all the five villages. Photo 11 below shows a man erecting timber in preparation of grass thatching in the village of Gani. The photo also shows Camel thorn trees, which provides timber for various purposes (firewood, designing furniture such as doors, tables and chairs).
Perceptions on firewood collection.

In the rural areas of Botswana wood is the most important source of energy. During fieldwork, it was observed that the collection of firewood is common in the study area and it has become a lived experience to most local people. It is mainly carried out by women and young girls. During the interview on June 23, in the village of Kauxwi, two middle aged women stated that they were going to fetch firewood toward the river to prepare dinner for family members. Phetu, in Mohembo village, made a comment that if her daughter does not study hard in school, she will suffer mainly that she does not know the traditional duties performed by a girl at home, such as cultivation in the fields and
collection of firewood. The researcher asked Phetu to explain how she discussed with her daughter when she is at home.

Jana, who is the grandmother to one of the students and live in Xakao, mentioned that in addition to studying and washing school uniform, her daughter also fetch water from the river and fetch firewood. Regarding the importance of natural resources in the region Jana mentioned: “Trees are important because you can collect firewood from them. We live with wild animals and they are important in our eyes just for the sake of continuously seeing them. Water resources are important because we collect water for cooking, drinking, and bathing” (Personal interview, June 30, 2014). Still in Xakao, Ketho responded about the importance of natural resources as follows: “as it is now, we sit in the shade but, under the tree of mogotlho. When it is dry we collect firewood.”

Photos 12 and 13 below shows how local people transport firewood in a donkey cart and carry on their heads to home.
Photo 12 Donkey cart is used to carry firewood along Mohembo and Gani road
Source: Kgosietsile Velempini, 2014
These interviewees further inform the research’s understanding of how local knowledge of environmental resources is learned through parents, the community and in the schools.

**Various Perceptions on Tourism**

Tourism is the second income earner of Botswana and the Okavango Delta is the major tourist destination due to a rich biological diversity. The data collected for this case study showed that the descriptions regarding the tourism sector in the region varied among the interviewees, who raised positive and negative issues such as income generation, acquiring knowledge, fear of relocation, less comparative development in the region, and congestion of infrastructure and pollution in the Okavango Delta. In the village of Gani, Maka was found weaving a traditional basket. She was probed on why
she sells her basket at the price of 30 BWP instead of selling it at a higher price of 120 BWP. Maka explained: “the local buyers who might be interested cannot agree. It is only when you go to the Mohembo ferry station and sell to tourists. The tourists are from rich countries and they can buy at a higher price.” (Personal interview, July 26, 2014). Part of the interpretation from this explanation is that she understands that tourists have higher income expenditure. Therefore, community people, from remote villages such as Gani, have the knowledge of where they can interact with tourists.

At Mohembo Pontoon station a Pontoon is used to transport vehicles, people, and property from the east side to the west side of the panhandle. During fieldwork, trucks of tourists were observed queuing to cross the panhandle to Seronga, which is a village further and offers a variety of tourist facilities. Photo 14 below shows local people, tourist truck and some European tourists boarding the pontoon and cross to the east side of the Delta’s panhandle. During the interaction and informal conversations with one of the tour guides from Zimbabwe, at the Pontoon station, it was learned that the tourists shown in the photo were from the Netherlands in Europe.
There are perceptions that income is generated at a local place when tourists visit a natural environment that is endowed with rich biodiversity. Mahu explained:

We did not really perceive the importance of tourism in the past. We lacked knowledge but now we can see that we can benefit from nature. Other people from various nations do not have these resources in their places, and they visit to see them here. In return, they bring money in our country. That is the importance as well, for example, when we request money to construct the shelter for community gathering. (Personal interview, June 16, 2014)

According to Mahu there is an open camping site that tourists normally utilize during their nature walk in the village of Kauxwi. He explained:
So, when the tourists arrive, they meet here with me. They would explain that they are going to camp here. We then arrange for the local traditional dancers to entertain them. Some San (Basarwa) people come to dance here. They take them photographs. They pitch up tents and make fire here…The tourists prefer to camp in this area as well as under this Umbrella tree or White thorn (more-o-mosetlha, Acacia sieberiana). That is why the government says that we are likely to be relocated to some other places. This is because when the wild animals roam around in the wetland, they should not be disturbed by people. Did you hear that Okavango Delta became number one internationally? (Personal interview, July 29, 2014)

The content of relocation in the above explanation indicated that some local people in the study area are aware of the impeding relocation that was also reported by Tabane (2014) as follows in the Botswana newspaper of the Echo dated 07 – 13 August, 2014:

There are fears that about 36 communities living around the Okavango Delta could be relocated away from their homesteads, following the listing of the Delta as a World Heritage Site. The Ministry of Environment, Wildlife and Tourism has confirmed that out of 36 communities consulted, three of them are against the listing expressing fears of relocation and lack of access to prime tourism land. When asked to confirm allegations that residents who are seven kilometers from Okavango Delta could be relocated, the Minister of Environment, Wildlife and Tourism, Tshekedi Khama did not rule out the possibility of removing the residents from their settlements. The Minister last week told parliament that
following the listing, communities living 15 kilometers within the Delta are now forced to adhere to environmental laws emphasizing that resource utilization within the buffer zone should be based on sustainable development.

The above content suggest a modernization approach in resource management and moving local people away from their native place.

Although interviewees explained the damage that is caused by elephants they also recognized the elephants for luring the tourists. For example, Phetu stated as follows: “wild animals like elephants attract tourists in our region. The business of nature Photography is promoted by wild animals. As a result income is generated and the Government is able to purchase medicines such as Anti-Retroviral drugs” (Personal interview, June 22, 2014). However, some interviewees stated negative perceptions about tourism. Seya in Sekondombo stated:

Really at first the wild animals were important to us. But now although they could be important the benefits of wild animals are not experienced by us, the local people in the Okavango. The money from wild animals goes to the government. The region of Okavango has remained behind in terms of development.

The question asked aimed at finding out how the interviewee perceives the importance of wild animals in his life. Sondi, in Xakao village, explained about tourism on July 28, 2014:

We have been living in this place for a long time. There are some visitors who come from foreign countries. They consider how to utilize this environment. They should do this taking into consideration how local people have been surviving. In
the past, the Okavango River was not congested and there was no accumulation of waste. Currently, there are some visitors who came and introduced their businesses. They brought infrastructure, including papers and tins. We are now emphasizing that this waste should be disposed properly. If litter is not contained it has the potential to develop rust and affect the indigenous plants of Okavango. Then, right now we are confused and not able to discern what is right for us and what is not right because visitors also want us to conform to their ways of living.

The perception above suggested that tourism businesses in the Okavango region should be sensitive on issues of conservation, waste management, and the values of the local people. Also, Seya explained about the importance of wild animals:

To the people here wild animals do not have importance. Wild animals benefit the government. Those who want to do photography, they pay money to the government. If a white person comes and say that he wants to do safari hunting, he or she pay money to the Government.

The data above suggest that tourism has both positive and negative consequences for tourism destinations, socio-culturally, economically and environmentally. Although the topic of tourism widely exists in the school curriculum such as Social Studies, it is not exactly known to what extent lessons learned from the above explanations (e.g. less benefits from tourism income, concerns on waste management) of community people are discussed with students during instruction.
Poverty Reduction through Backyard Gardening

Although small-scale local economic development projects have limited success, they continue to be the main approach for dealing with rural poverty in the region of Southern Africa (Scones, 2009). In Botswana one of the examples of such development projects include backyard gardening, which is increasingly being recognized as one of the poverty eradication initiatives. A higher number (about 43 %) of the households were found to be surviving under the poverty datum line in the North West District where the Okavango Delta is situated (Republic of Botswana, 2008). According to Mbaiwa (2008), communities in rural areas have fewer income generating opportunities and have thus become an economic burden to the government from whom they receive monthly food rations and handouts.

Consequently, local people are encouraged to construct gardens in their homes. In some villages, community-based backyard gardening has emerged. It was observed that some local people, in the study area, constructed vegetable plots in their gardens. Thugi, in the village of Gani, was asked about the life experiences in Rukonga (a cattle post) and in Gani. Thugi explained that in Gani they fetch water from the public standpipes, eat food that is mainly bought from grocery stores. She explained that in Rukonga they milk cows and drink the milk, sometimes slaughter goat for meat, or they could as well rely on vegetables from the backyard garden. Thugi continued to say: “In Gani we use money to buy vegetable soup, onions, and potatoes, which are not grown locally” (Personal interview, July 26, 2014).
Although the above interviewee did not mention the vegetable gardening in Gani, there were four vegetable gardens that were constructed through the assistance from the Government Program of Poverty Eradication. Vidi, in Gani village, stated: “There are four backyard gardens in Gani. They started to operate this year. Vegetables have been planted in all the gardens and the owners sell to local people” (Personal interview, July 26, 2014). In one of the gardens in Gani shown in Photo 15 below there is a green plastic water container, compost heap, water sprinklers, water pipe, mash net to cover plants from the sun’s heat and birds.

*Photo 15* A Government aided garden in Gani village  
Source: Kgosietsile Velempini, 2014
In the village of Kauxwi, Mahu managed three vegetable gardens. Two of the gardens belonged to his nephews. He explained that local people should be taught about backyard gardening and tree planting. Mahu explained: “Here is my garden. I survive from it. I plant water melons, sweet reeds, and maize. I start to eat in the month of March. When water fills up here, it just flows around over here” (Personal interview, July 29, 2014). Mahu continued to state: “The garden that is over there belongs to my nephew who live here in Gowa. This other garden belongs to that man who found us at home. He is from the nearby village called Ngarange.” The discussion about backyard gardening was started by the interviewee during a walk to study and observe nearby forests. The forests are a place where cattle suffering from cattle lung diseases where buried, and the area proposed by Government officials for tourism development. The gardens observed were in a circle shape and had spiky tree branches acting as perimeter fence.

The other interviewee in the village of Kauxwi had a garden, which is rectangular in shape and had standing wooden poles with wires binding them together. There were only two plots inside the garden with vegetable crops. A watering horse pipe was observed lying inside the garden. Teta stated: “As you can see we have a garden. I advise my daughter and son to always water the garden so that plants germinate” (Personal interview, July 10, 2015). Still in Kauxwi village, one of the households interviewed had a backyard garden. When asked how they consider the vegetation to be important in the region, the female guardian to two school students stated that they sometimes plant vegetables in the garden and provide water to the plants. Their backyard garden did not
have plants growing in it during the field work. Interestingly, there was a water standpipe inside the garden.

For her part, Biki responded as follows when asked about backyard garden: “We used to have a garden but our dog like digging soils and squirts in the dump cool soils. Chickens also used to jump into the garden and scratch out the cool soils of vegetable plots.” The above explanations indicated the lived experiences of community people about backyard gardening in their local environment. Their experiences stands a chance of being emulated by the school children, who bring local experiences to the classroom.

The next thematic finding, which also relates to local people focuses on local cultural practices.

Existence of a Variety of Local Cultural Practices

Plant species used for Traditional healing, Rain making and Marriage reinforcement.

Plant species such as blue sour plums (moretologa, Ximenia Americana) are used by traditional doctors for medicinal purposes in the study area. The secretary of the Village Development Committee in Gani explained that traditional doctors dig roots of the blue sour plums, boil them and offer the boiled water to patients. Furthermore, the roots of Camel thorn (mogotlho) are boiled and the warm water is offered to patients as well, who have a nose bleed or a cough. The teacher of Social Studies, who also traveled to the village of Gani and assisted with language translation from Setswana to Hambukushu, further explained: “in most cases it is quite rare that people divulge information on traditional practices such as healing. The practices are known by the
traditional doctor who rarely explains a lot. There is a secret in this traditional practice” (Personal interview, July 26, 2014).

When probed to explain the cultural elements that are practiced in the village, Phetu, in Mohembo village, also confirmed that there are traditional doctors in the Okavango region. Phetu said: “there are some traditional doctors who can help when you are in problems or have got sicknesses. They use practices of our Setswana culture that we rely on” (Personal interview, July 5, 2014). In relation to traditional doctors, Seya had this to say: “as Africans our belief is on traditional healing; however, we are not much focused on traditional doctors” (Personal interview, July 5, 2014). The above explanation shows that there is existing local experience on the use of forest plants for medicinal practices.

When asked about the use of trees she planted in the yard, Ketho explained that the large bush-willow tree (modubana, Combretum Zeyheri) is used for cultural practices that involve asking rains from the ancestors (Ngwale). Ketho explained: “we cut a branch of large bush-willow and make fire so that the fire (the rains from ancestors) does not stop” (Personal interview, June 30, 2014). They believe that the burning fire represents the continuous rains. Furthermore, Ketho explained that during a marriage ceremony, a branch from the large bush-willow tree is also cut and set on fire. They believe that, by so doing, the bride and the groom would live forever in their marriage. Therefore, community people in the Okavango Delta have social and cultural values that are connected to the utilization of plant species.
Basket weaving in the Okavango.

Basket weaving, in the Okavango region, is one of the practices that enable community people to generate income. Women harvest the fibers of *mokolwane* tree (real fan palm tree, *Hyphaene petersiana*) from the banks of Okavango River and boil them and use the dye as a colorant to the dry palm leaves. In the village of Gani, Maka explained that she sell weaved baskets to both community people and visitors. Maka uses the money to buy food for family members. Photos 16 and 17 below show women who were found completing their baskets. In explaining how they are surviving, Maka said: “we survive by doing it ourselves such as cutting grass and weaving the baskets” (Personal interview, July 26, 2014).

*Photo 16* Basket weaving in Gani village
Source: Kgosietsile Velepini
Some of the baskets, similar (in shape and design) to baskets seen from local people, were found on display at the administration office of the school, as shown in Photo 18 below. The display of cultural baskets was aligned with one of the overall objectives of the national education in Botswana, which state: “to improve the partnership between school and community in the development of education” (Republic of Botswana, 1994, p.5). The Republic of Botswana (1994) continued to state: “it is government policy that, as much a possible the community should participate in the development and management of education” (p.11). However, this policy did not exactly state the display of traditional baskets in schools. One of the objectives of CBNRM is to “promote communication, education and public awareness” (Republic of Botswana,
regarding the management and sustainable use of natural resources within and by communities. The display of some elements of the local knowledge (e.g. traditional baskets) in the school could signify the extent at which the local environmental knowledge is integrated in the curriculum and instruction. However, it is not exactly known whether teachers bring the students to observe, discuss, think and make future ideas about the patterns, design and shape of the baskets.

Photo 18 Cultural weaved baskets on display in the administration building of the Junior Secondary School
Source: Kgosietsile Velempini, 2014

According to Mbaiwa (2004), other livelihood options need to be identified in order to reduce the level of poverty and improve the livelihoods of local people in the
Okavango region. Mbaiwa (2004) suggested “in order to reduce poverty levels and improve livelihoods and the living standards of rural people in the Okavango, alternative livelihood options need to be identified” (p. 222). Traditionally, women in the Okavango region make baskets for households and agricultural uses (Terry, 1999 cited from Mbaiwa, 2004). Basket production should attract young people and educated people if it is to increase rural incomes and promote sustainable livelihoods. Mbaiwa (2004) stated: “this can promote the preservation of traditional or indigenous knowledge and skills in basket weaving which are otherwise important aspects of cultural tourism” (p. 233).

Cultural beliefs.

The culture of the Hambukushu people, in the panhandle of the Okavango Delta, is mainly focused on crop cultivation. Moro, in the village of Xakao, explained: “Really, we believe in cultivating crops in order to survive. My mother tries to cultivate crops, but they do not germinate. In our Hambukushu culture we believe in the cultivation of crops” (Personal interview, June 30, 2014). The culture of crop cultivation among ethnic groups of the Hambukushu and the San was also explained by one of the headman in the village of Kauxwi. He explained that the San (formerly called Bushmen) people learned how to cultivate crops by copying from the Hambukushu people who had just arrived in the region. After that the San started to combine practices of both farming and hunting. Mahu said: “when they arrive with a game meat, they call an old man to come and perform ritual blessings so that they could catch more game in the next hunting spree” (Personal interview, June 16, 2014). The belief is through the blessing of the village elder that they will catch more wild animals in the next hunting spree.
In the village of Mohembo, Xoromo, who is of San ethnicity explained that he grew up following the traditional values of his parents. Xoromo was instructed that the new harvests from the crop fields are not eaten immediately. The rituals should be performed and sacrifices made to the ancestors. Motsumi (2012) et al., also reported similar cultural practices in Tubu village, in the Okavango Delta. Accordingly, elders are supposed to eat the harvests first before children. Similarly, the game meat of the wild animal is eaten first by elders not the children. The sacrifices to the ancestors were also explained, about the sea, by Loban (2008) in Australia. Loban (2008) as cited from Whitehouse et al., (2014) wrote “As I got older I was taught the importance of sea, never to underestimate it and to show appreciation…An example of appreciation is when we catch a lot of fish, we would throw some fish back to thank our ancestors” (p. 59-60).

In addition to relying on rainfall for crop production, some parents in the village of Xakao collected and used the rain water for spiritual purposes in the church of Zion Church of Christ (ZCC). When asked to explain the importance of rain waters the interviewee, Moro, who is a single mother and a street vendor, said: “Rain water is very much important for cultivation of our crops. We also contain the rain water and use it at church for spiritual purposes” (Personal interview, June 30, 2014). The cultural belief was also demonstrated by the Mosu in Gani village. He culturally demonstrated how to eat a wild orange (Strychnos cocculoids) by explaining that a stick is used to hit and crack the coat of the fruit before using the stick to take out the contents of the fruit, rather than using hands or a spoon. Mosu warned: “You do not use fingers to eat the fruit. You use a
stick. If you use your fingers you vomit” (Personal interview, July 26, 2014). Hence, cultural traditional practices are continued to be taught within these communities.

Use of indigenous languages in schools.

The data from the interviewees suggested that community people prefer the use of their indigenous languages, in addition to English and Setswana, at the school. The interviewee, who stated that he is a committee member of Parents Teachers Association, explained that the use of Hambukushu language as a medium of instruction, in the schools that are in Okavango region, would enable students to easily understand the instructional content. Similarly, in Sekondombo village the interviewee, who is the uncle to one of the students, argued that it does not profit much when a student is taught by a teacher who does not understand nor speak the indigenous language. For his part, the chief, in the village of Xakao, explained that the first ethnic people in the Okavango region are the Bushmen or San (Basarwa); followed by the Gciriku and later the Hambukushu who have now increased in large numbers and dominated other ethnic tribes even in terms of language use.

Therefore, the use of the indigenous languages in the schools could signify that teachers are placing attention on the local social and economic values in the Okavango region. In this line of thought, Sobel (2005) stated that if school teachers and administrators place more attention on the particularities of the local place, local climate, existing community organizations, environmental learning centers, and parental concerns, then there would be varieties of curriculum and project-based learning activities. This suggested that students would most likely understand and be interested in the initiatives
that include environmental education. Place-based education is aligned with the ideas of Dewey (1891), who initiated the progressive model of education that advocate for a child-centered and holistic approach to learning, thus making education more responsive to the needs of children.

**Traditional dance.**

One of the traditional dances in the Okavango region is Sepero, which is a cultural practice performed by local people in the Okavango Delta. It is traditionally danced when people are happy, after feasting, from the crop harvests. The performers beat the traditional drums, while others do the dancing. The dancers wear animals’ skins and tie rattles around and towards the end of their legs. Mahu, in Kauxwi village, suggested it is important for students in schools to be taught the traditional dances of their place and this could probably enable easy understanding of the instructional contents.

Music education is one of the optional subjects taught in Sharange junior secondary school, where this case study was conducted. Mahu advised the government should exercise the authority of ensuring teachers are trained in local cultural practices where they are posted to teach. Regarding Sepero, Mahu explained further as follows:

The traditional dancing is all about rotating. A man and woman dance facing each other. Others beat the drums while others sing and clap hands. They exchange the roles. There are some rules. When they are in a circle, those beating drums sit a bit upfront. The dancers dance inside the circle. After the first dancer finishes, the second dancer gets in and do the same. The significance of the songs is that they
talk of advice and some talk of community events. (Personal interview, July 29, 2014)

In association to the explanation above, the Ministry of Education (2010) stated that “learning through music can also promote and add enjoyment to the learning of necessary skills necessary for the understanding of all other school subjects and contribute to the preservation and transmission of cultural heritage of Botswana” (p. 302). The curriculum of Music in the document of Botswana junior secondary schools stated the aims of number six and seven as follows, about students who complete the curriculum: “Developed an appreciation of their own musical heritage and culture, as well as an understanding of and respect for the music of other cultures” (Ministry of Education, 2010, p. 302) and “acquired knowledge and understanding of the role of music and other art forms in society with regard to traditions, ceremonies, customs, and social norms” (Ministry of Education, 2010, p. 302).

The above two aims link to the approach of place-based education. It also link to the explanation given by the interviewee mainly when he stated that the songs send the message about community events. Topics 4.1 and 4.2 in the Music curriculum are about Characteristics of African Music and Indigenous Music of Botswana, respectively. Some of the objectives in topic 4.2 are that the students should be able to classify indigenous Botswana music as recreational and ceremonial; and list styles of ceremonial and recreational indigenous music (Ministry of Education, 2010).


Nature-related responsibilities for children.

