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Teacher Education and Indigenous Epistemological Discourse in Integrated Science: The case of a College of Education in Zambia.

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Abstract

The purpose of this research is to investigate to what extent the Primary Teacher Education Integrated Science course addresses indigenous / local knowledges in both content and actual teaching practices at a college of education in North-western Zambia. The study explores the experiences, perceptions and attitudes of lecturers and teacher students towards indigenous epistemology in science education. The challenges faced by educators in integrating indigenous knowledges in formal science classroom teaching have also been addressed.

The data to the research was collected at a college of education after a realization of the important role that colleges of education play in the creation and re-creation of knowledge. Qualitative methodology has been used in this study and all the respondents in this study were drawn from a college of education. Cheong's (2002) Theory of a tree, Freire's (1970) Transformative Role of Education and Holmes and McLean's (1989) Curriculum Dependency Theory inform the analysis of this study.

The study reveals a gap between state theoretical education indigenization policies and practical integrated science education in the college of education. I argue that despite somewhat firm policy pronouncements on the need to incorporate indigenous knowledges in formal schooling, the integrated science course lacks significantly in indigenous content and is largely Western Knowledge dominated. The nexus between theory and practice and the practical is gray. Lack of Indigenous learning and teaching resources coupled with a highly bureaucratic and centralized curriculum and examination institutions, impact greatly on what is taught and how it is taught and is thus, seen as impacting negatively on localization. Teacher apathy and the lack of capacity and skill are but other challenges affecting the effective inclusion of indigenous knowledges. The research has proposed alternative measures to remedy Western knowledge hegemony and decolonize the Integrated Science curriculum.

Key Words

Epistemology, Indigenous, Western, Globalization, Localization

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Harrison Katonga

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Abbreviations

AIEMS	Action to Improve English, Mathematics and Science
BESSIP	Basic Education Sub-Sector Investment Program
BSAC	British South Africa Company
CDC	Curriculum Development Centre
CPD	Continuous Professional Development
DANIDA	Danish International Development Agency
ECZ	Examination Council of Zambia
GCE	General Certificate of Education
GRZ	Government of the Republic of Zambia
HIV/AIDS	Human immunodeficiency virus/Acquired immune deficiency syndrome
IK	Indigenous Knowledge
IKS	Indigenous Knowledge Systems
JETS	Junior Engineers, Technicians and Scientists
LK	Local Knowledge
MMD	Movement for Multiparty Democracy
MOE	Ministry of Education
PF	Patriotic Front
PU	Production Unit
SSME	Spiritual and Moral Education Studies
TEK	Traditional Ecological Knowledge

TP	Teaching Practice
UNESCO	United Nations Education, Scientific and Cultural Organization
UNICEF	United Nations International Children's Education Fund
UNIP	United National Independence Party
WKS	Western Knowledge Systems
ZATERC	Zambia Teacher Reformed Course
ZECF	Zambia Education Curriculum Framework

CHAPTER ONE
CONTEXT AND PURPOSE

1.1 Introduction

While considerable attention has been paid to the alien epistemological space, a mediocre devotion to the discourse of indigenous epistemology characterize many institutions of learning today in the global south. Methods and content in schools have been largely modelled and based on foreign Western concepts where the everyday experiences and educational ideologies are different from the world views, histories and ways of life of most school children (Breidlid, 2013). Most students in Africa, Zambia alike, are located in a space where their cultures and world views are rarely taken into account in the school curriculum. This may affect the learning of students and impair their identity construction. While on one hand the cognitive and epistemological issue is partly due to the gap between curricular content, the student's home environment and epistemological content, on the other hand are pedagogical issues of teacher apathy, attitude, and capacity coupled with localization logistical constraints.

This means that; the success of incorporating local / indigenous knowledges in formal schooling in general and in Integrated Science in particular may largely depend on the competence, commitment and resourcefulness of its teachers. Thus, the role of teacher education is central in this process. Teaching of Indigenous Knowledges is not only relevant in negotiating the epistemological and ontological border crossing of children from a culture at home into a sub culture of science at school (Ogawa, 1995), but is also necessary for identity construction and effective learning. In today's globalized world, this means carefully hybridizing indigenous and western knowledges for a viable education system and consequently the production of a well-balanced individual. The philosophy, methodology and content of schooling in Africa need to be shaped and molded not exclusively, but to a far greater extent, by the indigenous perspectives (Brary et al 1989). While the indigenization policy in Zambia is somewhat clear, its implementation in the teacher education integrated Science is fuzzy and surrounded with pedagogical and economic restraints and indigenous knowledge skeptics.

This introductory chapter will present a general background to the province and district in which the study site is found. This is to demonstrate the complexity and diversity of the region in which the research site is situated. The rationale that might have influenced the choice of this study will then be highlighted. After which the statement of the problem and the significance of this study will be stated in their contexts before listing the aim and objectives. This will be followed by stating the research questions that guide this study. Lastly, the structure of the thesis will be outlined.

1.2 General Background to the Site of Study: North Western, Zambia.

The study was conducted at a public college of education in Solwezi district of North-western Zambia. Zambia is divided into ten regions called provinces for administrative purposes. Towards the North-West is the North-western province with a total surface area of about 125,826 km2 and the population density of 5.80 per km2 (CSO, 2010). The Province is home of several different ethnic groups namely Kaonde, Lamba, Luchazi, Luvale, Lunda, and Mbunda. It stands out as the only province with three (Kiikaonde, Lunda and Luvale) diverse local languages out of the seven local languages with an official status of the ten provinces. The Province is bordered along Angola in the West, DR Congo in the North, Copperbelt Province in the East, and Central and Western province in the South. According to the Zambia 2010 Census of Population and Housing, North-Western Province has a population of 727,044 accounting to 5.55% of the total Zambian population of about thirteen million now estimated at fifteen million. Out of this, 358,141 are males and 368,903 are females, making the sex ratio to 1,030 for every 1,000 males, compared to the national average of 1,028.

The population's literacy rate stands at 63.00% against a national average of 70.2%. The province's rural population constitutes about 77.45%, while the urban population is about 22.55%. The unemployment rate of the province is 10.30%. The total labour force constitute 55.50% of the total population. Out of the labour force, 60.9% are men and 50.4% women. The population has an annual growth rate of labour force of about 1.8. The life expectancy at birth stands at 56 compared to the national average of 51 (CSO, 2010).