In the Okavango Delta, gender division occurs in some households. One of the female interviewees, in Mohembo village, explained that her sons are normally taught by their father how to cut and design wooden tools such as spoons. She teach her daughters how to knit traditional dresses (seteku), apply cow dung on the floor of a house and how to harvest veldt products. The student, who was present during the interview, added that his father also taught him how to design a wood container (kika) that is used to pound grains such as sorghum, cut and design a water canoe and how to thatch huts using grass. Photo 19 below shows three local boys in Mohembo village using a wooden sticks to paddle in a dugout canoe, in the Okavango River. The nature-related experiential learning explained by the interviewee above could be associated with the ideas of John Dewey, who stated that school subjects that are removed from life experiences of learners do not enable integration with social life (Dewey, 1897).
Knowledge about the History of Place

Literature (e.g. Gall, 2003; Hitchcock, 1996, 2001, 2002; Sylvain, 2014; Solway & Lee, 1990) has demonstrated that the San people are the first ethnic group to settle in the Kalahari region of Africa, where the panhandle of the Okavango Delta is situated. This demonstration was affirmed by the interviewees in the study area. The village authorities were asked and probed on the meanings of the names of some of the wards and villages. The inquiry related to what the Botswana Vision 2016 stated under the headline titled, Botswana History and Culture: “all forms of cultural expression, such as the arts and music, must be given full encouragement through the provision of more
resources” (p. 49). As noted throughout the interviews, respondents knew the history of their particular region and people.

**Meaning of the name Gani.**

Mosu, the village authority in Gani, narrated that the founders of Gani were his Hambukushu great-grand uncles, who happened to live with the San people. Mosu explained that his uncle and one of the San man went out to hunt a wild animal. After killing the wild animal, they wondered how they were going to slaughter it because it was gigantic and unmanageable. They saw a wooden pole lying on the ground. They shoveled the wooden pole underneath the wild animal to balance it during the slaughtering on the ground. Therefore, in the language of the San people, the process of shoveling the pole underneath the wild animal and rolling it on the pole is called g’la  g’la ni. Hence the place was called ‘Gani’.

**Meaning of the name Gowa.**

The establishment of the ward of Gowa was traced back to the period of 1940 and 1941 during the time when Chief Moremi (of the Batawana tribe) came back from the second world-war. Mahu explained that the name Gowa is a San name. The San ethnic tribe called ‘bugakhwe’ was found by the Hambukushu people occupying the land. Mahu explained: “Those san people are the people we find living in the waters. Their lifestyle consisted of fishing. They did not know how to cultivate crops. There was the chief of the Bugakhwe named Nxa! Ikhwe.” Mahu elaborated further as follows:

The name Gowa is named after that river valley, where the Bugakhwe people used to live. There was a big valley; even now it is still there that side. Now the
Hambukushu changed the name ‘Guwa’ to ‘Gowa’ because they were failing to pronounce Guwa! The Hambukushu could not speak the Bushmen language.

(Personal interview, July 26, 2014)

In addition, the above interviewee explained an Aardvark wild animal (*Thakadu*), used to reside by the valley. Eventually, the land was given the name Guwa. According to the interviewee, Aardvark is also called Guwa, in the bushmen language, hence the valley called Guwa and then the entire land of *Guwa* named *Gowa*.

According to Mahu, the tribe of Hambukushu (now the dominating group in the Okavango) is now mixed with the San people and there are intermarriages. However, the majority of the San people have voluntarily relocated to the drylands of Okavango such as Kaputra and Tobera settlements. The current streams of the Okavango River and valleys used the Bushmen names such as Sharikhwe and Khawire. Another interviewee, Xaka, in the village of Xakao agreed that the name Gowa is supposed to be ‘Guwa’. But, he also explained that Guwa refers to a spotted wild animal called hyena, which was often observed by the San people drinking water from the river.

**Meaning of the name Xakao.**

The meanings of the names of two villages above related to wild animal and grass. Now, Xaka, the villager authority in Xakao explained as follows when asked about the meaning of Xakao, which is also a San name:

It explains the root stub of the grass that is left by harvesters after the upper part has been harvested. When the elders came to settle here, they asked other people who had already settled, ‘where do you harvest the grass?’ They responded by
saying we harvest the grass toward the river. They took the grass cutter and found that those who also went to harvest finished the upper part of the grass. They returned to say that other people have finished the grass and what is left is just the root stubs. Then in the Bushmen language the root stubs are called Xakao.

(Personal interview, July 28, 2014)

The descriptions above suggested connection of place names to nature. The Botswana Vision 2016 Council (2010) suggested that in the process of preserving the history of the people of Botswana it is important to have ways for the collection, documentation and preservation of Botswana’s rich and diverse oral and written traditions and arts. Also, it is necessary to develop historical libraries in all regions of the country. The Botswana Vision 2016 Council (2010) stated “All forms of cultural expression, such as arts and music, must have support and encouragement. This must include measures to preserve the history of the country” (p. 21). The above interviews about meaning of place names, in the context of local environmental knowledge, could contribute into the strategies that aim at preserving Botswana’s historical knowledge. It is also important to note the advice by van Eijck and Roth (2010) in their paper titled *Towards a chronotopic theory of “place” in place-based education* that “stripping a place from its indigenous name can be seen as a form of silencing the indigenous voice and hence as a form of colonization” (p. 881).

**Summary of Chapter Four**

This chapter has presented the interrelated thematic findings of the case study, on the first research question, about the elements of the local environmental knowledge that
exist in the panhandle of the Okavango Delta. First, crops and livestock farming practices is one of the lived experiences that is presented in this chapter. The data suggest that community people cultivated a variety of crops that include maize, sorghum, and water melons. The crops are increasingly damaged by wild animals (a second thematic finding discussed in this chapter), which often cause threats to local farmers. In addition to this destruction, which is caused by wild animals and the farmers receiving low government compensation, intermittent rainfall contributed to the rotting of crops, such as water melons.

The shift of cultivating crops from the river banks to the dryland areas has raised diverse perceptions. Some farmers welcomed the plan from the land-board authority and stated that the dryland soil is more suitable for sorghum and millet, but not maize. Other interviewees stated that the shift from the river channels was due to the motivation by the government of Botswana to promote nature-based tourism. Still under the thematic finding of crop and livestock farming practice, this chapter discussed that community people have a lived experience of rearing livestock (e.g. cattle), in the communal lands. Cattle production is one of the topics that was discussed during the teaching and learning in the subject of Agriculture.

Third, the chapter has presented the lived experiences of community people regarding perceived importance from natural resources. In addition to being harvested for medicinal functions, tree species such as Camel thorn provide shade during sunny days and timber for building huts. Grass is harvested from forests and used for thatching and selling to local people or visitors. Community people also harvest the Brown Ivory
tree and African Jackal berries. In relation to the importance of natural resources, community people collected firewood for energy purposes at home. Firewood collection is a common practice for community people in rural and remote places of Botswana.

Fourth, this chapter presented perceptions of community people toward the tourism industry in the panhandle of the Okavango Delta. The data showed that the descriptions regarding tourism varied among interviewees, who raised positive and negative issues. Although the topic of tourism widely exists in the school curriculum such as Social Studies, it is not exactly known to what extent lessons learned from the descriptions (such as less benefits from tourism income) of community people are included during instruction. Fifth, the chapter discussed the backyard gardening practices that take place in villages of the panhandle of the Okavango Delta. Local people constructed vegetable plots in their gardens. Some gardens in Gani and Kauxwi villages were constructed through the government program of poverty reduction. However, some local people constructed the gardens themselves without government assistance.

Sixth, this chapter has presented that community people carry out traditional practices that rely on the utilization of natural resources. The presentation is in relation to the thematic finding about cultural practices. Community people use plant species (e.g. Blue sour plums) for traditional healing, rain making and marriage reinforcement. The existence of a variety of local cultural practices that include the use of indigenous language as a medium of instruction was also presented in this chapter. Community people in the study area advocated for the use of indigenous languages during instruction in the school. The use of indigenous language as a medium of instruction could enable
students to understand the content of instruction. The existence and public display of cultural baskets is aligned with the objective of the 1994 Revised National Education Policy of Botswana, which promote partnership between schools and communities. The lived experiences of community people is also shown by women who are engaged in making cultural baskets through harvesting fibers of the Real fan palm tree (Hyphaene petersiana).

One of the objectives of CBNRM policy is to “promote communication, education and public awareness” (Republic of Botswana, 2007, p. 5-6) regarding the management and sustainable use of natural resources within and by communities. This study indicated that the display of some elements of local knowledge in the school premises could signify that teachers have passion to incorporate the local environmental knowledge in the Curriculum and Instruction. This case study suggested that it is not known whether teachers bring the students to observe the cultural baskets, discuss, think and make plans about the baskets that are in the administration office. Continuing with cultural practices, this chapter presented that some community people carry out ritual practices after (1) catching a wild animal (2) harvesting crops.

Last, this chapter has presented that community people, in the panhandle of the Okavango Delta, have knowledge regarding the history and implications about the names of their villages. Names of villages such as Gani, Gowa, and Xakao have meanings that are attached to animal species (Antelopes, Buffaloes, and Aardvarks) and vegetation, respectively. The Botswana’s Vision 2016 council (2010) stated that in the process of preserving Botswana’s history, there is need to introduce strategies for the collection and
preservation of Botswana’s oral and written traditions and history. The discussion of the meanings of place names, in the context of local environmental knowledge, could contribute into the strategies that aim at preserving Botswana’s historical knowledge. This chapter indicated that it is also uncertain on the extent at which students in the school understand the implications that local people attach to the village names. With the above theme of knowledge about the history of place, the next chapter for this case study presents and discuss the existence of the local environmental knowledge in curriculum and instruction and how teachers implement environmental education in the curriculum.
Chapter Five: Local Environmental Knowledge in Curriculum and Instruction and How Teachers Integrate Environmental Education in the Curriculum

Introduction

This chapter presents and discusses the extent of the existence of elements of local environmental knowledge in the curriculum. This presentation and discussion is based on the data that was collected during the second term of 2014 at a Junior Secondary School in the panhandle of the Okavango Delta. The elements of local environmental knowledge that are discussed include (1) Crop and Livestock farming practices (2) Human-Wildlife Conflict (3) Importance of nature (4) Tourism and (5) Backyard gardening. The implementation of environmental education at the Junior Secondary School by the teachers is also discussed. The profiles of teachers, with pseudonyms, is summarized in table 1 to indicate their resident status, educational level, teaching experience, and the position held at the school.
Table 3

Profiles of teachers

<table>
<thead>
<tr>
<th>Gender</th>
<th>Subject</th>
<th>Okavango resident</th>
<th>Educational level</th>
<th>Teaching experience</th>
<th>Positions held in school</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thandi</td>
<td>Female</td>
<td>Agriculture</td>
<td>Resident</td>
<td>Bachelor Degree</td>
<td>PS &amp; Sec. Secretary of Waste Management Committee</td>
</tr>
<tr>
<td>Ellen</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinton</td>
<td>Male</td>
<td>Social Studies</td>
<td>Non-Resident</td>
<td>Bachelor Degree</td>
<td>PS &amp; Sec. Chairperson of Boxing Club</td>
</tr>
<tr>
<td>Marshall</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Johnny</td>
<td>Male</td>
<td>Maths</td>
<td>Non-Resident</td>
<td>College Diploma</td>
<td>PS &amp; Sec. Maths Coordinator</td>
</tr>
<tr>
<td>Titus</td>
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<td></td>
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</tr>
<tr>
<td>John</td>
<td>Male</td>
<td>English</td>
<td>Non-Resident</td>
<td>College Diploma</td>
<td>Sec. Non-reported</td>
</tr>
<tr>
<td>Pule</td>
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</tr>
<tr>
<td>Busisiwe</td>
<td>Female</td>
<td>Science</td>
<td>Resident</td>
<td>College Diploma</td>
<td>Sec. Badminton &amp; Science coordinator; PD Secretary</td>
</tr>
<tr>
<td>Jonathan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dumbu</td>
<td>Male</td>
<td>Agriculture</td>
<td>Non-Resident</td>
<td>College Diploma</td>
<td>PS &amp; Sec. EE Coordinator</td>
</tr>
<tr>
<td>Shumba</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

PS = Primary School, Sec = Secondary School, PD = Professional development

**Crop and livestock practices in the curriculum.**

As noted in the earlier chapter through the interview, beef cattle production plays an important role in the lives of people in Botswana. It is a source of meat, income, employment, and draught power during crop cultivation. The lessons that were observed during fieldwork in the subject of Agriculture focused on the following learning outcomes: Students distinguish between the communal and the ranching systems of raising beef cattle; Students explain the significance of providing shelter to beef cattle; Students describe the types of feeds suitable for beef cattle and the importance of water...
provision; Students identify the diseases of beef cattle in Botswana and discuss traditional ways of handling milk from cows. The teacher’s delivery of content in the above learning outcomes was observed during field work. The learning outcomes were also stated and explained in the textbook of Agriculture from Chapter seven (The Reproductive System in Cattle) to Chapter 18 (Milk Production and Marketing). Thus, place-based education is integrated in the curriculum.

On June 19 the topic, which was supposed to be facilitated by a pair of students, focused on the communal grazing system and its advantages and disadvantages. Surprisingly, the students only read from a notebook in which they had written about the topic. Before the pair of students walked to the front of the classroom to facilitate, the teacher (Ms. Ellen) posed the question to all the students in the classroom: “What are the reasons of recommending the breeds of cattle in Botswana?” The teacher kept on calling students by names hoping to get a response to the question. Interestingly, the teacher did not make a recall, from the previous lesson about the names of breeds to which she was referring.

Moreover, it sounded like the question was incomplete and not easily understood by the listener. It was only after about ten minutes of silence that she restated the question: “two reasons why Brahman and Tuli breeds are recommended in Botswana?” Eventually, one of the male students responded: “The breeds have a good growth rate.” The teacher acknowledged the response although the student did not state Brahman and Tuli. The teacher explained another reason: “Our country is a semi-arid country. So we always have higher temperatures here. These breeds that are recommended here can
tolerate Botswana’s climatic conditions. They do well in our country.” The above discussion came from the field notes written by the researcher during the lesson of Agriculture.

After questioning the students and their response above, the teacher said to the pair of students: “Go and read.” It sounded like it was often the case that instead of facilitating and discussing with their colleagues, the students merely read directly from the textbook or from their notebooks on the topic that is assigned to them. This pedagogical approach of just reading directly from the textbooks and notebooks, instead of engaging the colleagues and the teacher, was also observed in other subjects of Science, Mathematics, Social studies, and English. The pair of students made a fearful (not facing their colleagues) reading about the communal grazing system and its advantages and disadvantages.

Then, Ms. Ellen asked the students the following questions related to grazing and livestock water provision: What is communal grazing system? What is the difference between a well and a borehole? Most relevantly, she stated: “Most of our farmers here… I haven’t heard of anyone…any farmer around here practicing any other system rather than communal grazing system. Our grandparents and our parents are raising their cattle under this system where nobody owns a land.” She mentioned the family names of local people in the village of Kauxwi whose cattle graze under the communal grazing system. The above statement places teaching and learning, about cattle rearing at the local place. There was also reference to social themes through the teacher’s naming of “grandparents”. She continued to explain:
They graze anyway they like and they graze anyhow. The grazing land is owned by all members of the community. That is the communal grazing system. No grazing land is fenced. It is open for all cattle. In this system, usually herd boys are used and a lot of us, here, we don’t even have herd boys. We just release cattle in the morning from the kraal, and follow them in the evening, and a lot of us we do not drive the livestock in the kraals…and again farmers can keep as many cows and bulls as they want under communal grazing system, unlike under the ranching system in a fenced area, where the area restricts you to keep a certain number of animals. Under a communal area as long as your kraal can hold that many … five hundred herd of cattle, you do not care about the availability of grass. So the system allows you to keep many animals unlike the ranching system.

Although the above explanation was made in the classroom it could also be argued that the teacher attempted to integrate the local experiences of the student, in terms of cattle rearing, into the curriculum. The Junior Secondary School, where classroom observations were conducted, is situated in a Controlled Hunting Area (demarcated as NG 11), which is part of the land use strategy of CBNRM. The 2007 CBNRM policy of Botswana emphasizes “Community-based” while the teacher of Agriculture emphasized “communal grazing system.” The overall goal of the Community Based Natural Resource Management (CBNRM) policy is to “create a foundation for conservation-based development, in which the need to protect biodiversity and ecosystems is balanced with the need to improve rural livelihoods and reduce poverty” (Republic of Botswana, 2007, p. 5.).
It seems that the focus of the teacher of Agriculture was not directed towards conservation or rural development but grazing livestock in an unfenced and open-space that is owned by all members of the community. The focus of the teacher was to teach the content according to the curriculum objectives. The CBNRM Policy, whose one of the objectives is to “facilitate capacity building within communities to engage in natural resource-based tourism” (p. 5) seem to focus more on wildlife resources and less on grazing of livestock. This contrast could be explained by official statistics from the World Travel and Tourism Council (2014) and Seanama Conservation Consultancy (2012). According to the World Travel and Tourism Council (2014), “the total contribution of Travel and Tourism to GDP in Botswana was BWP14,172.1mn (8.4% of GDP) in 2013, and forecast to rise by 8.1% in 2014” (p. 4). Seanama Conservation Consultancy (2012) explained “the Agriculture sector has experienced a steady decline in its contribution to GDP over past 42 years…From a 42.7 % share in GDP at independence in 1966, agriculture has fallen to 1.9 % as at 2008” (p. 1). The above statistics of GDP could assist in suggesting the rationale that the CBNRM program continues to promote wildlife-based resources than livestock-based resources.

Other objectives of the 2007 policy of CBNRM in Botswana are as follows: specify land tenure and natural resource user rights, which may be developed to communities; protect the intellectual property rights of communities with regard to natural resources and the management of such natural resources; encourage communities to participate meaningfully in the monitoring of CBNRM; facilitate capacity building within communities to engage in natural resource management
tourism; establish an institutional support framework for the implementation of CBNRM and promote communication, education and public awareness on CBNRM. (Republic of Botswana, 2007, p. 5 – 6)

Ms. Ellen explained to the students that one of the consequences of livestock not being penned at night, particularly in the Okavango region, is that they are most likely to be attacked and killed by wild animals such as lions, cheetahs and hyenas, which also roam in the communal lands. On June 27 she engaged the students in discussing Foot and Mouth disease; a disease that occurs repeatedly in the Okavango region. It could be suggested here that the teacher paid attention on the particularities of place (the Okavango region). She also paid attention on the concerns of the community in terms of engaging the students to discuss the Foot and Mouth Disease. Concurrently, there was Foot and Mouth Disease (FMD) outbreak in the Okavango Delta region during the days that the classroom observations were made and also during the entire period of fieldwork. A Stop and Check control point was put in place at the Mohembo East village by the Government authorities from the Department of Veterinary Services.

The duty of Veterinary authorities was to ensure that travelers do not pass the control point with meat of cattle to areas that the outbreak of FMD was not reported at that time. Vehicle tires were sprayed and people’s shoes were also disinfected. During the class instruction a participatory lesson was also observed as two male students facilitated the topic of diseases that affect beef cattle. In addition to FMD they also presented on heart-water disease. Ms. Ellen informed the students that the FMD is caused by a virus, which is found in animals that have cloven hooves such as buffaloes and cattle. She
stated: “As long as we have buffaloes, we will always experience the Foot and Mouth Disease. The virus can be carried in the air as well as through the wheels of vehicles and our feet” (Field notes, June 27, 2014).

The above contents from the lesson of Agriculture constituted some elements of local environmental knowledge explained by community people during the semi-structured interviews. For example, one of the local environmental knowledge learned from the semi structured interviews with the community people is that they graze their livestock (cattle, goats, and donkeys) in the communal lands during the day. The community people quite often stated the destruction of their properties by wild animals, which the teacher also made reference to when explaining the consequences of not penning livestock at night.

Although the Ministry of Environment, Wildlife and Tourism (MEWT) of Botswana launched the CBNRM policy, it rarely discusses the grazing resources. One of the objectives of CBNRM is to specify land tenure and natural resource user rights, which may be devolved to communities. The observations made in the classroom and the responses from community people suggested that there are no institutional rules that are observed when pastoral farmers release their livestock to graze in the communal land, hence the ‘land tenure’ as specified in the CBNRM policy is not clearly discussed, although overgrazing was stated by the teacher during instruction as one of the disadvantages of grazing in the communal lands. This oversight does not promote the aims, particularly in this fragile ecosystem, of CBNRM which are to achieve conservation and rural development.
Photo 20, below, from the textbook of Agriculture titled *Diamond Agriculture: A fresh start*, concurred the responses from community people and classroom instruction about livestock management. The photo shows the image of cattle grazing in the communal lands in Botswana. It also stated:

Communal grazing occurs on land owned and shared by members of the community instead of an individual. Members of the community have the right to graze their animals on the land. Usually the land is not fenced. As a result cattle kept under this system can move about freely or with less restriction…in many instances cattle owned by different farmers mix and graze together or in the same area. They drink from the same wells, rivers, and boreholes. The cattle are usually looked after by herd boys or their owners. (Chengeta, 2011, p. 128 - 129)
If they are used for cross-breeding, the calves produced perform better than both their parents under conditions in Botswana.

They are more tolerant or resistant to common diseases and parasites.

If they are exotic breeds such as the Brahman and Simmental, they are recommended because they produce higher quality beef than the indigenous Tswana cattle. By cross-breeding them with the Tswana cattle, the calves born are expected to produce better quality beef than the Tswana. This then helps improve beef production in the country.

**Exercise 11.1**

1. Name any five breeds of beef cattle found in Botswana.
2. Explain why the Brahman and Simmental cattle breeds are recommended in Botswana.
3. Describe the characteristics of the Tswana cattle.
4. Describe the characteristics of any one named exotic breed of cattle found in Botswana.
5. Compare and contrast the good and bad qualities of beef cattle breeds.

**Communal and Ranching systems of raising beef cattle**

There are two main systems of raising beef cattle in Botswana which are the communal and ranching systems. We will discuss each of these systems in terms of what each is about, and its advantages and disadvantages.

a) **Communal grazing system**

Communal grazing occurs on land owned and shared by members of the community instead of an individual. Members of the community have the right to graze their animals on the land. Usually the land is not fenced. As a result, cattle kept under this system can move about freely or with less restriction. In some parts of Botswana, a drift fence is constructed to separate cattle from the crop fields. In many instances, cattle owned by different farmers mix and

*Photo 20* Communal and ranching grazing systems of beef cattle in Botswana  
Source: Kgosietsile Velempini, 2014
Chengeta (2011) stated that most cattle producers in Botswana keep their animals in kraals at night to protect them from predators and thieves. Therefore, livestock is usually driven inside the wooden enclosures (kraal) from the evening until the following morning. The enclosures are usually built from the drought resistant tree-timbers such as the Camel thorn (*Vachellia erioloba*) and Mopane (*Colophospermum*). Livestock farmers in the Okavango are continuously confronting the outbreak of cattle disease such as foot and mouth and cattle lung disease. For example, one of the village authorities (the interviewee from the village of Kauxwi) recalled the catastrophes of 1996 and 1997 whereby about 320,000 cattle were slaughtered and buried after contacting the cattle lung disease (*Contagious Bovine Pleuropneumonia*) (Marobela-Raborokgwe, 2011).

In the subject of Social Studies, the teacher (Mr. Marshal) also referred to Crop cultivation (traditional farming skills) and Livestock management activities that include the rearing of cattle, goats, and donkeys by local people in the Okavango Delta. These local environmental knowledge systems, which are inherent in the lives of community people, are essential livelihood practices in the Okavango Delta. The land board authority, a Government department, is tasked with allocating land for crop cultivation in the entire country. This could suggest that this particular local environmental knowledge is institutionally regulated and might help strengthen the conservation aims of the CBNRM policy in the Delta.

One of the students from the English subject gave the following example of passive voice on June 1: “The crops from the fields were eaten by an elephant.” This example is about Human-Wildlife Conflict (HWC), which is common in the Okavango
region. The example above seem to emanate from a lived experience. The semi-structured interviews with community people suggested, as well, that elephants destroy local people’s property such as huts, crops, and perimeter fences of the compounds. This means that students come to school with a lived experiential knowledge that they acquire from home.

**Implementation of the content of Crop and livestock practice in the curriculum.**

The teacher of Agriculture, Ms. Ellen, was asked to explain how she is teaching the contents of environment in the subject of Agriculture. She simple explained they are doing it at the garden site. For example, She said that in the village of Shakawe (where she used to teach), they cultivated spinach (an edible flowering-plant) in the garden as a practical project for form three students. She continued to explain: “But spinach may not grow well here. But we are getting there” (Personal interview, June 18, 2014). Although they try to teach elements of environmental education, the sandy soils in the panhandle of the Okavango Delta do not favor the cultivation and growth of spinach. She also mentioned: “We even cancelled some vegetables this side because they never do well in the area due to certain environmental factors. Some of the crops do not do well here. We have to grow crops that do well in this area.” This place-based explanation concur the lesson learned from the community people that maize is not favored by the soil type in the study area.

When probed on how she is incorporating the elements of environment in topics such as Mating and Breeding of Cattle, Ms. Ellen complained about the lack of research that existed among teachers. She said:
We don’t do research in preparation to teach a lesson. We just concentrate on the content from the textbooks; and the examples from the textbooks. But we should at least explain and give examples from our surrounding here, which I do not do that much. Students do not grasp more if we give examples from the textbooks, and examples that are not from the local place.

Regarding the recommendation by the 1994 Revised National Policy of Education to integrate environmental education, Ms. Ellen argued that teachers rarely fulfil what the policy has recommended. She stated: “Usually we just plan the lessons following the content from the syllabus and content from the textbook. Environmental Education and the HIV and AIDS issue were to be inclusive in each subject, but we are not doing much” (Personal interview, June 18, 2014). She explained that it is not in every topic that environmental education is incorporated. However, certain topics such as Fruit tree production and Forestry signify the incorporation of environmental education in the curriculum.

During the semi-structured interview, Ms. Ellen was asked to explain how and which strategies can be used to improve the teaching and learning that is provided to students. She explained that the Discovery teaching strategy is the preferred method of teaching. Furthermore, she explained that the strategy enables teachers to learn as well from the students. She argued that although teachers need to be facilitators, it is difficult for students to speak up during instruction. When asked the question about her teaching experiences and the strategies she prefer to employ during teaching she responded:
I do not want to teach in the classroom. I prefer to teach in outdoor places, for example in a chicken production unit and constructing a brooding unit. I like to show the students how a chicken brood chicks and how we feed cattle. I want students to discuss and see, but here it is very much difficult to do these strategies. According to Ms. Ellen the delivery of the broilers and layers has delayed and the Form two (Grade 9) students missed the practical session of chicken production. She argued:

It is hard for us to do projects, especially in my teaching subject. You cannot just go there in the classroom and discuss, rather I want to discuss with the students in the field and not in the classroom. I want the students to tell me what they see and what they think.

Ms. Ellen’s argument suggests that the school is under resourced to engage students in experiential learning activities. Ms. Ellen explained she believes students express themselves better when they are doing a group work activity and then later present instead of the teacher standing in front of the students and giving them information. She explained that most of the group discussion takes place inside the classroom. She explained as follows: “But if we have lessons of chicken production whereby we are teaching about a chicken house we would walk there to the chicken house and see it with our eyes where it is so that the students could understand as well the issues of ventilation.”

The coordinator of environmental education also emphasized that topics such as Fruit tree production and Forestry Conservation signify the integration of the elements of
environmental education in the curriculum. He explained that forestry conservation deals with how children should take care of fruit trees. This explanation was also stated by Ms. Ellen, who explained that the content of forestry exist in the subject of agriculture. He stated that the elements of environment are also included in the topic of Chicken production, whereby students feed chickens and enable them to grow. The coordinator was asked to explain some of the effective ways whereby the elements of environment could be incorporated. He explained:

I think that workshops are needed for teachers on the issue of environmental education. Teachers should be told that it is quite important for them to integrate elements of environment when they teach. For example, in the subject of Home Economics, teachers and students cook using spray-oil everyday. Where and how do they dispose the cooking oil? It is very important that they understand how to handle these issues. If there is going to be pipe-blockage in the home economics laboratory, really it is not going to be a conducive environment. We feel it has to be the cleanest area within the school.

The above explanation focuses on enhancing the Professional Development workshops, building of teachers’ knowledge about environmental education and the cleaning of school’s infrastructure. Clearly, the coordinator contended that things need to change in order to better assure integration of environmental education in the classroom. However, he did not provide any solutions.
Human – wildlife conflict in the curriculum.

The existence of the Junior Secondary School in a Controlled Hunting Area indicates that there are possibilities for the occurrence of Human and Wildlife Conflict. In Botswana, the Controlled Hunting Areas are administrative land blocks that are used by the Department of Wildlife and National Parks (DWNP) to allocate hunting quotas, where applicable. Therefore, issues of human and wildlife conflict existed in the curriculum. For example, Ngongola and Montsho (2010) (from the Social Studies textbook 2) explained about Human and Wildlife Conflicts on the topic titled Land Use Conflict between Human, Livestock and Wildlife. These authors argued that the use of boreholes as source of water has enabled people to settle and rear their livestock in areas that were previously occupied by wildlife. They argued: “As a result, people and their livestock are increasingly living in closer to wildlife areas. Sometimes predators such as lions and leopards kill livestock and elephants destroy people’s home and crops” (p. 221). Furthermore, Ngongola and Montsho (2010) said “the increase in some wild animal populations such as elephants, means they need more space. Sometimes this means the wild animal enter human settlements that are near game reserves and national parks, and cause damage to crops, houses, and other properties” (p. 222).

The above statement that is found in the textbook used by students was also learned from, Sondi, one of the interviewees in Xakao village who stated:

…the destruction caused by an elephant is too much. That’s why I am saying that where there are many people the need for residential land increases. For example, we could say that in 1979 in the village of Xakao, I was around here as a young
boy. It was just forests all over. Now, this indicated to me that where there are many people residing the space for human habitation expands. In the past, wild animals could pass just over here during that time when there were not so many people. But now, people have also encroached over to reside where animals used to cross or walk because they are increasing as well. … Amongst all other animals, the destruction caused by the elephant is high. It destroys fruits, it destroy crops in the fields, and it also follows where I keep my food property and eats. (Personal interview, July 28, 2014)

During the interview, the Coordinator of environmental education related the concept of environmental education to the local people in the Okavango. He stated: “at one point when we were here with the Kgosi (chief), we walked to the river, where the chief and other village elders explained to us about the presence of dangerous wild animals such as crocodiles. They arranged for this discussion because we used to go to the river for entertainment. They cautioned us that it is not safe to hold entertainment along the river because there are crocodiles and hippopotamus” (Personal interview, July 11, 2014). The coordinator linked the place-based education with the dangers of actually engaging in recreational work for teachers. Because of the dangers associated with animals, the cultural and recreational practice was discontinued.

**Implementation of the content of human – Wildlife Conflict in the curriculum.**

Although the issue of Human and Wildlife conflict was one of the major concerns in the panhandle of the Okavango Delta during the field work, the lessons of instruction that were observed did not specifically focus teaching and learning on human and
wildlife conflict. However, the subject of Social Studies, particularly the textbook, used by the students integrated contents of human and wild animal conflict. For instance, Ngongola and Montsho (2010) discussed this content in the Social studies textbook, under the topic titled *Land Use Conflict between humans, livestock and wildlife*. These authors continued to write “Sometimes predators such as lions and leopards kill livestock and elephants destroy people’s homes and crops” (p. 222).

Nonetheless, during interviews, the teachers of Agriculture, English, Science, and Mathematics explained that the discovery method is one of the pedagogical approaches that they use to implement the elements of environmental education, such as Human and Wildlife Conflict, during teaching and learning. For example, the teacher of Science, Mrs. Jonathan, explained as follows when asked to talk about the teaching strategies she uses to integrate environmental education “I like to use prompting, probing, guided discovery and sometimes I use the technique of asking questions” (Personal interview, July 17, 2014). The teacher of English stated “Personally, I love group work as well as guided discovery” (Personal interview, July 10, 2014). The response from the above teachers could suggest the issues that relate to environmental education are discussed in class only when they feature in the syllabus of the subject. Clearly, teachers used different pedagogical strategies to address these concerns.

**The importance of natural resources and the curriculum.**

During fieldwork, elements that indicated the importance of nature were discussed in several subjects such as Social Studies, English, Agriculture, and Science. The contents of instruction taught by Mr. Marshal, in the subject of Social Studies,
incorporated natural resources such as local aquatic species, vegetation and wild and domesticated animals in the Okavango Delta. On June 11, Mr. Marshal taught about the Eastern Margin and Hard-veldt environmental zones of Botswana. The Eastern Margin lies in the ecological and eastern direction of Botswana. In this zone, the soils are loamy and clay. According to Mphale, Dash, Adedoyin, and Panda (2014), rainfall is above 400 millimeters (mm) annually in this zone. The predominant landscape is savannah grasslands.

The Hard veldt lies in the center and west ecological part of Botswana. This zone is mainly covered by the Kalahari Desert (Velempini & Perkins, 2008). In this ecological zones, the rainfall is lower compared to the eastern margin, and the soils are not suitable for cropping. Mr. Marshal also taught about environmental determinism, whereby he explained that local people, in the Okavango region, construct houses using reeds from the Okavango River. Reeds is a natural growing grass in wetland places. He explained to the students that the environment mainly determines the lifestyle of local people. For example, He stated:

Let us go back to our issue of environmental rights. You can see that the environment is very important here because it offers food like water lily and fish, which are a natural resource. So it is up to you to see to it that the environment is not damaged by other users because if they do that you will end up suffering. It is your right to make sure that you live in an environment that is not harmful. Remember that fish here is a very important natural source of food. But each day
the pontoon does what?... It leaks oil or diesel in the water. (Field notes, June 11, 2014).

In the above quote, Mr. Marshall was discussing the importance of natural resources, such as fish, to the diet of local people. Fish is one of the resources that was also mentioned by local people during the semi-structured interviews. Unlike in the lessons taught the subject of Agriculture, the teacher (Mr. Marshall) of Social Studies instills to the students the conservation aims of water lily and fish in the Okavango Delta. The textbook of Social Studies contained the following instructional contents that constituted the knowledge related to the theme of the importance of nature: Chapter 2 (World physical features), Chapter 3 (World climates), Chapter 4 (Climate change), Chapter 5 (Botswana’s Cultural Heritage), and Chapter 15 (Tourism in Botswana). In this case study, the contents about Botswana’s Cultural Heritage and Tourism are also described under the theme of Local cultural practices and Perceptions on Tourism, respectively.

Firewood is one of the less expensive and affordable forms of energy for local people in rural areas. During the lesson, Mr. Marshall made reference to firewood collection by local people in the Okavango Delta. He said to the students, “some people around here end up cutting down live trees to make fire at their homes if they cannot find dead firewood. You know quite well about this practice and may be some of you do it sometimes.” Photo 21 below shows how human activities such as firewood collection contributed to the process of global warming. The photo, from the textbook of Social Studies by Ngongola and Montsho (2010), had the statements that read:
Many people still burn wood as fuel and this releases carbon dioxide into the atmosphere. In addition trees are cut down to produce timber or to clear land for agriculture and settlements. This means fewer trees are left to absorb carbon dioxide and the gas goes into the atmosphere thereby contributing to global warming. (p. 55)
Photo 21 Social Studies textbook images showing how human activities contribute to global warming
Source: Kgosietsile Velempini, 2014
The forms of transport that were mentioned during the class on July 17 and familiar to the students included the Okavango River, which is a natural resource (in addition to Ox-drawn sledge, Canoes, Trucks, Cars) as one of the perennial rivers stated by the teacher in class. The textbook of Social Studies list the importance of the Delta, in page 27, as follows: people fish in the Delta; fertile alluvial soils found in the Delta are good for farming; Deltas are a source of water for homes and agriculture; They are a source of raw materials such as reeds; They provide habitats for aquatic species such as birds (e.g. the slaty egret), crocodiles and hippopotami; and Deltas are on flat land which is easier to develop than hilly land.

On July 25, Mr. Marshall taught about the topic of transport and communication sector. The instruction focused on the importance of this sector, particularly with regard to offering employment and services to the public. He asked the students to raise their hands and explain what they think about the problems that face the sector of transport and communication in Botswana. After about five minutes of no response from the students, he gave the example by stating:

Let’s say you stay in Mohembo-West village and you want to come to school. The Pontoon or ferry might also not be operating. It could be broken down, and then you get to school late. The teacher starts to shout at you. But if there was a reliable transport system you would arrive in school on time (Field notes, July 25, 2014).

The Pontoon (shown in photo 22 below) is a source of transport by way of ferrying goods, cars, and people from either side of the Okavango River. Several students
use the Pontoon on Fridays when they visit their relatives in the village of Mohembo, Shakawe, Shaikarawe, and Gani. Also, they rely on the Pontoon on Sundays to cross the river and return to school.

Photo 22 Local people boarding the Pontoon in Mohembo
Source: Kgosietsile Velempini, 2014

On June 17, Mr. Marshal discussed with students about the topic of inflation. Later, the students were asked by the teacher to engage in a research about Inflation. He asked them to walk outside, meet any member of school staff and ask questions regarding the fluctuation of prices of goods and services in the Okavango region. Photos 23 and 24 below shows part of the data collected and presentation by one of the groups of students on their return back to the classroom.
Photo 23 Data collected by Group 1 members on price of goods and services
Source: Kgosietsile Velempini, 2014

<table>
<thead>
<tr>
<th>Item</th>
<th>20 years ago</th>
<th>Nowadays</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 kg</td>
<td>P2.00</td>
<td>P5.65</td>
</tr>
<tr>
<td>Orange juice</td>
<td>P0.50/lt</td>
<td>P3.00</td>
</tr>
<tr>
<td>Potatoes</td>
<td>P2.50</td>
<td>P6.00</td>
</tr>
<tr>
<td>Petrol</td>
<td>P5.00</td>
<td>P11.75</td>
</tr>
<tr>
<td>Milk</td>
<td>P3.00</td>
<td>P10.95</td>
</tr>
<tr>
<td>Sugar</td>
<td>P3.00</td>
<td>P3.70</td>
</tr>
<tr>
<td>Meat Meals</td>
<td>P10.00</td>
<td>P3.70</td>
</tr>
</tbody>
</table>
The research about inflation focused at the local place, which is the Okavango region. This activity fulfilled the principle of place-based education, which stated that learning should compose of hands on activity. The activity took place outside the classroom in the school yard. After the group presentation the teacher asked students to name the products that the country of Botswana exports to other countries. The students stated products such as beef (from cattle), and minerals (specifically the diamonds). One of the students responded that Botswana export fish, which has recently become a lucrative sector for the local fishermen and women in and around the water resource called Lake Ngami. This water resource is also situated in the same district (Ngamiland District) with the Okavango region. The fishers export fish to buyers from the regional
countries such as Zambia and the Democratic Republic of Congo. The beef cattle, minerals, and fish are all environmental-based resources and were discussed by some community people during the semi-structured interviews. For example, Seya, one of the community people stated as follows about the drilling of a mine in the Okavango region:

I also heard that there is another mine in the village of Shakawe close to the Choppies supermarket… About the mining in the village of Xakao, I only heard that there are some foreigners who have set up camping facilities close by here. I do not have evidence of where the mineral deposits might be found and whether it is toward the dry land or near my home (Personal interview, July 5, 2014).

The outdoor learning of conducting interviews and the observation of transport system seems to follow the first two stages that are discussed in Kolbs’ theory of experiential learning (Kolb, 2015). The two stages are Concrete Experience (CE), whereby the learner is “involved in experiences and dealing with immediate human situations in a personal way” (p. 105) and Reflective Observation (RO) whereby the learner “focuses on understanding the meaning of ideas and situations by carefully observing and impartially describing them” (p. 105). After the outdoor learning on inflation of goods and services, the students made presentations in the classroom. They reflected back or used the data they collected to respond to the questions from the teacher.

Although there might have been some elements of Kolbs’ theory, it appears that students received little preparation for the experience (of observing transport) or no effective chance to reflect (restricted by lesson time) on the experience and relate it to
their wider reading to other subjects or to the more theoretical aspects of the subject. It seems that the last two stages of Kolb’s theory are neglected during instruction in this lesson. The two stages are abstract conceptualization-concrete experience (AC-CE) dimension (THINK), whereby the learner “emphasizes thinking as opposed to feeling; a concern with building general theories as opposed to intuitively understanding unique, specific areas…a person with an abstract-conceptual orientation enjoys and is good at systematic planning, manipulation of abstract symbols, and quantitative analysis” (p. 105) and an active experimentation-reflective observation (AE-RO) dimension (PLAN), whereby the learner is “influencing people and changing situations. It emphasizes practical applications as opposed to reflective understanding; a pragmatic concern with what works as opposed to what is absolute truth” (p. 105). According to Kolb (2015) individuals learn better when the subject matter is presented in a way that is consistent with their preferred learning style. He suggested teachers should encourage students to engage in all four stages of the learning cycle. But in this Social Studies class, the students were engaged only in the first two stages.

The textbook of Social Studies emphasized environmental responsibility. On June 10 the students, in the subject of Social Studies, defined rights as powers that people are entitled. They defined responsibilities as duties people should carry out. Under the broader topic of Citizenship in Botswana, the Social Studies textbook by Ngongola and Montsho (2010) explained as follows about environmental rights: “We all have rights to live in an environment that is not harmful to our health or well-being. The environment we live in should not be polluted because this can damage our health” (p. 169). Ngongola
and Montsho (2010) also explained environmental responsibility as follows: “the responsibility to take care of and protect our immediate surroundings. For example, we should dispose of waste properly and plant trees where we can” (p. 169). During the above discussion of the topic of Citizenship and Responsibility in Botswana, Mr. Marshal emphasized the importance of litter picking in and around the school. He mentioned the concept of NIMBY (Not In My Backyard) and pointed out that normally people throw thrash and even dirty bath water in other people’s compounds particularly when they are not seen by anybody. Although he did not say it outright, his statement suggested that he was advising students against such undesired practices.

Although Climate Change was not completely taught by Mr. Marshal during the fieldwork for this study, the textbook included the content of Climate Change such as evidence of Climate Change, global warming, and the causes of Climate Change, natural causes of Climate Change, human causes of Climate Change and the question on what is the greenhouse effect? The above contents of nature were stated by community people during the course of semi-structured interviews.