North-western Province is live to cultural and festival ceremonies spread all over the province through its diverse tribes and customs. The Kaonde people in Solwezi District celebrate: Kufukwila; Nsakwa yaba Kaonde; Kunyata Ntanda; Lubinda Ntongo; Kuvuluka Kishakulu festivals. Nsomo and Lwendela festivals are also celebrated by the Kaondes of Kasempa District and Ntongo and Makundu festivals by the Kaondes of Mufumbwe Distrct. Among the Lambas is Ukupupa festival celebrated in Solwezi District. The Luchazi people celebrate Chivweka festival in Kabompo District. The famous Likumbi Lya Mize festival is celebrated in Zambezi District by the Luvale tribe. Among the Lunda people is Lunda Lubanza festival celebrated in Zambezi District, Chisemwa Cha Lunda and Chidika Cha Mvula festivals celebrated in Mwinilunga. The Mbunda people have Mbunda Liyoyelo festival and Lukwakwa festival both celebrated in Kabompo District. These festivals provide a valuable insight into the rich traditional culture that has been passed down from generation to generation. They manifest in customs, social life, rituals, oral history, material and spiritual culture.

Provinces are further divided into districts and North-western has a total of nine (9) Districts. Solwezi District is the provincial capital and is in the process of being further split into three Distrcts, among them Kalumbila in the West and Mushindamo in the East. Solwezi is relatively an urban district and as a provincial headquarter, it is an administrative epicenter for government activities in the province. It has approximately 200,000 inhabitants of which Kaonde is the largest tribe represented (CSO, 2010). In addition to this are large numbers of Lunda, Luvale, Chokwe and Mbunda speaking people. However, with the advent of mining activities at Kasanshi, Lumwana and Kalumbila Mines, the area has been infiltrated by languages brought by economic migrants from other parts of the country. The population is now growing at a fast rate turning the city into a cosmopolitan one. Today, you are likely to find all sorts of people within and across the country represented in the district town who have been attracted to the booming mining sector which is employing some job seekers with others bringing with them various other businesses and investments. Apart from mining, agriculture is the main economic activity with over 75 % of household income derived from agricultural related ventures (CSO, 2010).

About 70% of the population of Solwezi leave in the rural outskirts of the district which are administered by traditional leaders called chiefs (CSO, 2010). To the West of Solwezi are Chief Mumena, Senoir Chief Mukumbi, Chief Matebo, of the Kaonde people and Senior Chief Musele

of the Lunda people. To the East are Chief Musaka, Chief Mulonga, Senior Chief Kalilele and Chief Kikoola of the Lamba people and to the South are Chief Kapijipanga and Senior Chief Mujimanzonvu of the Kaonde people. Chiefs are seen as key custodians of culture and traditions and play a major role in managing land tenure, local justice, property inheritance, and the implementation of customary law and conflict resolution within their boundaries.

1.3 Rationale for the Study

Western, empirically-based epistemologies have long been considered hegemonic over Indigenous epistemologies under subjugative colonialism, imperial relations and foreign influences (Breidlid, 2013; Cross, 2006; Mnguni, 2013; Odora Hoppers, 2002). It has been the source of knowledge production in formal schooling in most societies across the world while Indigenous epistemologies have had little or no prominence, based on the assumption that Indigenous epistemology is unempirical, superstitious, primitive and traditional (Breidlid, 2013; Odora Hoppers, 2002). Nevertheless, there has been a growing realization of the "potential for human and social development" (Odora Hoppers, 2002:17) of indigenous knowledges and thus an urgent call to indigenization.

In Zambia, the policy direction and the curriculum are both succinct and cognizance of the importance of including alternative knowledges in formal schooling. The question is therefore, not a policy one but an implementation one. However, it is hard to know how institutions of learning are going about the implementation of this particular policy given its complex nature.

The whole success of this process is placed on educators. The teacher education is, thus, crucial to the successful implementation of this policy. As such, the attitudes, perceptions and beliefs of lectures and student teachers in colleges of education about indigenous knowledges are of interest. The manner in which student teachers are trained to value alternative knowledges and the challenges encountered thereof in the process of localization is of curiosity.

The underlying assumption is therefore, that, the quality of output will be determined by the quality of the input - garbage in garbage out. If student teachers are trained to value and incorporate aspects of local knowledges in their daily classroom learning, the same is highly

likely to manifest in their teaching and this will successfully be passed on to the products of the education system who are the learners who will in turn successfully negotiate the cultural border crossing that may exist between the home culture and the Science culture at school and thus smoothly achieve the goals of the education system.

1.4 Statement of the Problem

The overall research problem addressed in this study is that despite the overwhelming and remarkable policy decision on localized curriculum or the inclusion of indigenous knowledges in policy documents, little had been done to explore the presence and actual implementation of the discourse in Integrated Science Course in colleges of education. According to the policy:

> The science syllabus, for all schools, should contain a core of environmental science, dealing with issues that are relevant to pupils in every part of Zambia. There should also be room within the syllabus for topics that are relevant to particular localities or to dominant characteristics of the local economy. While there is a certain foundation level of knowledge and understanding about the physical world that every child should grasp, the development of scientific thought processes in children can be approached from a number of starting points and does not require uniform content across the country. The criterion should be the relevance of the material to the environment and to the possible later sphere of employment of the pupil (MOE, 1996:35).

It is however, not clear how this is hoped to be achieved and how much of this policy decision has trickled down to institutions of learning and is actually being implemented. Sadly, and vividly, though, is the poor performance of learners in science and the high dropout rate experienced in most schools (MOE, 2011). Breidlid, (2013) notes that, teaching and examining pupils about a world view that is alien may pose repercussions on the quality of education. A large proportion of learners fail to draw any relevance and value in what is taught and thus dropout or otherwise are pushed or squeezed out of school.

If the issue surrounding localization is not treated with the seriousness it deserves, it risks remaining a mere superficial rhetorical policy acknowledgement and indigenous knowledges will continue to remain in the margins of science. It is therefore, urgent and necessary to explore to what extent this policy statement is being effected.

1.5 Significance of the Study

African indigenous Knowledge Systems are an integral part of our culture as a people. Consequently, the Systems need to be documented, preserved, promoted and protected because it is community-based and hence a sustainable resource in mitigating against the developmental challenges facing many African local communities. Education can play an important role in documenting, preserving, promoting, protecting and transmitting these values from one generation to the other. Therefore, the integration of indigenous knowledges in formal schooling in general and in Integrated Science curriculum in particular is an important process in making learning more relevant to the pupils.