The instruction in the English subject integrated various content that relate to environment. On June 11, the teacher of English, Mr. Pule, taught about Active voice and Passive voice. He stated that active voice is when the subject of a sentence performs an action. Therefore, an example given by one of the students, about active voices, is as follows: “Thabang pick litter around the school.” The teacher wrote on the white board marker that passive voice always uses the proposition “by”. The example above from the students included the elements of environment by using the phrase of “pick litter.” It is
possible that the student thought about an environment that is not polluted. On June 23, 2014, Mr. Pule did not teach any topic, instead he asked the students to write a letter to the School Principal complaining about bad smell from the sewage. This was part of the English learning content of Letter Writing. The contents of letter writing as read from the white board incorporated the phrases of bad smell, sanitation and effect to the environment. Mr. Pule wrote on the whiteboard:

Write a complaint letter to the School Head complaining about the bad smell brought about by the sewage system in your school. Guidelines – What happened to the sewage system? How it affects you, other students as well as the environment you are living in? What can be done to solve or amend the situation? (Field notes, June 23, 2014).

The types of poems that the students learned on July 10 in the English subject were Lament, Ballad and Sonnet as shown in Photo 25 below. The poems incorporated some elements of wildlife resources. The students also wrote lesson notes in their notebooks. The front table is mainly used by the teacher to place his books. On July 10 the teacher brought a stick (that normally disciplines students) to the classroom. The existence of a disciplinary stick suggested that the teacher’s views about teaching and learning is that the learner is actually passive and has to respond to environmental stimuli, which is likely to be punishment. This pedagogic view is explained through the Behaviorism learning theory, whose Principal originators are John B. Watson (1878-1958) and B. F. Skinner (1904-1990). Punishment could be viewed generally as an act that decreases the frequency of a particular response, which is undesirable. Punishment is effective in stopping undesirable
behaviors, which in this class of form three south, it could be: (1) students keeping quite in class and not responding to teacher’s questions (2) arriving late in the class (3) and not doing the assignments.

*Photo 25* Types of poems written on the green board during the English subject
Source: Kgosietsile Velempini, 2014

Also, students used the poetry book titled “Let me Be – a junior anthology of poetry” (1990) which incorporated environment related poems such as Clouds, What the leaves said, The New-Comer, The Spider, The Wind is angry and Who Killed the Swan. The poem titled, *the new-comer* discussed aquatic species such as fish in the river, animals such as the polar bear in the snow, hills and trees. The poem titled, *Who killed
the Swan discussed the management of water in the river. The Poet advised the fishermen and other users of waters in the river not to dispose waste (such as oil, plastics, tins) in the water because it may be harmful to birds such as the Swan and other creatures like crocodiles, fish and hippopotami. According to the Poet, the Swan is therefore likely to die in the water and eventually get trapped in the aquatic plants such as the reeds due to pollutants that are introduced into the habitat of the Swan.

On July 7 and 11, Mrs. Jonathan, the teacher of science, taught about the related concepts of Managing Natural Resources and Pollution. She engaged the students in explaining the different types of pollution, their sources, methods of controlling pollution, effects of water and air pollution on human’s health and measures of preventing pollution in a local place. Some of the ways of controlling solid, air and water pollution were discussed during the class. One of the female students raised her hand and stated that pollution can be controlled by the addition of chlorine. Another student raised his hand and stated that pollution can be controlled by adding some bacteria. Mrs. Jonathan also added: “we can use filters to control water pollution.” Clearly, elements of environmental education were existent in the curriculum.

Implementation of the content of importance of natural resources in the curriculum.

Teachers implemented the elements of nature in various ways such as through poetry, letter writing, group work and guided discovery. Ms. Ellen, who taught the subject of Agriculture, first explained the integration of environmental education by referring to the primary school curriculum. She explained the subject of Environmental
Science exists in the standard one curriculum to standard seven curriculum. She said:
“Environmental Education also exists in Science, Agriculture and Social Studies, even in Setswana (the national language in Botswana) subject in the topic of Culture. For example, there are natural resources that are used in carrying out some cultural ceremonies” (Personal interview, June 18, 2014). She explained that there are plant species that are used for cultural ceremonies.

The above explanation concur the responses from a semi-structured interview in the village of Xakao that branches of Camel thorn tree are burnt as firewood during rainmaking ceremonies and during marriage ceremonies. The belief is the ancestors would provide more rains and the married couple would stay together forever. Relatively, when analyzing the Social and Environmental Studies Curriculum of Malawi, Kayira (2015) found the content of indigenous knowledge that is addressed in the curriculum centers on initiation ceremonies, marriage systems and traditional dances. However, indigenous knowledge was found to be rare in topics such as environment, forestry, farming and soil erosion. Ms. Ellen lamented that environmental education is taken for granted and there is lack of awareness in utilizing environmental resources such as the anthills and the rivers. The explanation by Ms. Ellen suggested the need for self-consciousness and positive values towards the importance of environmental resources.

Mr. Pule, the teacher of English explained that there are poems, in the book *Let Me Be* related to nature, such as animals and plants. However, he argued that it is hard for students to understand the instruction that incorporate elements of environment. Also, he said sometimes it is advisable to relate a topic to the environment. He further explained:
“It gives them the light on what they are supposed to do. When you talk about nature… things that are surrounding them, it becomes a bit easier for them to understand.” Mr. Pule was asked to explain his experiences of incorporating environmental education in the subject of English and library studies, while he was still a pre-service teacher in Tonota College of Education. He responded by stating that the integration of environmental education occurred in the English literature. He asserted that they read an English novel about the lives of people. Furthermore, “the instructors would ask us to relate maybe a theme of the story to real life experience. Basically I would say that has to do with the environment because we would actually read the novel and relate it to what you always see in real life” (Personal interview, July 10, 2014).

In explaining some of the contents of English that he taught which include syllables, parts of speech, types of sentences, poetry, grammar, literature and continuous writing he indicated recently he asked the students to write a letter to the Principal of the School complaining about bad smell in the school yard from the sewage. Mr. Pule stated:

Those novels, as we read them, we can actually interact with the environment. So those are the two concepts, writing and literature, that could as well be used to test students about their environment. As teachers, we have to think about what we are going to teach and how we are going to teach.

When responding to the question of experience he stated: “in literature, we actually involve students in the interaction with the environment, especially when we read novels. They are reading about issues that are actually happening. Therefore, we have to make sure that they interact with the environment”. The English teacher, Mr.
Pule, also mentioned that he uses the discovery approach during instruction. However, he
complained:

Believe me. It is hard. We actually try all the strategies, but you end up
exhausting them. This is because our students here… I do not know… our
students are very… I do not know how to explain it…they make things very
difficult for us. Personally, I love group works as well as guided discovery.

(Personal interview, June 10, 2014)

Tourism and the curriculum.

The tourism industry is the major economic activity in the Ngamiland district of
Botswana. There is lack of research on tourism and the curriculum in Botswana. In the
safari sector of Botswana, most employees do not have basic training. Their progression
in tourism and hospitality is limited (Manwa, Chipfuva, Mahachi, 2011, cited from
institutions that are offering tourism and hospitality training “do not provide adequate
practical training” (p. 17). One of the reasons is that they lack “specialist trainers in Food
cost and control as well as menu planning (Manwa et al., 2011, p. 17). The “Botswana
School Calendar of Environmental Days” has the content of “World Tourism Day” in
page 21 and states that issues of tourism are finding their way into the curriculum for
purposes of education to provide entrepreneurial skills to the learners. The school
calendar continues to state that the World Tourism Day of September 27 build awareness
of the impact of tourism amongst communities. Specifically, it states that in Botswana
tourism brings in foreign revenue and exposes to the world Botswana’s diverse culture.
During the data collection at the Junior Secondary School, Mr. Marshal, who taught the subject of Social Studies mentioned the ongoing construction of tourism facilities such as lodges and hotels in the Panhandle of the Okavango Delta. He mentioned this when he was teaching about Environmental Impact Assessment. He also mentioned the need for fair access to environmental resources by local people. Moreover, he stated some lodges are built on the banks of the Okavango River. Mr. Marshal stated that local people might have long lived along the panhandle of the Okavango River, and therefore, there is need for them to have fair access to the abundance of natural resources. It could be suggested that the instruction from the teacher of Social Studies promote some objectives of the CBNRM policy such as “specify land tenure and natural resource user rights, which may be devolved to communities” (Republic of Botswana, 2007, p. 5) and “protect the intellectual property rights of communities with regard to natural resources and the management of such natural resources” (Republic of Botswana, 2007, p. 5). Mr. Marshal reiterated:

As citizens of the Okavango region, if there is any development taking place on land, is it very important that you are consulted about the particular development. The government must involve the local communities that are being affected. This is why Environmental Impact Assessment (EIA) has to be conducted before any development could take place. Currently, there are lodges along the river. Local people culturally go fishing into the river. Owners of lodges found the local people, who must be consulted and not denied their right to the natural resources. (Classroom observation, June 11, 2014)
On July 23, Mr. Marshal mentioned the Okavango River as one of the perennial rivers in Botswana. The river is well known to the students in the region and they have experience of lodges and hotels in the region. Photo 26 and 27 below were captured from the textbook and they shows descriptions of Deltas, including the Okavango Delta.

*Photo 26* A photo from textbook describing the formation of Deltas
Source: Kgosietsile Velempini, 2014
The textbook stated that one of the importance of the Delta is tourist attraction. Ngongola and Montsho (2010) stated: “The water in the Delta attracts wild animals. These in turn attract tourists, for example the Okavango Delta in Botswana is a major
tourist attraction. Tourism is an important source of income.” (p. 209). Chapter 15 of the textbook is “Tourism in Botswana.” In this chapter, Ngongola and Montsho (2010) also explained that people use lakes for various leisure purposes such as canoeing, swimming, and fishing. Moreover, they stated: “countries and local communities earn money from tourists who visit the lakes. Tourism creates employment for local people” (Ngongola & Montsho, 2010, p. 209). They wrote: “Botswana’s tourist attraction include wildlife and the wilderness experience, physical features, historical sites, cultural heritage and museums…Tourists activities include game viewing, photographic safaris, hunting safaris and bird watching” (p. 209). Furthermore, they stated as follows about the Okavango Delta: “The Okavango Delta is unique because it is the world’s largest inland Delta covering up to 13 000 km². The Delta’s uniqueness, natural beauty and abundant wildlife attract many tourists” (p. 209). Regarding the importance of tourism, Ngongola and Montsho (2010) stated:

> Tourism creates an opportunity to educate people about the importance of protecting and caring for the environment and the natural resources it provides. It encourages the conservation of resources that attract tourists. For example, there are laws that protect historical sites and monuments. Wildlife is protected in game reserves and national parks. Through the Community Based Natural Resource Management program, some communities use the natural resources in their areas to run tourism related businesses. This encourages them to conserve and use the resources in a sustainable way. (p. 212)
On July 23, Mr. Marshal continued to teach about the transport system in Botswana and one of the discussions focused on airport in the country. After students listed some existing airports such as Sir Seretse Khama International airport in Gaborone, Francistown Airport, Maun airport, and Kasane airport, he stated as follows: “as you can see here we do have airports that contribute a lot to our tourism, for example, Kasane airport was constructed due to the growth of tourism…apart from that we also have what we call airstrips.” This means that within curriculum and instruction, students were taught how the environment fosters economic growth and tourism.

**Implementation of tourism in the curriculum.**

During the data collection, it was found that the subject of Social Studies is the only subject where the teacher taught about tourism in the second term of the school year in 2014 for the form three south class. In order to determine how the content of tourism is implemented, Mr. Marshal was asked to explain the teaching strategies that he uses during the lessons. He stated that he prefers to use field work and sometimes invite local people to the school to talk about the natural resources that are found in the local environment. However, it was observed that during the content of tourism, students were taught in the classroom through the approach of question and response. It was also observed that group discussions and presentations were employed during the time that the content of tourism was taught.

**Backyard gardening and the curriculum.**

During the topic on *Simple Machines* Mrs. Jonathan asked students to name simple machines they know. Students mentioned the digging fork, trowel, watering can, and rake.
These are also local farm tools rural people keep in their homes. Most families in the rural villages of Botswana keep and use the simple tools in the backyard gardens. During the semi-structured interviews with the community people the local farm tools such as watering can and rake were observed in a backyard garden in Kauxwi village and also in a government – aided backyard garden in Gani village. On her arrival in the classroom on June 12 Mrs. Jonathan said to the students: “Now I would like you to name the simple tools that you know.” One of the students raised his hand and said “digging fork” while two other students mentioned the rake and spade. The Science textbook stated as follows about the simple tools: “Spades, Scissors, Screwdrivers, and Step ladders are all examples of simple machines that we use everyday to help us with our work and make it easier” (p.189).

**Implementation of backyard gardening in the curriculum.**

It was learned during the fieldwork that the implementation of the elements of backyard gardening in the curriculum was carried out through the inquiry-based learning. For example, the Science teacher called on students regardless of whether they have their hands raised or not. She mainly used the random call (question-answer relationship) and scaffolding whereby she expanded the answers given by the students. For example, she asked as follows: “What is a machine?” The student responded: “Things that make our work easier.” The teacher then said “these are things that make our work easier, okay. Instead of using a stick to cultivate the soil, the digging fork and the rake enables us to quickly finish making a vegetable plot, and because of this the rake makes our work become easier.” It was observed, during the question – answer relationship that students kept on repeating what the teacher stated.
Local cultural practices and the curriculum.

The government of Botswana introduced the subject of Cultural Studies in primary education. One of the aims of Cultural Studies is to cultivate the knowledge and understanding of the local cultural practices. This is an indication that the Government is committed to the recognition, support and strengthening of different languages and cultural traditions in Botswana. The textbook used in Social Studies has the content of “Botswana’s Cultural Heritage” and stated that “culture give a community or society a distinct identity and is a link with its past. Knowing and appreciating one’s culture is therefore important” (p. 62).

During one of the interviews, the teacher of English stated that teaching the students in their school is very difficult and teachers need to improvise and use all the resources available to teach. Similar to the expressions from the English teacher, the teacher of Agriculture also stated:

You have to use resource persons especially the non-teaching staff in schools to explain during the lessons. Some words, like mites in English and Setswana are not known by the students. Even in Setswana language the students do not know what is matsetse (ticks), but if you consult the non-teaching staff to come and talk in local languages like Hambukushu, you then see the students speaking out and following what is being taught. You then have to use a lot of pictures and the pupils should see with their own eyes and that is when they can understand… I had to go out to Bokgosana (headmen of village wards) to seek explanation and
when I came to class, at least, I delivered what comes from the mouths of local elders. (Personal interview, June 18, 2014)

In the explanation above, the teacher of Agriculture was explaining how she incorporated some elements of environment during the teaching and whether the students responded relying on the local knowledge from home. She relied on local non-teaching staff to come to the class and explain in Hambukushu (the indigenous language). This enabled the students to understand the content of learning. Furthermore, the teacher consulted with the local tribal leadership to explain some teaching concepts, which she could use and mention during the class.

_Implementation of the cultural practices in the curriculum._

Regarding the 1994 policy of education, Mr. Titus, the teacher of Mathematics, stated that the recommendation to integrate emerging issues such as environmental education depends on the knowledge of teachers. Further, he explained the teaching methods that he employs during instruction. He explained outdoor learning, group discussions and delegating students to facilitate a topic would work for any teacher of Mathematics. Similar to Ms. Ellen and Mr. Pule he explained that students in the school need to be monitored because they may not do the school work on their own. He expressed as follows: “If you give them group work, most of them will just sit in groups and speak their own indigenous languages. They do not have the self-drive” (Personal interview, June 26, 2014). This suggested students at the Junior Secondary School express themselves better when they speak their own indigenous languages instead of the English language or the Setswana language, which is also the national language.
The data presented in this case study also showed that community people understand the names of plants and animals in the Okavango Delta in their indigenous languages. Most interestingly, during the fieldwork it was observed that the school management dissuaded the students from communicating in their indigenous languages when they are in the school campus. This suggested that the local environmental knowledge, under the place-based education, is undermined. One of the community elders in the village of Mohembo argued: “…one of the concerns I have is that teachers do not teach our children some local knowledge such as the color of cattle, the colors of goats and chickens, and about the cultural knowledge” (Personal interview, June 22, 2014). In defining the phrase of environmental education the above community elder stated:

It is a must that these children know, for example, the names of trees in other languages, even in their mother tongue. As a parent, I should teach them to know the names of trees. Again, as arable farmers the soils that we step on we should understand and able to categorize which soil type is suitable for cultivation. We should look and able to tell using our eyes. All this information need to be transmitted to the children. We should teach them this knowledge at home so that when they are questioned in school, they could find that they already know the answers. This is all about environmental education. There is also a tree called motsotsojane. Do you know motsotsojane (*grewia retinervis*)?

The teacher (Mrs. Jonathan) of science explained that when she was a pre-service teacher the subject that seemed to have connection to environmental education was
Science. When asked how she integrated the elements of environmental education, she stated elements of environment are inclusive in the topics of Pollution, Earth System and the Solar System and diffusion. Mrs. Jonathan preferred teaching using the Guided discovery strategy. She explained Guided discovery is when a teacher offers the students some questions in the form of instruction and they present basing on the instructions that has been offered. She continued: “for example, if you want students to research about a particular topic such as pollution, you could tell them to go and focus on the types of pollution, causes of pollution, and sources of pollution. This shows you are guiding them towards the required task” (Personal interview, July 17, 2014). When asked in which of the topics she mentioned does she think that elements of environmental education are integrated effectively. She mentioned the topic of pollution:

First of all, I should understand that students have previous relevant knowledge. So if they have previous relevant knowledge, it means that learning is not going to be difficult. As a teacher, I would then need to relate for example, pollution in the science class to daily pollution in their (students) communities of living.

When asked on where the students acquired the previous learning experience, Mrs. Jonathan stated:

Sometimes as people we do other activities at home, but unaware that these activities at home could still be applied in school. So basically, I would know that they throw litter everywhere, dump litter in the rivers using the little knowledge that they have.
The explanations from the participants suggested the Guided discovery strategy is the most preferred strategy of teaching by the teachers. Mrs. Jonathan indicated she likes to use Prompting, Probing and Guided discovery strategy. Sometimes she used the inquiry method (the strategy of asking the students some questions). According to Mrs. Jonathan, probing means that if a student responds with a shallow answer, the teacher could ask further until the student respond with a detailed answer. She explained that Prompting is when students respond by giving a “Yes” or “No” answer and the teacher tries to follow up in order for the student to clarify the question that is being asked. Mrs. Jonathan explained how a guided discovery works:

This is when a teacher gives students some questions in the form of instruction and they present basing on the instructions that you would have offered them…. for example if you want the students to research about a particular topic like pollution, you could tell them to go and focus on the types of pollution, causes of pollution and sources of pollution. (Personal interview, July 17, 2014)

Mr. Marshal, the teacher of Social Studies, preferred to integrate field work and inviting community people during instruction. He explained as follows: “We invited people from the community to come and teach students on certain topics like what kind of resources are found in this environment and how do they use them ” (Personal interview, June 19, 214). This could suggest strategies of promoting the local knowledge and eventually the local environmental knowledge held by community people, which probably might not be a welcome idea in subjects such as Mathematics where the
History of Place and the Curriculum.

The first President of Botswana once stated:

It should now be our intention to try to retrieve what we can of our past. We should write our own history books to prove that we did have a past, and that it was a past that was just as worth writing and learning about as any other. We must do this for the simple reason that a nation without a past is a lost nation, and a people without a past is a people without a soul. (Sir Seretse Khama, speech of Chancellor at University of Botswana, Lesotho and Swaziland graduation ceremony, 15 May 1970; Botswana Daily News, 19 May 1970)

Therefore, in this case study, observations were made on how the elements (such as the local village names) of history of place exist in the curriculum. It was found that local names (such as Sekondomboro and Xakao) of villages where students commute from home to the school were integrated by the teacher of Mathematics during the content of Time, Distance, and Speed on June 10. In calculating the distance (d), the teacher simplified the question during the class and used the local geographical village names. For example, he stated as follows to the students: “If I ask you to tell me the distance between Mohembo and Sekondomboro villages, you are most likely to respond with a whole number without significant digits.” The content of time (t), distance (d) and speed (s) existed in Chapter 14 of the Mathematics textbook that is used by the students, as shown in photo 28 and 29 below.
Photo 28 Photo from Mathematics textbook showing the content of Time, Distance and Speed
Source: Kgosietsile Velempini
Therefore, his speed $= \frac{\text{distance travelled}}{\text{total time taken}}$

$= \frac{100 \text{ metres}}{1 \text{ hour}}$

$= 100 \text{ km/h}$ (This is the speed at which Kago was traveling)

In the case when we are given the total distance travelled and the average speed, the total time taken can be calculated using the formula: $\text{Time} = \frac{\text{distance travelled}}{\text{Average speed}}$

In the event that we are given the total time taken and the average speed, we can calculate the distance travelled using the formula: $\text{Distance} = \text{Speed} \times \text{Time}$

### 14.2 Calculating the average speed

The average speed is the total distance travelled divided by the total time taken to travel that distance. To calculate the average speed, we must know the total distance traveled and the total time taken to cover the distance.

**Example 1**

Baeng drove from Serule to Bobonong taking 2 hours. Calculate the average speed given that the distance between Serule and Bobonong is 160 km.

To calculate his average speed, we use the formula: $\text{average speed} = \frac{\text{distance travelled}}{\text{total time taken}}$

In this case the distance travelled is 160 km while the total time taken is 2 hours.