Notwithstanding the complexity and controversy surrounding the concept of indigenous knowledges, this study is aimed at creating awareness into the efficacy of the indigenization policy and hopes to give a renewed attention to the localization process and teaching and learning of indigenous knowledges in science. It is also hoped that this study may be beneficial in Zambia's future educational reform process.

1.6 Aim

- To explore to what extent the teacher education Integrated Science course addresses Indigenous epistemological discourse both in content and actual classroom practice at a college of education in Zambia.

Research objectives

- To explore the link between the localization policy and its actual classroom practice.
- To examine the content of indigenous knowledges in the Integrated Science curriculum.
- To analyse Lecturer's and Student's attitudes, and beliefs about indigenous knowledges.
- To highlight challenges educators, face in the implementation of a localized curriculum.

Research Questions

In pursuance of the aim and objectives above, the study will be guided by the following research questions:

1. How does the teacher Integrated Science curriculum address the concept of indigenous knowledge systems and world views?
2. To what extent are indigenous knowledges present in colleges of education, and how do lecturers approach the teaching of these knowledges?
3. What are lecturers' and teacher students' current attitudes and beliefs about Indigenous knowledges?
4. What challenges have educators faced with the inclusion of indigenous knowledges in Science?

1.7 Structure of the Thesis

Overall, this study spreads over six chapters. Chapter one gives a brief introduction of the study and introduces you to the background information about the province and district in which the study was conducted. The rationale for the study; statement of the problem; significance of the study; are then presented after which the aim, objectives, and the research questions are stated. Finally, the chapter gives a guide of how the thesis progresses. Chapter two presents the historical educational context and the indigenous discourse before, during and after colonialism to date. The motivation is to show and assess the attention or lack of it thereof the concept of indigenous knowledges has received in formal schooling at policy and curriculum level and actual classroom practice.

Chapter three is a conceptual framework. It unfolds by discussing some of the key concepts used in the study among them, Epistemology; Indigenous Knowledge and or Local Knowledge; localization; and globalization. The chapter also highlights some of the similar studies that have been conducted in Zambia. Further, the gap that may exist in these studies that this research attempts to address has been referred to before a discussion on the theoretical frameworks and theories that guide this study.

Chapter four is methodology. It represents the research paradigm, the sources of data, sampling techniques, the instruments and procedures of data collection and the methods of data analysis. The first part gives a review of the qualitative case study research paradigm, the research site and rationale for the choice. Further, data sources and sampling, techniques and procedures of data collection and methods of data analysis have been presented. Lastly, verification, ethical considerations and limitations of the study are briefly discussed.

Chapter five is devoted towards data analysis and discussing the main findings. A thematic approach has been used derived from the analysis of policy documents, semi-structured interviews, focus group discussions, observations and field notes. The last and final chapter (sixth) presents a summary of the main research findings, conclusion and reflection for future development and research.

CHAPTER TWO
THE ZAMBIAN INDIGENOUS HISTORICAL CONTEXT

This chapter provides an historical background on the process of inclusion of local / indigenous knowledges and its discourse in formal schooling in Zambia. It brings to light the historical developments which have since set the platform by shaping the many educational reforms implemented over the years. The discussion has been contextualized into five major distinct education policy development periods namely: the pre-colonial era; the colonial era; the United National Independence Party (UNIP) or Kaunda era; the era of liberalization under the Movement for Multi-Party Democracy (MMD); and the current Patriotic Front (PF) government era that began in 2011. Bearing the lengthy of the subject and the limitations there about, the chapter only highlights aspects that are pertinent to this study.

2.1 Traditional / Indigenous Education in (Zambia): The Pre-colonial Era

The inhabitants of what is today called Zambia had evolved their own system of education long before missionary education was introduced by Europeans. This education was mainly characterized by learning by doing through useful practical training. It aimed at preparing one for useful adulthood life in the household, village and tribe. In this way, it differed from one community to the other in both content and methodology as these where dictated by the nature of the environment in which it was found (Mwanakatwe, 2013). According to Kelly (1999) the curriculum of African Indigenous education was a sum total of experiences of family, tribe or group which was conducted within pervasive, unifying religious context. It stressed detailed knowledge of the physical environment and skills for exploiting it; the need to live and work with others: roles in networks of kinships and relationships, and understandings of rights and obligations; laws, customs, moral principles, obligation to ancestral spirits, to relatives, and others in group or tribe.

The process of learning was inculcated through imitation during work and play, through oral literature, participation in adult activities such as fishing, hunting, agriculture and house-keeping and through social ceremonies. There was also provision for some formal skills training such as pottery, carving weaving, bee keeping, herbalist knowledge and skills. The apex of traditional Education came with initiation ceremonies which today can be likened to the formal schooling system. Initiation ceremonies marked transition from childhood to adulthood. These ceremonies were characterized by a concentrated course of instructions in traditional hygiene, sexual behavior, and the responsibilities and rights of adult life. Read (1956:37) writes: "initiation rites, as a form of *rites de passage*, occur in many societies immediately after puberty". Much of these initiation rites take the form of a 'school', involving a period of seclusion in some remote locality away from normal social life, varying degrees of physical endurance test, instruction in traditional hygiene and sex life and in correct behavior to senior people, with an intense emphasis on submission to authority.

It should be noted that the graduation from initiation ceremonies did not however, mark the end of education. On the contrary, education, as has also been observed by Snelson (1990) was a lifelong process that started at birth to death; a condition of human survival and a means whereby one generation transmitted the wisdom, knowledge, and experiences that prepared the next generation for life duties and pleasures. This broad view of education contrasted sharply with the conclusion held by most missionaries that later introduced formal education, that the people of whom they had come to save were completely uneducated on account of their inability to read and write.

Writing on the strengths of African Indigenous Education, Kelly (1999:10) observes:

> Traditional education was meaningful; unifying; holistic; effective; practical; relevant. There was no separation between education and the world of work. It reached out to and educated the whole person. It involved the entire community. It developed strong human bonds. It was very strongly person centered.

Traditional education was concrete and non-verbal, concerned with practical activity not abstract generalization of knowledge that is compartmentalized and decontextualized in detached and confined setting of a classroom or laboratory within the margins of a school. Rather indigenous people traditionally acquired their knowledge through direct experience in the natural world (Barnhardt and Kawagley, 2005).

The fact that traditional education did not compartmentalize and sort their knowledge into academic disciplines such as 'science' does not in the least infer that indigenous people did not have any scientific knowledge. On the contrary, Burgess (in Barnhardt and Kawagley, 2005) demonstrate that Indigenous people engage in a form of science when they are involved in the annual cycle of subsistence activities. They have studied and know a great deal about the flora and fauna, and they have their own classification systems and versions of meteorology, physics, chemistry, earth science, astronomy, botany, pharmacology, psychology and the sacred. Similarly, Odora Hoppers (2002) expresses the same view about the existence of indigenous science especially in the fields of health and agriculture where even today people still heavily relay on indigenous knowledge and traditional know how that sometimes even proves more effective and productive than the imported techniques.

Nevertheless, like any other education system, traditional educational was not without weaknesses: "Any system of education has its share of failures and it would be foolish to pretend that traditional education in Northern Rhodesia was uniformly successful" (Snelson, 1990:3). Doubtless:

> It was static; conservative and not open to change or innovative. Its world view was restricted. It found it difficult to cope with the dynamic needs of the modern world. It was orally based without written records. It had limited scientific understanding. It promoted conformity and adherence to past traditions, rather than a spirit of inquiry, innovativeness or change (Kelly, 1999:10).

However, many scholars of indigenous knowledges (Breidlid, 2013, Odora Hoppers, 2002; Aikenhead, 1997; Jegede, 1995) do not agree with Kelly's assertion that indigenous knowledges were static and had a limited scientific understanding. For instance, Barnhardt and Kawagley, (2005:12) state that "Indigenous knowledge is not static, an unchanging artifact of a former lifeway. It has been adapting to the contemporary world since contact with "others" began, and it will continue to change. Western science in the North is also beginning to change in response to contact with Indigenous knowledge".

Notwithstanding this, in its best forms, indigenous education not only offered a comprehensive and harmonious preparation for life but also conserved the cultural heritage, language and traditional institutions and taught the young people to make the best use of their physical environment. In this way, traditional education fulfilled all the three agendas of schooling as

propounded by Serpell in his 1993 anthology 'the significance of schooling' namely; the promotion of economic progress, the transmission of culture from one generation to the next and the cultivation of children's intellectual and moral development. O'Hern and Nozaki (2014:47) conclude: "The indigenous knowledge generated and practiced before colonial domination was vital for the development of traditional African societies."

2.2 The Hegemonic Epistemic Encounter of the Other: The Colonial Era

The colonial era education policies lasted from 1890 to 1963 and were heavily limited to the provision of rudimentary education for Africans (Beyani, 2013). Like in many other African communities, Christian missionaries took a leading role in introducing, administering and funding formal schooling. Missionary activity intensified during the period 1882 to 1905 which saw several mission stations established throughout the region today called Zambia with an aim to launch campaigns for the evangelization of the indigenous people. The first kind of formal schooling was started in 1883 by the pioneer Brethren missionary, Fredrick Arnot (Snelson, 1990). This school, however, did not last long. Mwanakatwe (2013) establishes that, Arnot found out that it was hopelessly difficult to obtain or retain pupils and when a few would come to his school, it was only with supreme effort that Arnot could interest them. This school was from the beginning overwhelmed by vicissitudes, which lead to its closure until 1887 when it was reopened by Fracoise Coillard, a passionate and dedicated missionary who patiently attempted to introduce Western ideas and morality into Lozi life.

Soon, the intense missionary activity led to the establishment of several mission stations across the country motivated at this early stage with the desire to teach the natives in the knowledge of Christian doctrine and morality and through their converts spread the Christian faith further:

> There were two main motives for the missionaries' zeal to educate the people. In order that they might receive and understand the Gospel message, the people must be able to read the Bible. In order that the good news might spread to those whom the missionaries themselves were unable to reach, African teachers must be trained who could preach the word of God and teach others to read (Snelson 1990:11).

The second motive for missionary education was the understanding that western education was a civilizing force that has no equal and it would create rational thinking men who perceive cause and effect instead of those believing the silly notions arising from generation of paganism (Snelson 1990; Breidlid, 2013).

Although, the main motive of mission education was to quicken the conversion of native people to the new faith, some of the early missionary workers however, made determined efforts to raise living standards by teaching Western skills which could help make life a little more comfortable and a little less precarious (Mwanakatwe, 2013). For instance, Snelson (1990) records that Bernard turner who worked for the London Mission Society station at Mbereshi trained hundreds of African youths in building, carpentry, metalwork and other crafts. Similarly, other missionaries set high on the agenda, the teaching of better methods of agriculture as a means of improving the lives of the people they had come to save. However, it should be noted that there were differences of opinion among different mission stations as regards educational objectives. While certain missions were wholly concerned with the salvation of the soul, others were at pains to improve the physical and social wellbeing of the indigenous population as well (Snelson, 1990). But how did the people react to missionary education? We read that (Bray et al, 1986; Carmody, 1992; Mwanakatew, 2013) for a very long time; schools were regarded as places to go to when there was nothing more pressing to be attended to in the tribal economy. Attendance to school was highly irregular and there were many disappointments for the mission educationists. This is mainly owing to the fact that there was very little to motivate the people to become educated in the white man's ways. Snelson observes that 'it was generally the missionaries who were enthusiastic to impart education, not the African population to receive it" (Snelson, 19990:20). This is probably on account that the western education that the missionary introduced was alien to the ways of Africans. Kelly (1999:27) for instance observes that:

> There was very little capitalization on traditional systems of education and no appeal to the way people had hitherto transmitted wisdom, knowledge and experiences from one generation to the next. Instead, in the desire to 'convert' people to Christianity, missionary rejected much of the traditional way of life. As a result, schools were alien to the local culture from the outset-they were foreign to the people, western-inspired and conceived.

A similar view was expressed by Battiste that students in Indigenous societies around the world have, for the most part, demonstrated a distinct lack of enthusiasm for the experience of

schooling in its conventional form-an aversion that is most often attributable to an alien institutional culture rather than any lack of innate intelligence, ingenuity, or problem-solving skills on the part of the students (Barnhardt and Kawagley 2005). The curricula, teaching methodologies, and assessment strategies associated with mainstream schooling are based on a worldview that does not adequately recognize or appreciate Indigenous notions of an interdependent universe and the importance of place in their societies (Kawagley et al. 1998)

It was not until employment opportunities demanding some degree of education became available in the 1930s and 1940s that it can be said that there was increased demand for educational opportunities arising from a belief that the ability to read and write and count in the white man's language might make it easier to get paid employment in the public service or even private sector (Snelson, 1990).