So we will have average speed $= \frac{160}{2} = 80 \text{ km/h}$

Hence Baeng’s average speed was 80 km/h.

**Example 2**

Fatimah stays 5 km away from school. It takes her 20 minutes to walk from her home to school. Calculate her average speed in km/h from her home to school.

Average speed $= \frac{\text{Total distance travelled}}{\text{Total time taken}}$

To calculate Fatimah’s average speed, let us first convert 20 minutes to time in hours. To do that, we divide the 20 minutes by 60 minutes.

20 minutes will therefore be $\frac{20}{60}$ hours.

Then we will have: $\text{Average speed} = 5 \times \frac{20}{60} = 5 \times \frac{60}{20}$

$= 5 \times 3$

$= 15 \text{ km/h}$

Hence Fatimah’s average speed is 15 km/h.

### Exercise 14.1

1. Calculate the speed given the following:
   a) 20 km; 15 minutes (km/h)
   b) 30 km; 15 minutes (km/h)
   c) 40 km; 1 hr 10 minutes (km/h)
   d) 110 m; 12 seconds (m/s)
The teacher continued to use the local village names during class. For example, during the semi-structured interview he restated the example that he gave to students in the class as follows:

I once gave an example saying 1 Kg of Sugar is P15.00 (about $2) in Shakawe village. Then you are told that the price of sugar in Xakao village has been raised by P2.00 (about 0.25 US cents). What is the new price of sugar? (Personal interview, June 26, 2014)

During the class the students also responded that the new price of sugar is P17.00 (equivalent to 2 USD). The teacher confirmed the price of sugar in Xakao has increased. Some students in the class of form 3 south at the Junior Secondary School commute from the villages of Xakao and Shakawe. Their local village names were stated during the teaching and learning. This also indicate the application of place-based education by employing the local resources in teaching and learning where the school is situated. The textbook of Social Studies contained the following instructional contents that constitute the knowledge that is also related to the theme of history of place, Chapter 5 (Botswana’s Cultural Heritage). One of the objectives stated in the textbook is that students should be able to “discuss how various elements of culture bring about individual and national identity.”

**Implementation of history of place in the curriculum.**

Mr. Titus explained how he is integrating elements of environment in teaching as a teacher of all form levels (one, two, and three):
Mostly in my teaching there are a lot of topics where there is a relationship. You can give examples of what students are having in their environment and the taught content. It just depends on how he or she gives those examples. You can talk about the distance that they walk every day and you could refer to the calculation of Speed = Distance / Time. (Personal interview, June 26, 2014)

He further explained that in one of the classes he used the local names of villages of students. He stated:

In teaching we have to include the resources that the students know, and bring resources from their environment. We should not apply the knowledge that is abstract or difficult to understand such as the distance between the United States of America and another country. They will not know the United States of America. The best way to teach is to use local names for purposes of better understanding.

**Summary of Chapter Five**

This chapter has presented thematic findings of the case study, on the second and third research questions, about the existence of local environmental knowledge in curriculum and instruction and how teachers implemented the elements of environmental education in the panhandle of the Okavango Delta of Botswana. The data that also emerged from the classroom observations about community people further suggested teachers hold a wide understanding of local environmental knowledge.

First, chapter five indicated how the thematic finding of Crop and Livestock farming practice is presented in the curriculum. There seem to be lack of consciousness
and neglect of establishing connection of classroom instruction to government educational policies. The instruction from the teachers is simple guided by the syllabus, teachers guide and the content from the textbooks. For example, when she was teaching about community grazing and livestock management, the teacher of Agriculture did not exactly focus instruction towards conservation or rural development, as it is the aim of the CBNRM policy. She simple talked about grazing livestock in an unfenced open space, owned by all members of the community.

The observations that were made in the classroom and the responses from community people suggested that there are no institutional rules that are observed when farmers release their livestock to graze in the communal lands. Therefore, ‘land tenure’ as specified in the CBNRM policy is flimsy. The issue of overgrazing, which is due to overstocking, was stated by the teacher of Agriculture, during instruction, as one of the disadvantages of grazing in the communal lands. The practice of livestock grazing, which is common in many parts of sub-Saharan Africa supports the economic theory (Tragedy of the Commons), which was introduced by Garrett Hardin in 1968, that individual farmers, acting independently and being driven by each's self-interest behave contrary to the best interests of the entire community by depleting some common resources. In the Okavango Delta, common resources include grass species, shrubs, trees, water, space and soils. The other problem that this chapter presented, in relation to the subject of Agriculture, is that the delay or lack of delivery of poultry disparages the practical (e.g. outdoor learning) integration of environmental education in the subject of Agriculture.
Second, this chapter presented that although the issue of Human-Wildlife Conflict is common in the Okavango region, the data collected showed that it was rarely discussed during the lessons except in the subject of Social Studies. The teacher of Social Studies explained that the village authorities also addressed the school staff and teachers about the risks of holding the entertainment along the banks of the Okavango River. The risks are due to the presence of deadly wild animals such as crocodiles.

Third, this chapter presented on some elements of local environmental knowledge that are important and how teachers implement them in the curriculum. Some of the approaches of implementation are through the Guided discovery strategy, gardening, letter writing, poetry and group work. The instruction in Social Studies integrated some elements of local environmental knowledge. The data suggested that in some content areas of his instruction, the teacher of Social Studies taught about the conservation aims of water-lily plant species and fish species that are found in the Okavango Delta. The integration of this kind of content could suggest that there is the recognition of the local environmental knowledge during instruction in Social Studies. Still with the recognition of the local environmental knowledge, this chapter discussed that the land board authority, a Government department in Botswana, is tasked with allocating land, in designated places, for crop cultivation in the entire country. The suggestion is that this particular local environmental knowledge of crop cultivation is institutionally regulated mainly that there are two land-board offices (in Seronga and Shakawe villages) that are responsible for allocation of land in the Okavango region. The official regulation could promote the conservation aims of the CBNRM policy in the Okavango Delta. The
existence of consciousness about conservation and environmental awareness was also expressed by the teacher of Social Studies when he emphasized the importance of litter picking in the school. In stating the concept of Not In My Backyard (NIMBY), he discouraged students from throwing thrash and dirty water (after bath) onto other people’s yard.

Furthermore, this chapter presented that local people cut and harvest thatch grass. They arrange the grass in bundles of shape of triangles, which students learn in the topics of (1) Angle of Properties of Triangles and Quadrilaterals (2) Geometrical Constructions (3) Perimeters and Area and (4) Volume in Mathematics. The teacher of Mathematics used the local names of villages of students in calculating Speed, Time and Distance. This exemplify that it is possible for teachers to tap into the ‘funds of knowledge’ that exists among the community people and the students. Fourth, this Chapter presented on how the element of Tourism exists in the curriculum and how teachers implement it. During the fieldwork, the content of tourism existed mainly in the subject of Social Studies. Other subjects rarely incorporated the content of tourism.

Fifth, this chapter presented on simple tools (as observed in the science subject) that are usually used at homes or backyard gardens. The element of backyard gardens existed mainly in Science and Agriculture. The implementation of backyard gardening was through questioning, answering and scaffolding. The discovery teaching strategy seems to be the most described method of teaching preferred by teachers. It is a method of inquiry that emphasizes that the best way for a student to draw his or her past experiences and current knowledge is to discover facts and truths. Other preferred
methods of teaching stated by teachers include group work, field work, workshops and inviting community people to classes and to explain to students the contents that relate to the local knowledge. The preferred methods of teaching stated by teachers relate to the Place-based educational framework, Situated learning and Progressive education. The sixth and seventh elements discussed included Cultural practices and the History of place. The next Chapter, in this dissertation, is Chapter six. It discusses the perceptions of educational authorities towards environmental education in Botswana.
Chapter Six: Perceptions of Educational Authorities Towards Environmental Education

Introduction

This chapter presents and discusses the perceptions of Educational Authorities toward environmental education in Botswana. Specifically, the chapter presents the ideas of Educational Authorities that respond to the thematic findings that emerged and are discussed in the preceding chapters (i.e. Chapter four and Chapter five). The suggestions from Educational Authorities on how teachers should re-think their pedagogy styles on environmental education are discussed. The challenges that face effective integration of environmental education in the Curriculum and Instruction are also discussed through the perspectives of the Educational Authorities. The semi-structured interviews with the Educational Authorities were guided by the research questions, theoretical framework of place-based learning, lessons learned from interviewing community people and teachers and conducting the classroom observations. The profiles of ten Educational Authorities are summarized in table 2 to indicate their descriptions such as position held, resident status, and the work place.
Table 4

Profiles of educational authorities

<table>
<thead>
<tr>
<th>Authority</th>
<th>Gender</th>
<th>Position</th>
<th>Okavango Resident</th>
<th>Work place</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authority 1</td>
<td>M</td>
<td>UB Faculty &amp; NEESAP member</td>
<td>Non-resident</td>
<td>Gaborone</td>
</tr>
<tr>
<td>Authority 2</td>
<td>F</td>
<td>Curriculum Development Evaluation Officer</td>
<td>Non-resident</td>
<td>Gaborone</td>
</tr>
<tr>
<td>Authority 3</td>
<td>F</td>
<td>Regional Principal Education Officer</td>
<td>Resident</td>
<td>Maun</td>
</tr>
<tr>
<td>Authority 4</td>
<td>F</td>
<td>Local Principal Officer</td>
<td>Non-resident</td>
<td>Kauxwi</td>
</tr>
<tr>
<td>Authority 5</td>
<td>M</td>
<td>Member of regional EEC</td>
<td>Resident</td>
<td>Maun</td>
</tr>
<tr>
<td>Authority 6</td>
<td>M</td>
<td>Member of regional EEC</td>
<td>Non-resident</td>
<td>Gumare</td>
</tr>
<tr>
<td>Authority 7</td>
<td>M</td>
<td>Researcher in ORI (EC)</td>
<td>Non-resident</td>
<td>Maun</td>
</tr>
<tr>
<td>Authority 8</td>
<td>M</td>
<td>Researcher in ORI (Tourism)</td>
<td>Non-resident</td>
<td>Maun</td>
</tr>
<tr>
<td>Authority 9</td>
<td>M</td>
<td>Researcher in ORI (CBT)</td>
<td>Non-resident</td>
<td>Maun</td>
</tr>
<tr>
<td>Authority 10</td>
<td>M</td>
<td>DWNP representative</td>
<td>Non-resident</td>
<td>Maun</td>
</tr>
</tbody>
</table>

M = Male, F = Female, NEESAP = National Environmental Education Strategy and Action Plan, EEC = Environmental Education Committee, EC = Environmental communication, CBT = Community Based Tourism, ORI = Okavango Research Institute, DWNP = Department of Wildlife and National Park, UB = University of Botswana

The data from Educational Authorities suggested that the lived experiences of local environmental knowledge that are held by community people play an important role in teaching and learning. For example, the local environmental knowledge about plants (e.g. Blue sour plums) and animals (e.g. elephants) could be applied by teachers during teaching. The Educational Authorities explained some of the challenges that continue to impede the role of community people and consequently affect the process of teaching and learning.
Perceptions on crop and livestock farming practices.

Although environmental education in Botswana was officially recommended in 1994 by the Revised National Policy of Education, its practices are much older. For instance, Educational Authority 1 explained some practices about the history of environmental education in Botswana prior to the development of the first National Environmental Education Strategy and Action Plan, dated 1997-2003. He explained the Radio Botswana program of Agriculture (Temo-Thuo) was also engaged in broadcasting some integrated elements of environment during its sessions. He explained:

Although this was primarily for farmers, but in terms of the environment, there were some elements of environmental education such as water conservation and soil cultivation. There was also the kind of public education that was promoted through the newsletter called AgriNews, which was published by the Ministry of Agriculture (Personal interview, September 12, 2014).

The front page of the AgriNews letter, dated March 3, 2014, was written that it is dedicated to inform, educate and empower since 1970. Therefore, the date of 1970 suggested that the newsletter might have been publishing the elements of environmental education since 1970. Some of the elements of environmental education discussed in the AgriNews letter include dealing with the impact of flooding, potential of grain productivity, and late rainfall (Ministry of Agriculture, 2014). As described by the Educational Authority, the newsletter contained essential information related to Crop and
Livestock practices. It would have been more useful if farmers in rural areas have access to the newsletter and read and understand its contents.

**Perceptions on human and wildlife conflict.**

The lessons learnt in this case study suggested that the Okavango Delta is home to the infamous conflict between people and wild animals. Lions and other predators kill cattle, while elephants destroy crops in the farm lands, uproot trees, and ransack the landscape and consequently contribute into the erosion of the soils. The destruction caused by wild animals occurs mainly in the places that are adjacent to protected areas, such as Moremi Game Reserve and Chobe National Park. Community people also stated wild animals pose serious danger to their lives. During the semi-structured interviews in Kauxwi, elephant foot prints and their excreta were often seen on the ground. With this scenario in mind, the Educational Authority 10 (an employee in the Department of Wildlife and National Parks) was asked to explain how they were raising awareness about environmental education in relation to the destruction that is caused by wild animals. He explained that they often address community people through communal (*kgotla*) gatherings and during the World Environment Day. They also address community people about the impacts of poaching and explain the contents of the laws of Botswana regarding poaching and explain possible solutions. For instance, he stated section 46 of the Botswana’s Wildlife and National Parks Act stipulated that when a wild animal destroys property, the complainant could kill the wild animal. However, in relation to section 46, the educational authority explained:
But at the same time you find that you are not solving the problem. For example, let’s say a lion stays here and when you kill it you think that you are solving the problem. But, you could find that you are creating another open habitat since there would be no lion left in there. Later, another second lion could move into that habitat and after some time you could find that you have killed many lions. (Personal interview, August 15, 2014)

The Educational Authority above stated local people could kill the wild (problem) animal, but they should understand that wild animals are for all people in Botswana and they annually attract visitors, who pay a lot of money to enjoy Botswana’s wildlife and natural resources. Regarding the measures that deter elephants from destroying people’s property, the Educational Authority explained the ongoing project of using Chili Pepper, which is funded by the World Bank and the government of Botswana under the Ministry of Environment, Wildlife and Tourism. He stated the motivation of the project is to teach local communities about the mitigation measures that could be taken due to damages caused by the elephants. He explained: “when the elephant inhale the chili pepper, it gets irritated by the smoke released from the chilies and it then walks away to the opposite direction” (Personal interview, August 15, 2014). He explained the chili pepper (such as Tabasco) could be sprinkled on logs that surround the crop fields. The chili could also be mixed with cow dung or elephant dung. When the elephants approach, the farmer burns the chilly-dung and the smoke would cause the elephants to walk away and not enter the crop fields.
Perceptions on the importance of natural resources.

Educational Authority 3, the regional Principal Education Officer responsible for environmental education in Maun, was asked to explain how teachers, who have just arrived in the community, where they are assigned to teach, should learn about the local environment (e.g. Non-Timber Forests Products) and practices (e.g. Plant species that are used for traditional healing). She explained teachers should understand the varieties of food that local people eat, how they are surviving, and the natural resources in their locality. She said:

By so doing, it is going to help the teachers teach the local children. Even the children would share with the teachers on what they eat and the natural resources that they know. The teacher could also enquire from the local people and use the local natural resources in class as examples. (Personal interview, August 15, 2014)

She encouraged teachers to interact and mingle with the local people and avoid isolating themselves. She shared her experiences that during her time as a teacher, in the North East District of Botswana; also, she was also taught by students on how and when to harvest plant species such the Snot Apple (Azansa garckeana) and Marula (sclerocarya birrea). Educational Authority 5, a member of the regional Environmental Education Committee in Maun, was asked the question of what makes environmental education effective. He explained environmental education could be made effective through outdoor learning. He explained:
You need to take students out of the classroom and make them see and feel the contents of instruction…when you talk about how they should take care of animals, you need to take them to the wilderness so that they develop a firsthand information about what they have been taught. (Personal interview, August 15, 2014)

According to the above Educational Authority it is important to engage students on experiential activities such as nature trails in the woods and forest reserves. The teacher should explain the use of tree species. He explained through this process students grow up knowing their responsibilities as citizens how they need to take care of the environment and embrace environmental education in their daily lives.

On his part, Educational Authority 6, another member of regional Environmental Education Committee in Maun, emphasized that effective strategies of implementing environmental education could be explored through field trips such as nature trails and providing environmental literature such as nature corners, magazines, and posters.

Similar to educational authority 6 and 5 above, Educational Authority 3 suggested:

Teachers also have to take learners on educational tours like field trips so that learners can see and feel the tangible features…if you are teaching about the Tsodilo hills (a World Heritage Site), then arrange a tour and take the students to see the Tsodilo hills. If you are talking about wild animals, like us who are in this region of the Moremi game reserve, you arrange a trip on a Saturday and take the students to Moremi game reserve to go and see the natural resources. (Personal interview, August 15, 2014)
Perceptions on tourism.

The availability of tourism resources was acknowledged and commended by the Educational Authorities that were interviewed in this case study. However, some responses from the authorities suggested negative transformation of local people’s lives from the traditional life style to the modern or the western lifestyle. Educational Authority 8, a researcher at the Okavango Research Institute, explained that according to the findings of his research in the three communities of the Okavango Delta in Botswana, the growth of tourism gradually shifts the traditional lifestyle of local people from harvesting the veldt products in the forests to working in lodges and campsites that are mainly owned by non-citizens in Botswana. He suggested there is need to revisit the policy and plans of the tourism industry in Botswana. He attested: “People of Sankuyo are traditional people, who lived traditional lifestyle for a very long time. They applied their indigenous knowledge to survive in their local environment. The program of CBNRM is somehow helpful to them” (Personal interview, August 20, 2014). For his part Educational Authority 5 acknowledged that the 1994 Revised National Policy of Education has some elements of sustainability, and teachers need to tap, as well, into the strategies of traditional and indigenous knowledge systems. He explained:

There is also the Wildlife Conservation and National Parks Act, which deals with how national parks should be regulated. This act also caters for the CBNRM, which emphasizes that people should benefit from the tourism activities that take place in their localities. For example, the people of Sankuyo village have formed a CBNRM trust. (Personal interview, August 15, 2014)
The Educational Authority further indicated that teachers need to take advantage of tourist attractions (the local wildlife resources) that are found in the Okavango region and integrate them in the teaching curriculum with the purpose of promoting environmental education.

**Perceptions on local cultural practices.**

The main idea from Education Authorities regarding local cultural practices was the indigenous knowledge should be acknowledged by the teachers in schools. This would facilitate communication and understanding between community people and teachers and consequently promote the conservation of natural resources. Educational Authority 7, a researcher at the Okavango Research Institute, shared his experience from conducting a study focused on knowledge sharing behaviors among local stakeholders in the Okavango Delta. He explained the desire of community people is that non-community members (such as researchers, teachers, and other government employees and visitors) should be unpretentious and bring themselves to the level of community people so that they are able to understand the cultural practices at the local place. He concluded non-community members should address local people through the local chiefs who understand the indigenous knowledge systems of their places.

The above explanation suggested information sharing on environmental education, at the local level, should follow place-based cultural channels of engaging the local leaders and giving them the lead in addressing the local people. In this case study, the interviewer had asked the Educational Authority above to explain how environmental issues could effectively be communicated with local people. The ideas from this
Educational Authority supported some elements that are embedded in David Kolb’s theory, whereby the choice of learning style should reflect the individual’s abilities, environment, and learning history. It could also be suggested that local people would learn more about environmental education when the subject matter (such as pollution and poaching) is presented in a fashion that is consistent with their preferred learning style.

Educational Authority 1 was also asked to share his ideas about the cultural instructions given by some parents at home to their children and advising them to avoid questioning elders and just listen to the instructions. According to the experience of the researcher, for this case study, who grow up and lived in Botswana one of the cultural practices of raising children in Botswana and in some countries of Africa is that they desist in questioning elderly people. Consequently, children also apply this practice when they get to schools. They remain calm and not respond to the questions from their teacher (who is an elderly person) or contribute to the discussion during class. In his response, the Educational Authority argued that there is need to deal with cultural stereotyping. He explained it is important for teachers to understand what is meant by the learner centered pedagogy and how to implement this pedagogy. He stated:

If the teacher does not understand the learner centered pedagogy then there is a problem. If the supervisor of the teacher does not understand the learner centered pedagogy then we are going to have a problem because we are going to be assessed according to this old type…even though it is learner centered. People in our place believe that learner centered means group work. It is either group work or individual work…But then we have to expand …and say when I say group
work, do I understand the dynamics in terms of the learner? Do I understand the social background of this learner? When I say learner centered pedagogy, it means that the learning activity I am going to design should be tailored to this learner that I know. (Personal interview, September 12, 2014)

According to the above Educational Authority, learner centered pedagogy constitutes the social experiences and needs such as the electrical lights that enables the learner to write school assignments at his or her home place. He argued that the learner centered pedagogy does not refer only to group work, rather there are social and economic issues attached to it. Furthermore he said:

When I give the learner some assignments to do at home, will he or she be able to do it or it is the learner who will be distracted by parents from doing the school work. Sometimes the child reaches home and finds that the parents have a conflict. Teachers have to understand this possibility.

The perceptions above suggested teachers should understand the cultural practices, social and economic factors that surround the learner. Although it is not advisable for children to remain reserved and mouth-zipped in the classroom, the above Educational Authority seems to suggest that teachers should understand the challenges that face learners at home.