The period 1891 to 1924 in the history of Zambia is referred to as the 'company rule' so because Cecil Rhodes founder of the British South Africa Company (BSAC) had obtained from the British Government a royal charter for the company giving it the powers of government (Kelly, 1999). Therefore, the BSA Company administered the area in the name of the crown. The company thus imposed and collected taxes to meet the administrative cost. In terms of education, the company gave no support. Kelly (1999:27) observes that:

> The BSA Company administered the territory, collected large sums in taxes from the local people, but gave no money for schools (except for the Barotse National School). Mission supported schools and teachers from their own limited resources. Teachers were poorly educated, not trained, badly paid. The BSAC refused to support education but tried to control the system-its Native Schools Proclamation of 1918 gave the company sweeping powers over schools and teachers.

It should be noted that during this all period of the company rule, education remained a responsibility of the missionaries that established it and, although, the company tried to control it, missionaries were fully responsible for its support in terms of both human and material resources.

However, as Farrant (1980:30) correctly demonstrates that "indigenous education had no schools or buildings, or formal organization, of either nation or local education systems", most missionaries wrongly assumed that the people they had come to civilize didn't have any form of education and were completely ignorant and thus imposed western education and failed to

recognize indigenous ways of education. In this way, educational practice of the missionary flourished. Nonetheless, the fundamentally informal character of African traditional socializing children through to adulthood did not mean that it was in any way less effective even though it was overlooked by many early educationists (Kelly, 1999). On the contrary, it proved effective in equipping the members of those given societies with the skills and abilities needed in their natural and social environments.

2.3 Colonial Education Policy: An Instrument of Imperialist Domination

In 1924, the colonial government took over the administrative control of Northern Rhodesia "since the region failed to fulfil BSAC expectations as a source of revenue" (Kelly, 1999:20). For the first time in the history of Northern Rhodesia a high-powered team of educators made a comprehensive assessment and evaluation of educational opportunities for Africans through the Phelps-Stokes commission (Mwanakatwe, 2013).

The commission's immediate tasks were to investigate the people's educational needs, to ascertain the extent to which these were being met, and to assist in the formulation of plans to meet these needs. The commission recommended an education programme adapted and responsive to the needs of the community. Its concern was that education to be provided should meet the people's real needs and should prepare students for life in the rural village community (Kelly, 1999). This too is expressed in the Colonial Office's Advisory Committee report, 'Education Policy in British Tropical Africa', which states that: "education should be adapted to the mentality, aptitudes, occupations and traditions of the various peoples, conserving as far as possible all sound and healthy elements in the fabric of their social life" (Snelson 1974:142). In that way, education should aim at advancing agriculture, developing industries, improving health, training people in the management of their own affairs, and inculcating ideals of citizenship and service.

Besides, the Phelps-Stokes Commission advocated appointing a 'director of native education,' establishing an education advisory board that would represent all interested parties, subsidizing the educational work of the missions, and giving immediate priority to teacher training. The commission also advised that thought be given to setting up an institution that would provide

some form of higher education. The outcome of the commission was the replacement of what had been little more than a haphazard collection of schools by a more formal education system administered in an increasingly professional manner (Kelly, 1991). Nevertheless, even with these developments both colonial secondary school and higher education curriculum mirrored the curricula of equivalent elite institutions in Britain with only some sporadic local adaptation in the elementary school curriculum (Holmes and Mclean, 1989).

Kelly (1991) in his study 'Education in a declining Economy a case study of Zambia' sees important features of the education system during the colonial era that continues to have pernicious effects in today's education system. One of them is the way education developed as a highly centralized and highly selective system. The curriculum was the same for all schools and was centrally designed and imposed. Clearly this left schools with few opportunities to provide an education that was adapted to their pupils' specific needs. In other words, no room was left for a localized curriculum or inclusion of indigenous knowledges. The system's selective nature was such that progression from each grade to the next was by competitive examination, as such "even though locally relevant courses of study were sometimes introduced the principles of stringent student selection, specialized study and a humanistic or pure science bias prevailed" Holmes and Mclean, 1989:123). This too restricted schools' opportunities and willingness to be innovative and imaginative in responding to their pupils' particular needs. Like today, the requirements of the examinations dominated all the teaching and learning. Notice Snelson's expression:

> More emphasis was given to a child's acquisition of a limited store of ill-assorted and often irrelevant facts than to his ability to think logically or to the development of his natural curiosity. For the ambitious child, education was a rat race. For the rest, it was often drudgery (Snelson 1974: 275).

The education administration rested almost entirely in the hands of the government through its Department of Native Education, although the actual provision and management of schools and institutes remained largely with the missionary societies. The administration's task was to foster a sound and efficient system of education in keeping with the policy although, this become farfetched as the era was characterized with a slow development of secondary education due to colonial government's perennial fear of producing an educated unemployment class and thus, no early coherent directive policy on development of secondary education (Mwanakatwe, 2013).

Nonetheless, "After the Second World War, education began to expand to meet basic clerical and state institutions such as the police, basic colonial military needs and primary school teacher resource needs. But these efforts were inadequate to mitigate the years of colonial neglect" (Beyani, 2013:30). And moreover, the social, governmental, and economic institutions developed by the colonizers at the time, were more or less descendants of the well-established institutional formations found in Britain (O'Hern and Nozaki, 2014).

All in all, the over-arching policy that guided all educational policy at the time was that nothing should be done that would threaten European dominance. Thus, colonial education is often interpreted as being education for subordination, exploitation and development of underdevelopment and later seen as an instrument of imperialist domination and economic exploitation and finally as an instrument of intellectual and cultural servitude (Kelly, 1999). At independence in 1964, a fully developed education system had been created by the colonial empire which was more or less linked to institutions in Britain (Holmes and Mclean, 1989). Its curricula were seen to be inadequate and largely irrelevant to the needs of the local people. Thus, observes Freire (2000) projecting an absolute ignorance onto others is a characteristic of the ideology of oppression that negates education and knowledge as a process of inquiry.