Educational authority 4, who is the local principal education officer in the village of Kauxwi, was asked to explain the role of Parents Teachers Association (PTA), which is a committee that consists of teachers and some community people. She explained the role of PTA is to support the management of the school
and contribute to effective partnership between the local community and the school. She explained:

According to the constitution of PTA, it was agreed that meetings should occur once in a school term because some parents stay far away from school. Often we hear parents stating that they stay far away from school; some of them stated that they do not have money to come all the way to school. Transport is a challenge for parents.

The long distance from school to catchment villages, in the panhandle of the Okavango Delta panhandle, was explained by some parents who were interviewed in the villages of Gani and Sekondombo. The above educational authority recalled in the year 2012 they arranged with the North West District Council officials to provide vehicles that could assist and drive parents from their homes to the school. She emphasized:

Last year we took a tour to all the catchment villages and addressed the parents. We were accompanied by the Chief of Kauxwi village. The parents realized the need to work together and be involved in the management of the school. They were surely promising to come and attend the school meetings. The office of the School Head is also part of the Village Extension Team (VET). One of the purposes of VET is to sensitize parents about the importance of education. If the performance of the learners is to improve there is need for collaboration between parents and teachers.

The initiative to be accompanied by the Chief of the village supported the suggestion made by Educational Authority 7, who advised that information from non-
community should be communicated and reach the local people through the local chiefs who understand the local cultural practices. In relation to the above challenges of lack of transport and long distances, Educational Authority 5 explained that in some schools parents are dragging their feet to participate in the affairs of the school. He argued that effective participation of the community is a strategy of taking the school to the community, and as a result members of the community would be interested in understanding how they could collaborate with the teachers.

Educational Authorities argued that much of the local experience brought by students to school carries elements of local environmental knowledge, historical and cultural practices. This knowledge is essential in relation to what Haverkos (2014) calls historical reenacting, which is defined as an interaction with nature over time and leading to a critical perspective that can inform the understanding of the past, present and the future. According to Haverkos (2014), Dewey (1944) wrote that knowledge of the past is key to understanding the present. Therefore, the discussions below suggested that teachers in schools should tap into the local cultural practices and lived experiences that exist in the communities, where schools are situated.

Educational Authority 5 was asked to explain some of the teaching strategies that he used when teaching the subject of Moral Education. He is a teacher of a Junior Secondary School in Maun and at the same time he is a member of the regional environmental education committee. He explained that during group work students are at liberty to discuss given topics using their indigenous language. Furthermore, he stated: “...and in that way you tend to get more contributions pertaining to the topic of learning.
At the end, you realize that you are going to achieve the lesson objective” (Personal interview, August 15, 2015). This perception suggested he encourages the use of indigenous languages during instruction. He added that indigenous language is vital in daily lives and should be implemented in the school curriculum. This perception also supported the responses from some parents in Mohembo village and Sekondombo village who advocated for the use of indigenous languages in schools.

In her research paper titled *Going to the bush: Language, power and the conserved environment in southern Africa*, Cloete (2011) questioned the hegemony of the English language as the man language of learning and teaching that include environmental education. She argued that the English language facilitated the discourses that exist in Africa’s conserved natural environment, tourism, and environmental education at the expense of indigenous knowledge systems. Cloete (2011) stated:

> As a former colonial language that has become the principal means of formal postcolonial communication in large tracts of eastern and southern Africa, English’s influence and the desirability of access to it is increasing at the cost of indigenous languages and local communities’ environment-related practices (p. 35).

According to Cloete (2011), there is less desire to engage in traditional ecological knowledge among youth in southern African region. Regarding CBNRM, Cloete (2011) wrote:

> Community-Based Natural Resource Management projects (CBNRM) in Southern Africa are rural initiatives; and even though one of the CBNRM’s
objectives is to promote ‘the mainstreaming of CBNRM in formal and non-formal educational initiatives’, there is not yet such mainstreaming in the national government’s teacher guidebooks geared towards enabling an environmental focus in teaching. (p. 42)

Educational Authority 5 advised that teachers should engage in conducting research and consult the 1994 Revised National Policy of Education and the 1992 Botswana Wildlife and National Parks Act. He argued that these Government documents include elements of indigenous knowledge and sustainability practices. He said the Botswana Wildlife Conservation and National Parks Act also support the policy of CBNRM, which emphasized that local communities should reap benefits from tourism resources that are adjacent to their places.

The existence and emphasis of the recognition of local cultural practices was made by other educational authorities as well. Educational Authority 6, who is also a member of the regional Environmental Education Committee, stated: “To me indigenous knowledge is original. It is more practical than theory; hence I treat it with high regard” (Personal interview, September 26, 2014). Educational Authority 2, from the Headquarters of the Ministry of Education, explained children have a wealth of local knowledge and experience, which teachers should utilize during instruction. She was explaining how teachers should respond to the local experience. The above emphasis supported the sentiments from the regional Educational Authority who stated as follows on August 15, 2014 during the personal interview:
You do not have to take learners for granted. They have the indigenous knowledge that they carry from home. This knowledge is very important and we can lay a foundation. You have to determine how much do they know and you add on what they do not know.

Educational Authority 1 concurred with the above sentiments by stating teachers should take advantage of the opportunities existent from the local environmental knowledge embedded in the local experience carried by students. He stated:

I think it is actually how we can go about it instead of developing the material that may be contextually irrelevant to a particular locality when it come to the teaching of local ecological knowledge. If I am going to develop a program on indigenous knowledge I would be basing on my local knowledge or researched local knowledge somewhere. But it may not be contextually relevant to that particular school. So, I think that teachers are able to know that they can actually use this local ecological knowledge or prior knowledge that the students bring to class.

Educational Authority 10, from the Department of Wildlife and National Parks was asked to explain the effectiveness of local cultural practices on wildlife conservation. He explained that the cultural approaches that were adopted long time ago still play a major role in the conservation of natural resources. The below suggestion indicated that teachers should take advantage and implement the practice of totem-recognition in curriculum and instruction, thus enabling students to understand the content of instruction:
We do have modern ways of conservation and the traditional ways. For example, my totem is a baboon. As you know, a totem has got some principles that we should observe. For instance, like you are not supposed to kill your animal totem. You are not supposed to touch it because wounds may develop on your body. I believe that these traditional practices helped a lot in terms of conservation and leading to the modern ways of conservation as well. (Personal interview, August 15, 2014)

The perception by one of the teachers that officials from Curriculum Development and Evaluation have not effectively integrated the objectives of environmental education in the syllabus was reiterated by Educational authority 5, who stated: “But you find that our curriculum does not cater for that. The curriculum sidelines indigenous knowledge” (Personal interview, August 15, 2014). The Educational Authority was responding to a question on how teachers could integrate the local experiences that are carried from home and transferred to school by the students. He argued indigenous knowledge is vital in the daily lives; therefore teachers should invite, to classrooms, local traditional doctors who have historical experiences about the existence and utilization of local plants and animal species. He elaborated: “they would know which trees to harvest and when to harvest them. So, really, this tells us that community people are environmental friendly. We need to tap onto their local experiences instead of leaving out this indigenous knowledge”. The suggestion of inviting community people to share their local experiences was also stated by Educational Authority 6, who suggested teachers and students could also visit any elderly community
person and learn from them. The authority stated: “Let us trust the information that students learn and bring from home.”

The above perceptions from regional authorities were echoed by Educational Authority 2, from the Ministry of Education. She explained on how teachers could implement the local experiences that students carry from home. For example, she talked about the theme of the fair for environmental education held in 2013, which was titled *Indigenous knowledge-a step towards poverty eradication and environmental sustainability*. Compared with other previously discussed perceptions, she emphasized local knowledge should be blended with the modern knowledge system. Furthermore, she reverberated:

> If there are chances of someone within the community who is knowledgeable we ask the teachers to consult and call that particular person to school so that they impart their local experiences to students. Every village has its own holders of indigenous knowledge. These are the people that we depend upon.

The above totality of experiences, traditional structures of community helps to constitute the funds of knowledge students bring to school. Moll, Amanti, Neff and Gonzalez (1992), wrote that funds of knowledge refer to “historically accumulated and culturally developed bodies of knowledge and skills essential for household or individual functioning and well-being” (p. 2). The discussions in this chapter about the perceptions of Educational Authorities toward environmental education, on the basis of place-based education, suggested Educational Authorities believe local people possess a variety of
funds of knowledge that include local environmental knowledge on plants and wild animals.

**Re-thinking Effective Integration in the Atmosphere of Challenges**

Educational Authorities suggested a variety of experiential pedagogical activities, on the basis of place-based education, that could improve environmental education in the curriculum. Some of the activities that they suggested are as follows: Outdoor learning that incorporates fieldwork and nature trailing in the Tsodilo Hills, which is a World Heritage Site. UNESCO World Heritage Centre (1992-2015) stated as follows about the Tsodilo hills:

> The Hills have provided shelter and other resources to people for over 100,000 years. It now retains a remarkable record, in its archaeology, its rock art, and its continuing traditions, not only of this use but also of the development of human culture and of a symbiotic nature/human relationship over many thousands of years. (UNESCO, 2015, para 1)

Other suggestions by Educational Authorities included Group work, Provision of various environmental magazines and better understanding of the learner centered pedagogy when teachers integrate environmental education. One of the Educational Authorities explained it is important to promote the learner centered education by understanding the background of the learners such as where they come from and being aware of their economic and social issues. He argued:

> So the actual teaching has to be hands-on. We have to reduce classroom time and give them time to actually do a meaningful outdoor type of teaching and learning.
It has to be linked to the classroom discussion. If I am teaching standard one pupils about animals I have to start from the classroom so that when I take them outside, either in the school-yard or beyond the school yard I can make a link.

He suggested that students be empowered in terms of the teaching and learning, well planned discussions and there should be discussions through debate. Moreover, the teacher – led pedagogy should be reduced by having teachers introduce the topic and allowing the students take over and facilitate the instruction instead of following the conventional type of teaching. Although this suggestion is desired for instruction, it might work against the cultural practices of some parents at home who still find the importance of children remaining dormant and not questioning. The Educational Authority stated that it is important for teachers to understand the strengths and weaknesses of group work and be able to coordinate a higher number of students in a class. He explained that the student – teacher ratio is always a challenge to a successful student-centered learning approach. He said:

The other thing is the design of the classroom. Some of the students would be using the benches. If you say a group of five, you mean a line of five, that’s not a group! So they can’t come together face to face for the discussion. You end up having two or three pupils. Those at the other end of the table are just there waiting for the siren to ring and they disperse.

On her part, the local principal education officer in the village of Kauxwi suggested that student centered methods such as group work and discovery methods could help students discover on their own. She stated that learners will have the
opportunity to go outside and observe the environment. The Educational Authority who
is a member of the regional Environmental Education Committee in Maun explained that
they used to collaborate with officials from the department agriculture, who engaged
them during the National Day of Tree Planting. He made this explanation as he
elaborated on the roles that he play as a member of the regional committee for
environmental education in Maun. The conflict of interest between institutions was also
raised by the Educational Authority above, who argued that the national activities of
environmental education used to be coordinated by authorities from the Association of
Environmental Clubs in Botswana (AECB), but now the activities of environmental
education are coordinated by authorities from the Department of Environmental Affairs
(DEA).

When asked about this shift, the educational authority from the University of
Botswana confirmed that the Department of Environmental Affairs under the Ministry of
Environment Wildlife and Tourism, is the custodian of Environmental Education. He
explained that the Wildlife department (through the videos shown during communal
gatherings), and still the NGOs such as Kalahari Conservation Society and
Environmental Watch Botswana are also involved in the public activities of
implementing environmental education. However, it has shown nationwide that
Environmental Education still has a long way to go. He advised that it is important to
reenact the radio programs that used to broadcast sessions on *Makgabisa Naga*
(Beautifying Wildlife) and Livestock Farming. He also said: “In addition, we had the
museum radio program in relation to heritage education. They were actually doing a good
job through their zebra’s voice radio programme and magazine” (Personal interview, September 12, 2014).

Although place-based activities are desired in schools, the regional principal education officer for environmental education explained the shortage of funds as follows: “But this year we did not have the regional fairs due to lack of funds. The Government told us that there is shortage of funds. However, last year we hosted the environmental education fair in Maun” (Personal interview, August 15, 2014). She reiterated that environmental education needs office space in schools and at the regional education offices. She said activities of environmental education should not be baby-seated. She suggested that there should be the Principal Education Officer for Environmental Education, focusing on issues of environment. Environmental education should be included in the timetable so that teachers can teach it as a subject. She advocated that environmental education be included twice a week. This suggestion might lead to separate subject approach instead of promoting subject inter-disciplinarity.

Educational Authorities made suggestions that focus on the initiatives that promote professional development of teachers for the benefit of environmental education. For instance, the Educational Authority, at the Okavango Research Institute, explained during the personal interview on August 13, 2014 that the questions he was addressing on his study in the Okavango Delta were as follows: when do people share environmental information when they have been attending workshops? What are the needs and factors that would promote the attendant to go and share the information, knowing that it is not everybody capable of doing it? He wondered if it is a wiser idea of taking someone just
because they are in the committee and say that they will go to update their colleagues at
their work place. He explained that he had to look at concepts like issues of attitude of
someone toward knowledge sharing and it is possible to guess, using this method that the
officer would not succeed in updating their colleagues. Furthermore he said:

And the other aspect from attitude is the Locus of Control, whereby you check
someone if they can really make things happen or they expect something external
to push them, whereby you would ask someone…You have been from this
workshop, what will take you to present to your community? Are you going to
wait for the chief to arrange a meeting? You will be shocked that some indicated
that I will make things move with or without the chief. Some just said I need the
intervention of somebody. So you can always tell from the characteristics of
people. So unfortunately these are things whereby we are trying to communicate
using representatives.

The Educational Authority argued that it could become a problem to assume that
workshop attendees would actually update their colleagues. He said that he proposed a
model for knowledge sharing in terms of environmental information. The relevance of
this explanation is that it was discovered that at the Junior Secondary School, the
environmental education coordinator had not yet updated his colleagues about the
regional worship of environmental education that he attended in Maun. He advised as
follows: “One thing that has been dismissed generally in environmental education is the
issue of bombarding people with knowledge because knowledge does not change
behavior” (Personal interview, August 13, 2014). In relation to the issue of Professional
Development above, Educational Authority 2 explained that they often conduct workshops that are geared toward helping teachers implement environmental education in classrooms. Furthermore, she explained that they conduct workshops with in-service officers in all the regions of Botswana with the hope that they will share the lessons learned with other teachers in their school. This hope is the one that was being challenged by the Educational Authority, from the Okavango Research Institute that it is not always obvious that workshop participants will transmit lessons learned to their colleagues.

The regional principal education officer for environmental education advised it is important for teachers to engage in conducting research. She stated the district council is in the process of installing internet in all the schools so that teachers could effectively do research to support their instruction. She suggested teachers should also show research interest by using their mobiles phones to access academic materials from the internet. Although this could be a valuable initiative some teachers might not have mobile phones that access internet and those with such mobile phones might demand reimbursement for buying excess telephone credit. Some of the constraints often stated by Educational Authorities included time, availability of resources and higher expectations from implementing environmental education.

According to the member of the regional Environmental Education Committee, the lack of time and transport forces the regional education committee to visit schools only once each term. He claimed they also have to meet some deadlines as teachers. He indicated most of the time some supervisors in schools would not allow teachers, staff and students to effectively carry out environmental education related activities because
they are time consuming. He reiterated environmental education needs somebody who
has care for the environment. He said:

So then other people would be interested in knowing how they can help the
school, for example we had a plan of a ‘Cultural Site’ just by the school gate.
When the project was about to start, we were told that the school is going to
undergo some developments. Then part of that area of the Cultural Site might be
affected. There is no how we can go ahead with the project. This really affected
us so much and demoralized the students as well.

In relation to the above issues of resources that include time, the Educational Authority
from curriculum development stated:

That is what the curriculum has now decided to do although it is supposed to be
done at the regional scale. We are seeing that there is little progress when it comes
to the School Environmental Education Policy (SEEP). Remember, every school
should have its own environmental education policy. Sometimes we do not really
blame the teachers. It is because of this dual mandate and rules. We do not have
permanent environmental education officers in our ministry.

The educational authority shared her ideas on the reactions of the general public in
Botswana on the National Environmental Education and Action Plan Strategy (2009 –
2912). She argued teachers know about the National Environmental Education Strategy
and Action Plan. She believes the strategy has revived environmental education which
was dormant for some years. This idea contradict the response from the English teacher,
who argued Educational Authorities have not clearly articulated the objectives of environmental education in the curriculum.

Summary of Chapter Six

This chapter has presented the perceptions of educational authorities toward environmental education in Botswana on the basis of the theoretical framework of place-based education. Specifically, the perceptions that are presented focused on (1) Crop and livestock systems (2) Human and Wildlife conflict (3) Importance of natural resources (4) tourism (5) Local cultural practices and (6) How teachers should re-think their teaching styles about environmental education.

Community people possess a variety of funds of knowledge that include local environmental knowledge on plants and wild animals. They have historical and lived experiences about the destruction that is caused by wild animals, mainly elephants that are a menace to the farm lands. These lived experiences have a potential in classroom instruction. Although community people have a wealth of local knowledge, the data indicated that this knowledge has not been effectively integrated in the curriculum and instruction. For example, the Educational Authority, who is a board member of the National Environmental Education Strategy and Action Plan, emphasized that the public has raised concerns on the weaknesses regarding the publication and distribution of the strategy (National Environmental Education Strategy and Action Plan). Other lessons learned from this part of the discussion are that local people’s choices of learning styles and history determines the success of implementing environmental initiatives. Therefore, it is essential that non-community members learn from community people, who should
lead in raising local awareness regarding environmental issues. It is also important that teachers understand the dynamics that face the learner centered pedagogy when they utilize strategies that aim at integrating environmental education.

The data suggested information sharing with community people, should follow the local cultural practices. The local authorities are preferred to lead the discussions with the community people. This could ensure local people understand the discussions and are most likely to implement the suggestions that are made. Educational authorities suggested community people, with historically lived experiences, should be invited in classrooms to discuss with the students about the knowledge on cultural practices and resources such as plants, water, and animals. This local environmental knowledge could strengthen school-community partnerships, which is an element of place-based education. It is essential that new teachers interact and join Communities of Practice on their arrival in places where they are assigned teaching positions.

Students carry local environmental knowledge, historical and cultural practices from their homes to school. Therefore, teachers need to understand the social and economic backgrounds of students. Educational Authorities argued for the use of indigenous knowledge and that teachers should tap into it during instruction. Furthermore, the data in this chapter suggested that teachers should give examples of environmental resources during instruction, engage students on place-based activities such as field-trips and nature trailing in protected areas such as the Moremi Game Reserve. The school management should take an active role on environmental education
and there should be continuation of environmental projects when pioneers of such projects decide to take transfer.

This chapter has also presented challenges impacting the implementation of environmental education. The objectives of environmental education have not effectively reached all teachers. Parents do not have sufficient funds and therefore they lack transport to participate and engage in the activities of the school. Consequently, local people with lived experiences of nature (such as traditional healing, preparation of Tabasco Chili to deter elephants) rarely participate in the school activities. The next chapter of this case study is chapter seven, which is the final chapter in this study. Chapter seven provides the summary of the case study, major findings of the study, implications, conclusion and suggestions.
Chapter Seven: Summary, Findings, Implications, Conclusions and Ideas for Further Research

Introduction

Chapter Seven is the final chapter for this case study. The purpose of this chapter is to provide a brief summary of the study, major findings, implications, conclusions and ideas for further research. Based on the thematic findings in the panhandle of the Okavango Delta, the chapter proposed important ideas to enhance the integration of environmental education in Botswana.

Summary of the Study

The case study has indicated community people, in the panhandle of the Okavango Delta, indeed have a wide lived experience with environmental resources. This finding supports research such as Keitumetse (2011), Mbaiwa (2008), the elephant survey report by Songhurst and Chase (2010), and Weaver (2008) that Botswana has a wealth of cultural and environmental resources including wildlife. The government of Botswana has launched important programs (e.g. EESAP 2007-2012, Vision 2016, CBNRM 2007, and SEEP) to support the implementation of environmental education in schools and raise the awareness and conservation of natural resources by local communities. The 1994 RNPE of Botswana recommended environmental education should be integrated in the school curriculum. This case study has reviewed the literature on environmental education in Botswana, which reported that the elements of environmental education exist primarily in the subjects of Social Studies and Sciences.
The first research question this case study asked is what are the key elements of local environmental knowledge existent in the panhandle of the Okavango Delta? The CBNRM policy demonstrated the Government of Botswana is committed to the conservation of cultural and natural resources, but this commitment has also led to some negative outcomes. For example, recent studies (Demotts et. al., 2009 and Mbaiwa, 2011) lamented there is a transition of traditional lifestyles to modern lifestyles as local people continue to earn money by working in lodges and campsites situated in the Okavango Delta. This contention has manifested itself in the school classroom.