Education at Independence and Today: De-colonization of Education

2.4 The United National Independence Party Era

Education policy development under United National Independence Party (UNIP), cover the period 1964 to 1991. At independence, Zambia's education system was essentially based on the colonial system of education inherited from Great Britain. Faced and overwhelmed with a multiplicity of challenges, the immediate urgent need was how to expand access to educational at all levels, for girls and rural children especially at Secondary and University level (Snelson, 1974). However, the question of what kind of education to give whether academic, vocational, practical or rural oriented, never featured prominently in the discourse at the time. According to Kelly three main principles have motivated all recent changes in educational policy:

> First in an independent country which subscribes to a democratic way of life, the national interest requires that there should be equality of educational opportunity for all and without regard to racial, tribal or religious affiliations; second, in a young country, the system of education must foster a sense of nationhood and promote national unity without necessarily incurring educational uniformity; and, third, in a developing country seriously deficient of trained manpower, an urgent objective of educational policy must be to sub serve the need for national development without, in the process, frustrating the full development of individual abilities and satisfactions (Kelly, 1999:70)

Thus, the basic objective of all educational programmes after Independence was to lay the foundation for the provision - after 1970 - of some of the much-needed trained man power in all fields of technical and economic activity (Mwanakatwe 2013). As regards educational policy, Beyani (2013) observe that the only policy guide at the time was the ruling party manifesto and the Education Act of 1964, both of which had no precise targets other than providing free education for all citizens. However, it seems fair to re-echo O'Hern and Nozaki words that: "After independence, education policy and practice were drawn from colonial remnants and many of those who propagated such polices were themselves products of colonial education" (O'Hern and Nozaki, 2014:134).

Nevertheless, the country witnessed a spectacular rise in access to education, especially at primary and secondary school levels. An ambitious programme was launched to build new schools and expand some existing ones to increase enrolments, while white-only schools were taken over by the government and Zambian children were admitted to them (Beyani, 2013).

Kelly (1999) notes several problems that beset education today which manifested themselves during the first decade of independence, 1964 to 1974 and two of these are worth mentioning. While some of these problems were merely a continuation of problems already experienced during the pre-independence era, others added a new dimension. First, the recognition that for many years to come primary education would be terminal for most children, brought into focus the issues of the relevance of the education received, and the allegations that it tended to alienate primary school-leavers from their communities and from rural life. The Second, government's realization in the late 1960s that science and mathematics were posing special problems and that the inadequacy of students' preparation in science and mathematics will handicap Zambia's manpower programme for many years (GRZ 1969). Despite this realization, very little was done to address these challenges but better still these revelations invoked education reforms.

The education reform of 1977 was the first comprehensive reform in the education system, which aimed at making education an instrument for personal and national development. The main features of this reform were the introduction of Basic and High School education system and the focus on skills orientation in Basic and High Schools. Among other things its contents were the aims at development of the whole person and; its insistence on quality and relevance (MOE, 1977). The reforms further retained English as a medium of instructions and also retained the certification and selection functions of examinations (Kelly, 1999). Positively, the reforms were viewed to have pressed emphasis on the concern for the whole person and each individual, concern for curriculum relevance and a cultural dimension towards a restoration of Zambian Languages.

On the contrary, many critics see the reforms as a mere linear expansion of the existing educational system. For instance, it never brought out the issue of the education needed in the present-day Zambian society, nor did it inquire whether the existing system was producing universal well-being. It took too little account of the context of education such as the growing population, rural neglect, the growing urbanization and the worsening economic situation. It had nothing to say on the issues of girls' education and environmental problems (Kelly, 1999).

In whole, its endeavor to reform the education system to one that meets the special needs of its people, the indigenous epistemological discourse as an alternative way of coming to know never featured significantly in the reforms debate. Rather, faced with a declining economy due to the drastic fall of copper prices on the world market in 1975 and the eventual deterioration of the economy into crisis proportions (Kelly, 1991), many former colonies, Zambia a like, were forced by poverty or powerlessness to rely on Western educational aid after political independence so that expatriate teachers from the west continued to orientate curricula towards Western patterns while local educationists were imbued with alien views through training in institutions in the West (Holmes and Mclean, 1989).

The epistemic genocide (Breidlid, 2013) of indigenous knowledges during this era appeared greatly to have affected those countries that often "had the weakest indigenous alternatives to British educational philosophy" (Holmes and Mclean, 1989:124) and Zambia is such even though its education aims and curricula aims were formulated by indigenous agencies. However,

the independence of curriculum and educational aims formulators away from foreign influence is highly questionable. For instance, Holmes and Mclean, (1989:130) argue:

> Foreign influences on the formulation of the curriculum aims occur through the initiative or willing acceptance of national or local policy-makers who have internalized foreign philosophies of worthwhile knowledge or who accept the claims to special professional expertise of foreign 'specialists'. General aims may be locally determined but precise curriculum objectives may be organized content packages (curriculum projects).

By and large, this era like the colonial era, was characterized with the transfer of foreign curriculum projects to schools in former colonies particularly in subjects such as English, Mathematics and Science (Action to Improve English, Mathematics and Science – AIEMS Project in Zambia) through a foreign determined content and heavy dependence on expatriate teachers and through the continued use of textbooks dominated by western authorship and production and through a standardized selection examination.

2.5 The Movement for Multiparty Democracy Era

This period stretches from 1990 to 2011. The MMD under President Fredrick Chiluba ended the one-party 27 years' rule of UNIP. The political change meant the demise of state monopoly of education as well. Education was liberalized a move that saw private and community schools being allowed to develop and contribute meaningfully to the education delivery system. The period 1991 to 2001 saw a significant decline in education sector development owing to the ailing economy. "Growing poverty and underinvestment in education was caused by the steady decline in the economy precipitated by the fall of copper prices in 1976" (Beyani, 2013).

It is against this background that this period saw considerable policy development and reforms. In 1990, for instance, Zambia attended the World Conference on Education for All, and the following year, a National Conference on Education for All was held in the country. The proposals and working strategies aimed at improving education delivery were drafted at the conference and culminated into what become to be referred to as "Focus on Learning 1992" a second major educational reform in the history of the country. The document was used to lobby Government and Cooperating Partners to consider allocating enough resources to the education sector in order to improve the quality and quantity of education in Basic Schools (MOE, 2013).

This meant that the country had to depend largely on foreign aid for the development of education in order to meet its educational budget.

The Zambian government, with partner support, began to address the declining trends in education delivery and performance. In 1996, the Ministry of Education developed the National Policy on Education, 'Educating Our Future', in order to respond to the developmental needs of the nation as well as those of the individual learners and to give direction to education service delivery (MOE, 1996). This policy has since become the basis of all the educational strategies that ensure the provision of quality education through suitable teaching and learning at all levels of the education system. BESSIP (Basic Education Sub Sector Investment Programme) was introduced by the Ministry of Education working with support from multilateral and bilateral financing agencies to deal with declining standards and infrastructure in primary schools (MOE, 2005). Development aid, included capital projects, and technical assistance that covered personnel, training and project operating costs (Kelly, 1999).

Worth mentioning is a science policy which was also developed in 1996 to encourage science education in schools. However, it is not clear how this policy was implemented as it was not concluded (Beyani, 2013). What is clear is that there has been a stagnant performance of Science were a massive proportion of candidates obtain a fail or only mediocre passes each year, with girls always lagging far behind boys (MOE, 2013). The debate on the poor performance of students in science has in most cases limited itself to mere narrative of teachers' inertia or incompetence, inadequate text books and laboratory materials, parents' failure to play a key role in the education of their children etc. Generally, the poor results have been blamed on the pupils, teachers, parents and administrators. Barely featured in the discourse is the language issue and what is taught. The medium of instruction in all learning institutions is English (at least from Grades 4) because of its claimed advantage to give access to international 'technical knowledge' and thus, the content of schooling is predominantly what is being taught in the West. While there have been advances particularly in the areas of medicine and agriculture that draw upon traditional culture and practice, the content of science in schools does not necessarily depend so directly on these recent developments in scholarship in developed countries rather "Western science penetrates the curriculum of non-Western schools through the agency of local universities which have accepted this science and insist on its dissemination in schools" (Holmes

and Mclean, 1989:132). For this reason, students not only battle to understand what actually is being taught because of the language barrier, but they are also located in a space where their cultures and worldviews are seldom, if ever, taken into account beyond their folkloristic aspects (Breidlid, 2013). The methods and content in schools are modelled and based on foreign western concepts where the everyday experiences and educational ideologies are different from the world views, histories and ways of life of most Zambian school kids. This has mainly been necessitated by Western domination of the production and publication of academic books and other pedagogical texts.

The National Policy on Education has been the basis for many educational decisions and restructurings. It is against this background that the Zambia Education Curriculum Framework (ZECF) has been developed to provide further guidance on the preferred type of education for the nation. Both the policy and the curriculum stress on the need for educators and their institutions to localize some aspects of the school curriculum to match local needs and circumstances. In a disparate move for localisation, a non-examinable separate area of study called community studies was introduced to deal with local/indigenous knowledges:

> One of the changes in the education system has been the introduction of community studies. This learning area aims at imparting knowledge, skills, positive attitudes and values to the learners within a locality for individual and community sustainable development (MOE, 2005:11).

It is not clear the success of this study area but it would be irrational to think that a non-examinable subject would thrive and receive any attention in a system built around examinations. Banda (2008) noted a lack of wider consultation with other stakeholders like the traditional leaders on what these community studies should include; the document on these community studies (MOE, 2005) did not explain the nature of involvement required on the part of parents and other community members in school; and most importantly the key stake holders – the teachers- were treated more or less like spectators and were only given a brief sensitization. Moreover, the introduction of a lone indigenous discipline (Community studies) was against the spirit of co-existence (as defined by Breidlid) between Indigenous and Western Knowledges, a situation where the hegemonic knowledge system talks to the dominated one and acknowledges the urgency of addressing issues that the dominant epistemology seems unable or unwilling to

tackle (Breidlid, 2013). This too challenges harmonization and integration of the best elements of both indigenous and western forms of education to create a more viable system of education.

Nevertheless, this was soon abandoned in preference for an all-inclusive curriculum that cuts across all study areas. So, a new curriculum named localised curriculum, which makes up 20% of the curriculum, was introduced (MOE, 2013). This curriculum area encourages schools to address issues of sustainable development that are locally relevant through this curriculum component, but it is not clear what kind of learning emerges from this curriculum aspect (Beyani, 2013).

The process of having a localized curriculum has been met with challenges. The major one is the restriction of CDC staff to Lusaka the capital which makes the curriculum development process remain highly centralized. This makes it problematic for the Curriculum Development Centre to develop epistemological variations in curricular materials that suit and respond to the different local needs and worldviews, not only of indigenous groups, but also of the underprivileged communities in the urban shanty towns. Kelly observes:

> In the mistaken belief that equality implies uniformity, the same syllabuses and teacher materials, often biased toward the middle and upper income urban sector, are used throughout the country. Zambia will require vision and courage to promote the development and use of a more localized curriculum and syllabuses. The lack of finances does not in itself prevent this, but the form of operations that financial restrictions have helped to entrench in the CDC render its occurrence somewhat unlikely (Kelly, 1991:131).

The second challenge to the process of localization is the persistent continued administration of highly centralized and standardized colonial forms of examination and assessments even after other areas of the curriculum have changed to meet local needs. Examination Council of Zambia (ECZ) was established through an Act of Parliament 1983 to set and conduct examinations and award certificates to successful candidates (www.ecz.org.zm). Prior to the establishment of the Council, the University of Cambridge Local Examination Syndicate in the United Kingdom was the examining and awarding body. The syndicate's examinations catered for many countries and consequently it was not easy for such examinations to reflect the needs of Zambia (www.ecz.org.zm). The education system was subject to British curricula, syllabi and regulations with little or no say from Zambia in the general policy of the syndicate examinations. It is in view of this, that it became necessary to reach a decision to localise School Certificate

examinations. Today, it is not clear to what extent the Examination Council of Zambia is localized to the extent of embracing indigenous diversity. Holmes and Mclean (1989:135) observe that examination systems may not be changed easily when they determine access to higher education or sought after occupations".

Despite these challenges, the new curriculum has come to the realization that with the introduction of formal education, learning institutions share the responsibility with the home and local communities of passing on to learners that part of the cultural heritage which is meaningful and useful in today's society. That the role of education of passing on of cultural heritage, values, traditions, language, knowledge and skills from generation to generation has not changed (MOE, 2013). Thus, curriculum should, therefore, respect and retain elements of the past and also be able to develop and assess competences needed for tomorrow's Zambia.