Sobel (2005) stated the approach of place-based education helps students develop stronger linkages to their local and traditional communities. This important approach enhances students’ appreciation for the natural world. Likewise, in describing the need for a theory of experience, Dewey (1938) stated:

Rejection of the philosophy and practice of traditional education sets a new type of difficult educational problem for those who believe in new type of education. We shall operate blindly and in confusion until we recognize that departure from the old solves no problems. (p. 25)

The above statements from David Sobel and John Dewey provide a basis for cautioning against shifting from the traditional lifestyle, which constitutes the local knowledge, to a modern lifestyle and consequently rejecting the traditional education with its cultural experiences.
Hence, the second question in this case study asked: To what extent is the local environmental knowledge present in curriculum and instruction in the junior secondary school? To address this question, the researcher explored the extent to which teachers integrated local environmental knowledge into the curriculum as well as how teachers implemented environmental education in the curriculum. Finally, the researcher was interested in understanding the perceptions of Educational Authorities toward environmental education.

The researcher conducted this case study in Botswana to address the four questions above. The data collection methods employed in this study included document analysis, classroom observations and the semi-structured interviews. The researcher collected data about the local environmental knowledge, as a process (Berkes, 2009), among community people in the region. The researcher also conducted interviews with teachers to assess the extent to which local environmental knowledge is present in curriculum and instruction as well as how teachers implement environmental education into the curriculum. In addition, the researcher interviewed regional and national Educational Authorities to determine their perceptions toward environmental education. In this case study, several research procedures such as reflexivity, prolonged engagement in the study area, member checking, triangulation of methods, peer debriefing, external auditing with the committee, researcher’s experience, and ethics were carried out to ensure that the case study is credible and its findings trustworthy. The major related findings that specifically answer the research questions of this case study are presented below.
Major Findings

Research question 1: What are the key elements of local environmental knowledge that exist in the study area?

This case study explored various lived experiences of community people with environmental resources, in the panhandle of the Okavango Delta. It was found that community people are in possession of knowledge that constitutes the local environmental knowledge. This finding suggests that the local environmental knowledge reflects the natural resources characteristic of the region. First, crop and livestock farming practices are a cultural activity and livelihood that is carried out by local people in the panhandle. Crop farming is one of the land cultivation practices for crops such as maize, sorghum, millet, watermelons, and pumpkins. Leguminous crops such as peanuts and beans are also cultivated. As confirmed by Statistics Botswana (2014), crop farms in the Okavango region are increasingly destroyed by wild animals, essentially elephants. Other wild animals that destroy crops are hippos, birds such as quelea and guinea fowls. In addition to the destruction that is caused by wild animals, intermittent rainfall contributes to the rotting of water melons.

The shift from cultivating close to the river channels (flood recession farming) to dryland areas has received different responses from community people with some interviewees arguing that the soils, in drier areas, is more suitable for sorghum and millet, but not maize. The findings suggested that the shift from flood recession farming is also politically motivated by the Government authorities who intend to enlarge tourism related activities in the wetland. This could also explain the reason why land board
authorities have stopped offering crop farming certificates in the wetland area. Moreover, there is no compensation offered for the destruction that is caused by wild animals in crop fields that are in the wetland area. Hippos and hyenas also threaten human lives. Incidents of local people being killed by elephants are common in the Okavango Delta. Local people also keep cattle, donkeys, and goats. Cattle often get in contact with Foot and Mouth (FMD) disease virus.

Second, it was found that community people bear local knowledge about the importance of environmental resources. Tree species such as Camel thorn provide shade during dry and sunny periods and timber for building huts, kraals for livestock, and encircling communal water standpipes. Grass is mainly harvested from the nearby forests and used for thatching huts and selling to potential buyers. Community people hold the knowledge that the harvesting period for thatch grass starts from July 15 until the month of October, every year. This was exemplified by the interviewee in the village of Gani. During this period, the seeds of thatch grass would have already fallen on the ground and ready to germinate again. Local people harvest fruits of Brown Ivory tree between the months of February and March. The fruits of the African Jackal berries are harvested during the winter season.

The above harvesting period shows that local people have experience about the harvesting of veldt products in their local place. This local knowledge is very important to document for the benefit of future generations. They stated that veldt products such as Rough-leaved raisins, African jackal berries, and Monkey oranges supplement the dietary human needs. The researcher and one of the headmen met five women carrying buckets
(about 20 liters each) of the African Jackal berries in the village of Kauxwi. The women explained that they were going to prepare dinner for family members. Some community people emphasized that wild animals deserve protection so that they benefit the future generations. Wild animals were also regarded by interviewees as sources of tourist attraction in the panhandle of the Okavango Delta.

In relation to the importance of environmental resources above, community people bear local knowledge about plants’ species that are edible and those that are used for traditional healing of sicknesses and for use during cultural ceremonies (rain making and marriage reinforcement). For example, traditional doctors dig the roots of Blue sour plums, boil them and offer patients the boiled water to drink. The roots of Camel thorn trees are also boiled and the warm water is offered to the patient who bleeds from the nose or having a cough. The culture of community people is also represented by the majority of women who are engaged in weaving traditional baskets. They harvest the fibers of real fan palm tree (*mokolwane* tree, *Hyphaene petersiana*) from the Okavango river banks, boil them and use the dye as a colorant to the dry palm leaves.

Community people mentioned that they carry out ritual practices after killing game and after harvesting crops. One of the ward headmen, in the village of Gani, also demonstrated how to eat the fruit of a wild orange using wooden stick to avoid vomiting when using a modern spoon. In all the five villages under this case study, community people advocated for the use of indigenous languages during instruction by teachers in school. In the village of Mohembo, one of the interviewees explained that the use of indigenous language as a medium of instruction would enable students easily understand
the instructional content. Interviewees from the villages suggested that it is relevant for teachers to understand the cultural background of the learners that they are teaching. They argued that culture is an identity of a human being. The above suggestions reflect Dewey’s (1938) assertion: “The teacher should become intimately acquainted with the conditions of the local community, physical, historical, economic, occupational, etc., in order to utilize them as educational resources” (p. 40). Some interviewees, from the San ethnic tribe, stated that they perform ritual practices after killing the game. By so doing, they believe that they would catch more game in the next hunting spree. Moreover, their culture consists of performing sacrifices to the ancestors as a way of thanking them for the harvests and believing that they will have plenty of harvest in the next season of cultivation.

Third, community people bear local knowledge on the history of place such as the meaning of local names of their villages. Surprisingly, the study found that village names such as Kauxwi, Gani, and Xakao have meanings that are related to wildlife resources such as buffaloes, antelope, and grass. In addition, Gowa (one of the village wards) means an Aardvark (*Thakadu*), which is a wild animal that local people used to see visiting the river valley quite often. Eventually the land, was given the name *Guwa*, which they currently spell *Gowa*. This finding suggests that community people, who were interviewed, in their lived situations, in the panhandle of the Okavango Delta, have ecological ties to the land and the resources that are found in their place.
Research question 2: To what extent is the local environmental knowledge present in the curriculum and instruction?

This case study explored contents of teachers’ instruction that might have been connected to real world experiential activities. The findings suggest that some contents of teachers’ instruction were mainly based on the local environment, in the panhandle of the Okavango Delta. Although this might have been the case, the majority of principles of place-based education were not fulfilled. Some of the principles included hands on activity by the students and engaging students on local community projects.

In one of the lessons of Agriculture, the teacher taught students about communal grazing and ranching systems of beef cattle. This instruction, during the subject of Agriculture, took place inside the classroom for all the 12 weeks of the second term of school year. The teacher of Agriculture taught content related to the tradition of communal grazing that the researcher learned in his interviews with community people. Community people graze their livestock (such as cattle, goats and donkeys) in the communal lands during the day. Although some elements of environment emerged from the instruction of Agriculture, the principles of place-based education rarely emerged. The two teachers of Agriculture explained, during the semi-structured interviewees, that their department had ordered chickens for students’ outdoor – projects, but the delivery has not yet been made.

In one of the Social Studies lessons the teacher often stated examples such as the local aquatic species, vegetation, and wild animals that are found in the Okavango Delta. Moreover, he taught about environmental determinism, whereby he explained that local
people in the panhandle of the Okavango region construct huts using reeds (a perennial grass) harvested from the Okavango River. Essentially, the teacher explained to the students that the environment determines the lifestyle of local people in the Okavango Delta. The subject of social studies included the content of tourism, whereby the teacher raised a concern that tourism structures are continuously built on the banks of the Okavango River. He stated that local people might have lived for a long time on the banks of the Okavango River. Therefore, there is need for them to have fair access and use of environmental resources that are found along the Okavango River.

The subject of Social Studies was the only one where students had an outdoor hands-on activity of observing and tallying types of cars that drove past the gravel highway in-front of the school entrance. In this subject, the students worked in pairs to carry out a brief (about 10 – 15 minutes) interview with any staff member of the school that they met around the school-yard. This activity resembled the principles of place-based education by teaching in the school-yard, outside the traditional classroom. The teacher of Social Studies was observed inside the classroom discussing the conservation aims of water lily plants and fish in the Okavango Delta. He also emphasized the importance of litter picking in and around the Junior Secondary School. In using the concept of Not In My Backyard (NIMBY), he spoke against people who sometimes dump litter and grey-water onto other people’s yard. In the subject of science, the theme of living in a hygienic environment resembled awareness (consciousness) of a clean and hygienic environment.
In the subject of Mathematics, the teacher rarely incorporated elements of environmental education. However, the local geographical names (such as Mohembo village and Sekondomboro village) of villages where students commute from home to the school were mentioned by the teacher during the lesson that involved the content of Time, Distance, and Speed. In calculating the distance (d), the teacher simplified the question and employed the local geographical village names. For example, he stated: “If I ask you to tell me the distance between Mohembo village and Sekondomboro village, you are most likely to respond with a whole number without significant digits.”

It was a surprise that in several lessons of the subject of English, the teacher integrated the contents of environment. For example, during the lesson that involved Letter writing the teacher asked the students to write a letter to the Principal of the school regarding the poor odor that emerged from a broken sewage-pipe in the school. Furthermore, the students also used the Poetry book titled Let me Be – a junior anthology of poetry, which incorporated environmental related poems such as What the leaves said, The New-Comer and Who Killed the Swan. The students discussed aquatic species such as fish in the river, animals such as the polar bear in the snow, and hills and trees in the poem titled The New-Comer. In the poem titled Who killed the Swan the students discussed the management of water in the river. The Poet advised fishermen and other water users against dumping waste (e.g. oil, plastics, and tins) in the water as they may be harmful to birds such as the Swan and other wildlife such as crocodiles, fish, and hippopotami. However, just like in the subjects of Agriculture and Mathematics, in all the
12 weeks of the school’s second term, the teacher of English did not engage students in any hands-on-activity. All English lessons occurred inside the classroom.

In one of the lessons of Science subject, some of the simple tools that were mentioned by students included the digging fork, trowel, watering can and rake. These are also the local agricultural tools that community people often keep in their compounds and in the backyard gardens in many rural villages of Botswana. The other local machine that was mentioned in the class is the Pontoon, which offers the only practical way to access the eastern side of the panhandle with a vehicle. In this subject of science, Mrs. Jonathan taught about the related concepts of Managing Natural Resources and Pollution. She engaged the students in explaining different types of pollution, their sources, methods of controlling pollution, effects of water and air pollution on human’s health and measures of preventing pollution in a local place. Some of the ways of controlling solid, air and water pollution were discussed during the class. In the subject of science, the students attended all the classes in the science laboratory. There were no hands on activity for all the students. Only two student presenters (a boy and a girl) were randomly chosen by the teacher to stand in-front of other students and explain some parts of the model of the human skeleton.

Community people argued that the local environmental knowledge should be integrated in the school curriculum. However, the findings presented in this case study suggest that the school does not have adequate resources needed to effectively integrate environmental education into the school curriculum. The principles of place-based education (e.g. hands-on-activity by the students, engaging students in community
projects) were not adequately addressed by the teachers above during instruction. The findings also suggested that teachers lack incentives and consciousness (alertness and making real life sense) of integrating the elements of environmental education. Furthermore, they neglect creating connection with government educational policies during instruction. The teachers were also not aware of the contents of Government educational policies such as the RNPE (1994).

In concluding the discussion of findings for research question two, some elements of environmental education were integrated in the subjects that were observed during fieldwork. However, this case study noted that the teachers’ integration was also determined by the particular topic and lesson objectives that existed in the syllabus, which was taught by the teacher during the period of data collection in the second term of the school year. It could also be suggested that the principles of place-based education rarely directed and informed the instruction.

**Research question 3: How did the teachers implement environmental education in the curriculum?**

During the semi-structured interviewees, three teachers (from the subject of Agriculture, English and Science) explained they try to implement environmental education by including it in their general teaching approach of discovery learning. This is an approach that is inquiry-based. It is a constructivist learning theory that takes place in problem-solving situations. In this teaching approach (introduced by Jerome Bruner, 1915 - ), the learner draws on his or her past experiences and existing knowledge to explore facts, relationship, and new truths to be learned. Some of the strategies that are
based upon the discovery teaching approach include guided discovery, problem-based learning, case-based learning and incidental learning (Bruner, 1966). The findings of this case study suggest that some of the teachers’ instruction attempted to incorporate the above strategies of discovery learning. The researcher observed that the lesson plans that were prepared by the teachers included the identification of the topic to be taught, the specific learning or instructional objectives and the outline (e.g. Introduction, Development, and Conclusion) of how the lesson was delivered. Below photos are examples of genuine lesson plans, captured using a Canon digital camera, from the subjects of Social Studies, Science and Mathematics. The name of the school and the teachers were erased from the images of lesson plans to ensure anonymity.
**Photo 30 Lesson plan for Social Studies, dated June 25, 2014.**

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<thead>
<tr>
<th>MS</th>
<th>CONTENT</th>
<th>TEACHER'S ACTIVITY</th>
<th>PUPIL'S ACTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION</td>
<td>Begin through question and answer strategy</td>
<td>Pupils respond to questions</td>
<td></td>
</tr>
</tbody>
</table>
| DEVELOPMENT |              | East pupils into their respective groups and assign them topics to discuss and present later. Ask pupils to prepare their work. | Pupils do their presentations. |}
| CONCLUSION |                | Ask few pupils to come up with the main points at the lesson. |     |

EVALUATION: The lesson was done

TEACHER'S NAME

SUPERVISOR'S SIGNATURE

DATE: Checked
Lesson plan for Science, dated June 12, 2014

**TOPIC:** Simple Machines

**RATIONALE:**
It is important for students to understand the concept of machines and their applications in daily life.

**OBJECTIVES:**
- Students should be able to classify examples of simple machines.
- Students should be able to explain the advantage of using a simple machine.

**PRE-REQUISITE KNOWLEDGE:**
- Basic understanding of force and motion.

**MATERIALS AND APPARATUS:**
- Simple machines (levers, pulleys, inclined planes, etc.)

**REFERENCE:**
Integrated Science Part 3

<table>
<thead>
<tr>
<th>STAGE/TIME</th>
<th>TEACHER ACTIVITY</th>
<th>STUDENT ACTIVITY</th>
<th>LEARNING NOTES</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INTRODUCTION</strong></td>
<td>10 min</td>
<td>Ask pupils to name tools and use</td>
<td>Give names of tools</td>
<td>Machines introduced, assessed learners interest</td>
</tr>
<tr>
<td><strong>DEVELOPMENT STAGE 1</strong></td>
<td>20 min</td>
<td>Ask pupils to define simple machines and give examples</td>
<td>Respond to questions</td>
<td>Simple machines - help students identify and classify different types</td>
</tr>
</tbody>
</table>

*Photo 31*
Lesson plan for Mathematics, dated June 17, 2014

<table>
<thead>
<tr>
<th>TIME</th>
<th>TEACHER ACTIVITY</th>
<th>STUDENT ACTIVITY</th>
<th>LEARNING NOTES</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRO</td>
<td>Introduce pupils to the new topic and see what they know about the topic.</td>
<td>Discuss work the teacher taught and what they know about the topic taught.</td>
<td>[(x-y)(x+y) = x^2 - y^2]</td>
<td></td>
</tr>
<tr>
<td>DEV 1</td>
<td>Give students some equations to solve on the board to be done as a class.</td>
<td>Do the given work.</td>
<td>Ex 15.1</td>
<td></td>
</tr>
<tr>
<td>DEV 2</td>
<td>Give pupils some questions to be done in groups. Give pupils some such problems to solve.</td>
<td>Do the given work.</td>
<td>Ex 15.1</td>
<td></td>
</tr>
<tr>
<td>CONCLUSION</td>
<td>Ask students to conclude the lesson content.</td>
<td>Calculate the lesson content.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PUPILS’ LESSON EVALUATION

Ask students to evaluate the lesson.

SELF EVALUATION

To be taught as it was not taught.
The format of the above lesson plans suggest that teachers’ instruction also followed the guided discovery strategy for teaching. In this general discovery learning approach, students in subjects of Social Studies, Agriculture, and Mathematics were often observed discussing a task in small groups of about five to seven students. This strategy of discussing a task in small groups resembled a problem-based learning strategy (where students discuss and make a plan on how to solve the problem) and case-based learning strategy (where the teacher engages students onto a real life problem and ask them to suggest solutions). There were no group work observed in the subjects of English and Science.

In addition to including the content of environmental education in the general teaching approach of discovery learning, the teacher of Agriculture also relied extensively on the topics that had contents of environment such as fruit tree production and forestry conservation. On the other hand, the teacher of English also relied extensively on the content that had elements of environment such as the poems titled *Clouds; What the leaves said; The New-Comer; The Spider; The Wind is angry and Who Killed the Swan*. Other strategies stated by the teacher of science to implement environmental education are prompting and probing. These are examples of incidental learning, which could still be grouped under the discovery learning approach. The researcher noted the above approaches were not targeted for environmental education *per se*, but for every content of learning that appeared in the syllabus during the second term of the school year.
Research question 4: How do educational authorities perceive environmental education?

The findings suggested the educational authorities believed that local environmental knowledge, among community people, that exists where schools are situated could play an important role in ensuring that environmental education is implemented effectively by teachers. For example, the local environmental knowledge about wild plants such as the cultural uses of Blue sour plums and Camel thorn could be integrated during teaching in the curriculum subjects of Agriculture, Science and Social Studies. Indigenous knowledge was considered vital, in daily lives, by educational authorities. For example, the Maun regional principal education authority stated that teachers should invite, to classrooms, the traditional doctors who have historical experiences about the existence and utilization of local plants and animal species. In order to increase their awareness of the local environment and practices, teachers should learn about the local food varieties that community people eat and how they are surviving, and the natural resources that exists in their environment.

Although community people have a wealth of local knowledge, explanations from educational authorities suggested that this knowledge has not been effectively implemented in the curriculum. For example, the educational authority, who is a board member of the National Environmental Education Strategy and Action Plan, emphasized that the general public in Botswana has raised concerns about the weaknesses regarding the publication and distribution of the environmental education strategy. Educational authorities also stated that much of the local experience that is brought by students to
school carries elements of local environmental knowledge, historical, and cultural experiences.

According to the findings that emerged from this study, Educational Authorities suggested that the local tribal authorities, instead of non-community people, are preferred to lead discussions during community gatherings. This could help community people to understand and try to implement the new information that would be discussed. Educational Authorities suggested that community people with historically-lived experiences should be invited in classrooms to talk with students about the knowledge on cultural practices and resources such as plants, water, and animals. This could strengthen the School-Community partnerships. In the process of this partnerships, teachers would be engaging into what is also called Communities of Practice (Lave and Wenger, 1991) on their arrival where they are assigned teaching positions.

Educational authorities supported the use of local knowledge and suggested that teachers should tap into it during instruction. Other suggestions that were made by educational authorities included teachers giving examples of local environmental resources during teaching, and field trips, and nature trailing in protected areas such as game reserves. Furthermore, the Management of the school should ensure that there is continuation of environmental projects when pioneers of such projects decide to take transfer to teach in other schools. In this line of continuity, Dewey (1938) stated that one of the elements of proper experience is that it has to connect with further experience, which is called experiential continuity. Dewey (1938) stated “the central problem of an education based upon experience is to select the kind of experiences that live fruitfully
and creatively in subsequent experiences” (p. 28). The above findings, from the case study in the panhandle of the Okavango Delta of Botswana, poses implications to the Government authorities, teachers, village leaders and the Non-Governmental Organizations (NGOs).

Implications of the Findings of the Case Study

The Ministry of education, skills and development in Botswana.

It is essential that authorities in the Ministry of Education, Skills and Development conduct studies that assess the relevance for teachers to allow students use their indigenous languages as medium of instruction, in addition to the current languages of Setswana and English. As presented in the findings, this case study suggested that community people advocated for the use of indigenous languages. Likewise, Educational Authorities and teachers that were interviewed stated that indigenous knowledge is important and need to be recognized in curriculum and instruction. The purpose of this promotion of indigenous language which is part of community’s traditional lifestyles would be one of the ways to strengthening the traditional lifestyle in the local communities around the Okavango Delta. Mbaiwa (2011) found that the practices of traditional lifestyle are gradually disappearing in some communities of the Okavango Delta. Ironically, on some occasions, students at the Junior Secondary School were penalized for speaking their indigenous languages around the school yard. The interviewee, who stated that he is a member of Parents Teachers Association (PTA), explained that the use of Hambukushu language as a medium of instruction, in the
schools that are in the Okavango region, would enable students to easily understand the content of instruction that relate to environmental education.

Similarly, the interviewee in Sekondomboro argued that it does not profit much when a student is taught by a teacher who does not understand nor speak the indigenous language of the student. The use of indigenous languages in the school yard could signify that both teachers and other staff members in the school are paying attention to the cultural elements of community people and the local places in the panhandle of the Okavango Delta. It is important to note here that Sobel (2005) stated if the school teachers and administrators place more attention on the particularities of the local place and climate, existing community organizations, environmental learning centers, and parental concerns, then there would be varieties of curriculum and project-based learning activities in the school and the community. This statement suggested that students would most likely understand and develop interest in initiatives that include environmental education. Place-based education is aligned with the ideas of Dewey (1891, 1916, 1938), who helped initiate the progressive education movement that advocated for a child-centered and holistic approach to learning, thus making education more responsive to the needs of children.

Furthermore, Educational Authorities and the officials of the school management should show continuous interest and the passion toward school-based environmental related projects. The delivery of outdoor equipment, for example in the agriculture lesson for chicken production, should be made on time so that students are able to carry-on with their outdoor experiential projects. It is also important that the objectives of
environmental education are exposed to and understood by all teachers and how they should implement them during instruction. The suggestions that are stated above could contribute as some of the effective strategies of integrating environmental education in the secondary school curriculum.

**The school management, teachers and staff in local schools.**

The management and teachers of local schools should take the initiative and invite, to the classrooms, community people such as those who still use the traditional implements to cultivate the land. The purpose for the invitation would be to allow community people to explain to students how they use the traditional implements (such as the traditional hand-held hoe) for tillage and the advantages and disadvantages of using them. For example, in the village of Xakao, the interviewee stated that she uses a hoe to cultivate crops in the dryland area. Other people who could be invited to the classroom include community people who bear local knowledge about harvesting and preparing plant species such as the blue sour plums for traditional healing. For example, community people (e.g. traditional doctors) mainly dig roots of blue sour plums, boil them and offer the boiled water to the patient. It would also be useful that teachers invite community people who understand how to utilize plant species such as the large bush-willow for rain making and marriage reinforcement. One of the interviewees in Xakao village stated “we cut a branch of large bush-willow and make fire so that the fire (the rains from the Gods or ancestors) does not stop.” To further illustrate the existence of local environmental knowledge, with regard to maize not growing in the dryland areas one of the female interviewees in Sekondombo village explained that she cultivates
sorghum, but when she cultivates maize it does not germinate. Therefore, local farmers have the experiential knowledge of which soil type is suitable for cultivating particular crops. This kind of experiential knowledge should be acknowledged by teachers and staff in local schools.

**Teachers in schools.**

It is important teachers utilize the school grounds (i.e. the existing nature spaces and resources that are found in the school yard). For example, teachers from the subjects such as Art and Mathematics could use effectively, in their class sessions, the traditional baskets that are on display in the administration building of the school. Natural spaces and resources (e.g. habitats for bird species such as quelea and crowned lapwing) that are found inside the school yard could be utilized as well during instruction. For example, during the science lessons, the students can observe the differences between the bird habitats and ground spaces that are not preferred by birds.

Teachers should often take students out of the classroom to visit the village projects. For example, in some villages such as Gani and Xakao, community people were managing the government-aided vegetable gardens. Students could learn how community people practically construct vegetable plots, prepare mulching, practice water conservation, maintain the garden and carry out the business of selling various vegetables. Furthermore, it is important that teachers understand, as well, and engage students in discussing the meaning of the village names and wards, where the school is situated. In this process, they could discuss, as well, with students the implication of the connection of village names to existing school subject (e.g. Moral Education) that is
being taught. With this in mind, the Botswana Vision 2016 suggested that in the process of preserving the history of Botswana, it is also important to introduce “clear strategies for the collection and preservation of Botswana’s diverse oral and written traditions and arts, and the identification and development of the national archaeological and heritage sites and other national monuments” (p. 49). The recognition of the local knowledge, in the area of environmental education, could contribute into some principles of the Botswana Vision 2016.

School, community and non-governmental organization (NGO) partnership.

The implementation of environmental education in schools could be strengthened as well through the means of collaboration and continuous partnerships. Teachers and Educational Authorities emphasized that the local environmental knowledge, which is brought to class by students, is relevant for teachers to understand. Studies (Barnhardt, 2008; Da Silva, 1996; Phuthego & Chanda, 2004) also suggested that local knowledge play a critical role in the sustainable management of natural resources. Further studies (Mbaiwa, 2011 and Demotts, 2009) reported that there is a gradual loss of traditional knowledge in some communities of the Okavango Delta due to the emerging modern lifestyles such as local people working in the tourism industry. Therefore, in order to facilitate effective implementation of environmental education, the findings suggested that school-community partnerships and outdoor learning as opposed to traditional classroom learning should be strengthened. The role of the community in the management of the school could be one way of revitalizing the traditional knowledge at the Junior Secondary School. This case study acknowledged that the curriculum of
Botswana is centralized. However, it should be possible that regional educational authorities engage a Non-Governmental Organization (NGO) to design an environmental-based project for school children. NGOs should be encouraged to collaborate with schools and engage in Adopt-a-School program. There are many Non-Governmental Organizations and trained extension workers in rural areas of Botswana that could be instrumental in mobilizing and strengthening the School Management Team as well as parent partnerships in governing the schools (Pansiri, 2008).

In his research in Alaska, Barnhardt (2008) demonstrated that the motive for encouraging inquiry-based and other experiential approaches to learning was to help guide teachers in using local environment resources in their teaching. It was through the NGO called Alaska Native Knowledge Network that traditional ecological knowledge has been embedded in the school curriculum in Alaska. Therefore, in Botswana teachers could also be provided with incentives (such as reliable transport system) to create partnership with community people and NGOs that can benefit the students and the school as a whole. The realization of this dream could give support to what Berkes (2009) stated that their experience with Canadian groups (Inuit, Gwich ‘in, Dene, Anishinaabe, and Cree) shows that “the willingness of indigenous elders to share their knowledge has resulted in the production of a range of indigenous knowledge outputs for joint problem solving” (p. 154). Berkes (2009) explained that “the partnership effort has resulted in materials that can be communicated to different audiences with multiple uses in mind” (p. 154).
The Department of meteorological services in collaboration with the village leadership.

This case study found rainfall variability, according to the knowledge of community people, affected negatively the growth of crops in the study area. Community people reported that rainfall variability caused the rotting of crops such as water melons in the panhandle of the Okavango Delta. In the village of Kauxwi, the interviewee complained that the seeds of water melons from his field did not germinate as anticipated in the year 2014. He stated “the problem is rain. We received heavy rains and then the water melons started to rot again.” This could suggest that local farmers do not receive place-based adequate information on when they should expect high rainfall, low rainfall and or floods. This could be due to lack of reliable and effective communication services such as radios and access to daily newspapers that provide update on weather forecasts.

In the context of this case study, place-based adequate information would include relaying information that is understood by community people. Accordingly, the authorities from the department of Meteorological Services are responsible for monitoring and analyzing the national and regional weather and providing weather forecasts. These are modern responsibilities, which need to be presented to community people in a fashion that support the social and cultural local themes. This study suggest that it is important that authorities from the Meteorological Services, in the nation-wide regional offices, convey weather forecasts and bulletins to the village authorities so that the forecasted information reaches farmers through communal gatherings that are normally addressed by the local tribal authorities. This approach of giving power to the
local authorities could also be one of the strategies of revitalizing the traditional knowledge in the Okavango delta.

**Land board authorities in partnership with the village leadership.**

The recommendation to stop cultivating crops along the river channels of the Okavango Delta and to cultivate in the dryland is a challenge that faces some community people who were interviewed. It was learned from the interviewees that when they apply for crop fields certificates, they are told by authorities that the land they applied for is not available. If they decide to cultivate on their own there would be no compensation given by the government authorities if wild animals destroy crops in their fields. In Botswana, the Land board department, under the Ministry of Lands and Housing, is responsible for allocating land countrywide. It is essential that authorities from the land board department collaborate effectively with village authorities (local tribal chiefs) in conveying information and discuss with local people about the need to abandon fields that are close to the river channels.

**Conclusions**

This case study, in the panhandle of the Okavango Delta of Botswana has shown that teachers at the junior secondary school are showing interest in integrating elements of environmental education in the curriculum. Surprisingly, this contradicts some research studies (Ketlhoilwe, 2010, 2013; Molosiwa, 2010; Moreri, 2011; Mosothwane, 2002; Mosothwane & Ndwapi, 2002; Musisi & Nomalang, 2012) which suggested that teachers in other subjects are resisting the integration of environmental education into the curriculum. Local knowledge, as the basis for local level decision making in community
practices such as agriculture, natural resource management, food supplement and health
care system is also given attention by the teachers. Although the responses from teachers
promoted the integration of environmental education and the local knowledge in the
school, the use of indigenous language by students, during group discussion, seemed to
be a practice that is not welcomed by one of the teachers, who was interviewed. The
teacher argued that the use of indigenous language by the students delays them to attend
to the problem and reading to understand the textbook, which is written in the English
language. This is one of the examples of the contention of modernity and traditional
lifestyle in the school yard.

Research studies indicated the integration of environmental education exists
mainly in Social Studies and Science subjects, thus implying that the approach of
integration is not extended to other subjects in the curricula. This study found that at the
Junior Secondary School the teachers of English and Agriculture implemented
environmental education, for example, through the letter writing about bad odor from a
broken school sewage and discussion of livestock grazing in the communal lands,
respectively. The teacher of mathematics attempted to implement the local knowledge
and place-based education through stating the village names, where students originally
come from, during the calculation of Time, Distance and Speed.

The need that this study found to exist at the Junior Secondary School is effective
School – Community partnership, access to resources that support environmental
education, timely update by teachers who participate in the regional Professional
Development Workshop of Environmental Education. The effective School-Community
Partnerships would revitalize and strengthen the traditional knowledge that is gradually disappearing in the Okavango Delta. When writing about Benefits of Complementary Knowledge for Problem Solving, Berkes (2009) speculated that there are many indigenous knowledge holders who are willing to collaborate in various ways with modern scientists. Regarding this important process of partnership, this study acknowledges Berkes (2009) that the educational system should provide sensitivity to different ways of knowing “for the coming generations of both scientists and non-scientists including members of groups who have historically suffered from colonialism” (p. 154).

**Ideas for Further Research**

The author of this dissertation wishes to propose the following ideas that could be pursued for further research:

1. Appraisal of the interests of community people from teachers who teach in schools that are situated at their local place. In this idea of appraisal, future research could focus on the specific areas of teaching and learning and School-Community partnerships. Although the school curriculum in Botswana is centralized, the voices of community people could strengthen the local knowledge and principles of the framework of place-based education in areas such as environmental education. When discussing reflexivity and voice, in his book titled *Qualitative Research & Evaluation Methods*, Patton (2002) urged that attention to voice applies not only to intentionality about the voice of the analyst “but also to
intentionality and consciousness about whose voices and what messages are represented” (p. 495).

2. Research on the strengths and weaknesses of outdoor learning versus the traditional classroom learning. The findings of this case study have reported that teachers rarely employ the outdoor learning activities during teaching. A lot of research has to consider focusing on the contemporary experiential learning approaches such as outdoor learning. The findings should also be shared with teachers in schools and during in-service workshops. In the region of Africa, there is lack of research that examine both outdoor and traditional classroom learning. However, it is important that the dangers of outdoor learning also be addressed by the teachers.

3. It is important that teachers and educational authorities understand the extent at which students in the school are cognizant of issues such as environmental education (e.g. what do they know about environmental education? How are they signifying their awareness of environmental education?) This case study did not focus specifically on examining the cognizance of students on environmental education. The findings from this proposed research idea could provide insights on the existing gaps that need to be filled by research and teachers as well.

4. During the data collection for this case study, some educational authorities argued in support of the introduction of environmental education as a separate subject instead of using the integration model. The literature review for this research has discussed in details the strengths of avoiding the separate subjects approach and
subject compartmentalization. The author for this dissertation suggest the idea of an Environmental Education Center. Prior to moving forward with the establishment of the center, it is important that researchers conduct a scoping or needs assessment study for the center. The findings from the scoping study should be shared with the stakeholders such as community people, teachers, educational authorities, environmental practitioners, and the land board authorities.
References


https://www.google.com/search?q=Education+and+Training+Policy.+The+United+Republic+of+Tanzania.&oq=Education+and+Training+Policy.+The+United+Republic+of+Tanzania.&aqs=chrome..69i57.523505j0j4&sourceid=chrome&es_sm=93&ie=UTF-8


Appendix A: Letter from International Review Board (IRB) Ohio University

A determination has been made that the following research study is exempt from IRB review because it involves:

Category 1. research conducted in established or commonly accepted educational settings, involving normal educational practices

Project Title: The Integration of Environmental Education in the Secondary School Curriculum of Botswana - A Case Study of 10th Grade Curriculum in Ngambao Community Junior Secondary School at Okavango Delta

Primary Investigator: Kgosietsile Mbuzele Velempini

Co-Investigator(s):

Advisor: Bruce Martin (if applicable)

Department: Education

Robin Stack, CIP, Human Subjects Research Coordinator
Office of Research Compliance

Date: April 11, 2014

The approval remains in effect provided the study is conducted exactly as described in your application for review. Any additions or modifications to the project must be approved (as an amendment) prior to implementation.
Appendix B: Research Permit from Botswana Government to conduct the Case Study

Kgosietsile Velempini
2 Andover Road, Apartment H11
Athens, Ohio, 4570
USA

Email: Kg374509@ohio.edu

APPLICATION FOR A RESEARCH PERMIT: INVESTIGATING ENVIRONMENTAL EDUCATION IN THE SECONDARY SCHOOL CURRICULUM OF BOTSWANA-A CASE STUDY IN THE OKAVANGO DELTA; EWT 8/36/4 XXV (26)

We are pleased to inform you that you are granted permission to conduct a research entitled: "Investigating environmental education in the secondary school curriculum of Botswana-A case study in the Okavango Delta (Seronga village)"

The research will be conducted at Seronga village and Ngambo Community Junior Secondary School.

This permit is valid for a period effective from 3rd February 2014 to the 31st August 2015.

This permit is granted subject to the following conditions:


2. Progress should be reported periodically to the Department of Environmental Affairs.

3. The permit does not give authority to enter premises, private establishments or protected areas. Permission for such entry should be negotiated with those concerned.

4. You conduct the study according to particulars furnished in the approved application taking into account the above conditions.

5. Failure to comply with any of the above conditions will result in the immediate cancellation of this permit.

6. The research team comprises of Kgosietsile Velempini.
Appendix C: Change of Research Site Approval from Botswana Government

Kgosietsile Velempini
2 Andover Road, Apartment H, 11
Athens, Ohio, 4570
USA

Email: kv375509@ohio.edu

APPLICATION FOR CHANGE OF RESEARCH AREA: INVESTIGATING ENVIRONMENTAL EDUCATION IN THE SECONDARY SCHOOL CURRICULUM OF BOTSWANA: A CASE STUDY OF GOWA CJSS IN KAXUXWI VILLAGE: EWT 8/36/4 XXVI (94)

Your request for a change of research area of the above permit received on the 3rd June 2014 refers.

Approval is given for the change of research area from Ngambao CJSS in Seronga to Gowa CJSS in Kaxuxwi village in the Okavango Delta from the 5th June 2014 up to the 31st August 2015.

Please note that the conditions of the above permit still apply.

Thank you

Yours Faithfully

C. Bogale-Jaycooba
FOR/PERMANENT SECRETARY

cc: Director, Department of Environmental Affairs
    District Commissioner, Okavango Sub, North West
## Appendix D: Observation Protocol in the Classroom

<table>
<thead>
<tr>
<th>Observer’s name</th>
<th>Name of School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>Form / Grade level (e.g. form 1a, 2b, 3c)</td>
</tr>
<tr>
<td>Subject taught</td>
<td>Duration of class</td>
</tr>
<tr>
<td>Name of teacher</td>
<td>Class period (period 1, 2 or 3 etc.)</td>
</tr>
<tr>
<td>Gender of teacher</td>
<td></td>
</tr>
</tbody>
</table>

### Description of lesson objectives:

1. 
2. 
3. 
4. 

### Topics taught in the lesson:

1. ______________________________   2. ______________________________
3. ______________________________    4. ______________________________

### Description of specific lessons covered in the topics:

1. ______________________________
2. ______________________________
3. ____________________________________________

4. ____________________________________________

5. ____________________________________________

Explain the intended lesson outcomes:

1. ____________________________________________

2. ____________________________________________

3. ____________________________________________

4. ____________________________________________

5. ____________________________________________

List the teaching materials that the teacher brings to the classroom as teaching aids

<table>
<thead>
<tr>
<th>1.</th>
<th>2.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.</td>
<td>4.</td>
</tr>
</tbody>
</table>

Description of the classroom interior, e.g.

1. Maps on wall.

2. Pictures of the Okavango Delta

3. Pictures of wild animals

4. Pictures of community people and or any infrastructure in the village

5. Physical tools (e.g. types of stones on closets)

6. Classroom decorations (describe)
Describe how students are assessed in the lesson? e.g.

1. Direct Inquiry
2. Quiz
3. Written test
4. Cooperative learning activities
5. Oral discussion
6. Other (describe) ______________________

Observe how the instruction relates to students’ experiential and local knowledge, e.g.

1. Reference to community social institutions such as Village Development Committee
2. Local vegetation referred to in the lesson
3. Agricultural activities (farming, livestock etc.) referred to in the lesson
4. Fuel wood collection
5. Other (describe)

Contents of environmental and or ecological issues that the teacher mentions during the instruction, e.g.

1. Okavango Delta river / streams
2. Eco-tourism
3. Wild animals
4. Management of waste
5. Energy (electricity) conservation
6. Fuel wood (resource extraction) utilization
7. Contents of developmental practices that the teacher mentions during the instruction, e.g.
8. Contents of social concerns that the teacher mentions during the instruction, e.g.
9. Other (explain)

Observe (and describe where applicable) if the teacher incorporate

a. Outdoor activities (e.g. what hands-on-activities learners are engaged into?)

b. Indoor activities e.g. what hands-on-activities learners are engaged into?)

c. Both out and indoor activities e.g. what hands-on-activities learners are engaged into?)

Describe the lesson strategy (s) employed during class instruction (tick all that applies):

1. Participatory
2. focus group discussions
3. case-based instruction
4. directive instruction
5. cooperative learning
Appendix E: Protocol for Document Analysis

1. Who published the official document and how was it created?
2. When was the official document published?
3. Who were the original people targeted as audience?
4. What are the aims and goals of the official document?
5. What kind of content does the official document contains about environmental education, local knowledge and place-based education?
6. What kind of content does the official document contains about local knowledge and place-based education?
7. What kind of content does the official document contains about curriculum integration and place-based education?
8. What kind of information is written about the community people?
Appendix F: Semi-Structured Interview Protocol with Local People

1. Could you start by sharing with me who are you and where do you come from?

2. Could you explain to me what you are doing in order to survive in this place?
   Could you explain in detail what is the focus of the job that you are doing in this place?

3. Explain to me how the environment (e.g. water resources, vegetation, wild animals, and soil types) is important or not important to your life?

4. Could you explain to me what you understand about environmental education?

5. Could you explain why teachers should consider or not consider the local knowledge in this place and cultural experience of learners in classroom?

6. How is participating in tree planting in this place (village) important or not important to you and other people?

7. Could you share with me how you talk and share knowledge with your child about the importance of natural resources (e.g. plants, water, wild animals, soils, rains) in this place?

8. How should teachers integrate the local knowledge from this place that students bring to school?
Appendix G: Semi-Structured Interview Protocol with Teachers

1. Please explain to me which area of the country you come from?
   a. Seronga village      b. Ngamiland district
   c. Outside Ngamiland district   d. Outside Botswana

2. Could you confirm for me your duties in Ngambao community junior secondary school?
   a. Classroom teacher
   b. Subject teacher
   c. Club coordinator (explain which club)
   d. Head of the department (explain which department)
   e. Other duties (explain)

3. Could you explain to me the subject or subjects that you specialized, while at teacher training college, to teach secondary school students?

4. Which college of teacher training did you attend?

5. Could you explain to me, on the subjects of your specialization at college, which ones are related to environmental education?

6. Could you share with me what you understand about the government’s environmental education strategy and action plan?

7. Could you share with me what you understand about the school environmental education policy pack, which was introduced by government in 2002?

8. Can you describe to me ways in which you are incorporating concepts and issues related to the environment into your class curriculum?
9. What are some teaching strategies that you prefer most to use when teaching students?

10. From your experience of teaching in secondary schools, what are the most effective ways of incorporating environmental education into your teaching?

11. In the classes that I observed you teaching, what do you consider to be good examples of integrating environmental education into the classroom?

12. Do you include local traditional values and knowledge about the environment into your teaching? And, if so, how?

13. Is there anything else you would like to add that you believe people should understand about environmental education?
Appendix H: Semi-Structured Interview Protocol with Educational Authorities

1. Could you start by explaining to me who you are and the position you occupy in the office?

2. What do you understand about environmental education?

3. Could you explain some of the strategies that you believe teachers should use to integrate environmental education during teaching?

4. What do you think makes environmental education effective?

5. What do you think could be the effective strategies of teaching environmental education in secondary schools of Botswana?

6. How effective is the local knowledge that students learn at home about wild animals, vegetation, water, tree planting, etc.?

7. How should this knowledge be included in the classroom by teachers?

8. Could you share with me how effective is the national environmental education strategy and action plan of Botswana in integrating environmental content into the curriculum.

9. Is there anything else you would like to add that you believe people should understand about environmental education?