2.6 The Patriotic Front Era 2011 to Date

It is not clear yet which policy direction the Patriotic Front will take regards the issue at hand. However, its strategic focus in the Sixth National Development Plan (2011) is on expanding access to high school and tertiary education with further efforts to improve the quality of education at all levels so that appropriate skills, knowledge, attitudes and values required for social and economic development are imparted to the learners. Overall, the new government has prioritized quality and relevance for its post 2015 agenda for education (MOE, 2015). Key to this agenda is the execution of the recently introduced primary school curriculum and the two-tier education system that offers academic and skills education. It will be interesting to see how the government plans to face the challenge of trying to tackle access due to population growth while trying to improve educational quality and the challenges in view of globalization and the importance and relevance of knowledge.

All in all, from the discussion, it is clear that the education sector in the past has done very little in not only advocating for the inclusion of the indigenous / local ways of knowing but also its actual practice in formal schooling. In most cases, schools share the blame in downgrading the traditional culture and languages. Today, however, the discourse is back in the educational domain. "Recently, many indigenous and non-indigenous people have begun to recognize the

limitations of a mono-cultural education system, and new approaches have begun to emerge that are contributing to our understanding of the relationship between indigenous ways of knowing and those associated with Western society and formal education" (Barnhardt and Kawagley, 2005:10). In Zambia, the Education policy and the national curriculum stress the need for indigenization. It is imperative, therefore, to explore to what extent institutions of learning are implementing this portion of the policy in preventing a further loss of cultural traditions and knowledges of indigenous groups in Zambia. However,

> …the problem today is that, in the context of colonial domination, we have to a large extent internalized the discourse of our former masters on our cultures, their denigrating views on African ways of life and modes of thought. As a consequence, we were and are still tempted to under value our own heritage, including the immense legacy of indigenous knowledge" (Odora Hoppers, 2002:25).

Like this chapter, the subsequent chapter provides an overview into some of the sources examined in this research but with a further insight into a theoretical framework consisting of concepts and definitions and a further reference to relevant scholarly literature.

CHAPTER THREE
CONCEPTUAL AND THEORETICAL FRAMEWORK

This research makes use of three main theoretical frameworks for the purposes of establishing diverse lenses into an exploration of the extent to which the teacher education integrated science course addresses Indigenous epistemological discourse in Zambia. The frameworks attempt to give a scientific research base and provide support and guide in the process of developing this study. In addition to providing guidance, these frameworks also act as a springboard through which the research unfolds and provides scientific justification for investigations. The chapter first opens with a discussion into the understanding and definitions of some of the key concepts used in this study; Epistemology; Indigenous Knowledge(s) and or Local knowledge(s); localized curriculum. Further, the chapter makes reference to other writings and specific research studies on Indigenous knowledges in Zambia before a description of the theories used in the study. Theories in this study include; Cheong's Theory of Tree in fostering local Knowledges in education; Freire's Transformative role of Education theory; and Holmes and Mclean's Curriculum Dependency Theory. This is finally, followed by a summary to the chapter.

3.1 Epistemology

Traditionally, epistemology refers to the theory of knowledge. Breidlid (2013:2) defines epistemology as that which "deals with questions of what knowledges are and how they are acquired-in other words, the nature, scope, and source of knowledges". Chilisa (2012:21) submits that "Epistemology inquire into the nature of knowledge and truth. It asks the following questions: what are the sources of knowledge? How reliable are these sources? What can one know? How does one know if something is true?" Epistemology, therefore, is the way people see and interpret the world around them according to their lived experiences and beliefs, (Bateson, in Breidlid, 2013). Epistemology is the study of how we know what we know. It is the study of the nature, origin and limits of human knowledge, often called the theory of knowledge (Bastein and

Holmarsdottir, 2015). It deals with the theory of knowledge and what counts as knowledge. Epistemology and worldview are often used simultaneously. Epistemology also often deals with the methods of how a certain epistemology or knowledge system is validated and legitimized (Odora-Hoppers, 2002; Visavanathan, 2002). It is an attempt to make sense of the possibility, nature, and limits of human intellectual achievement and aims to investigate specific domains of knowledge or rational belief (Tulving and Craik online).

In this study, I explore to what extent the indigenous epistemology narrative finds its way into a western epistemology dominated science classroom at a college of education. Epistemology has in this study been used synonymously with worldviews and both refer to its traditional meaning of nature, scope and source of knowledge.

3.2 Western Knowledge

Western knowledge is used to refer to the global architecture of education as 'a common, western epistemological discourse which permeates and dominates most education discourses in the global south as well as in the north (Jones in Breidlid, 2013). "It is a complex web of ideas, networks of influence, policy frameworks and practices, financial arrangements and organisational structures - a system of power relations that determine how education is constructed in the world" (Jones, 2007:325). According to the 'Handbook of Research on Social, Cultural, and Educational Considerations of Indigenous Knowledge in Developing Countries' Western knowledge also known as western science, is knowledge that relies on the established laws through the application of the scientific method to the phenomena. Its method begins with an observation and is followed by a prediction or hypothesis that has to be tested (Ngulube, 2007).

3.3 Indigenous Knowledge(s) and or Local knowledge(s)

Indigenous knowledges on one hand are 'knowledges produced in a specific historical and cultural context and are typically not "generated by a set pre-specified procedures or rules and

(are) orally passed down from one generation to the other', (Semali and Kincheloe in Breidlid, 2013:31). It is:

> …a way of knowing developed by local/indigenous peoples over generations as a result of sustained occupation of or attachment to a place, location, or space with the result that such occupancy allows peoples/communities to develop a perfect understanding of the relationship of their communities to their surrounding natural and social environments (Dei and Asgharzadeh, 2006:54).

Bearing the diversity, contextual and complexity of Indigenous knowledge systems, a plural form as been used in reference to indigenous or local knowledge. This is in line with Breidlid (2013) who argues for the use of the plural form 'indigenous knowledges' on account that there are multiple indigenous knowledges.

Local Knowledges on the other hand "consist of the knowledge, beliefs, traditions, practices, institutions, and worldviews developed and sustained by indigenous and local communities, and are believed to represent an adaptive strategy to the environment in which these communities live" (Vandebroek, Reyes-García, de Albuquerque, Bussmann, and Pieroni, 2011:1).

From the two definitions above, it is clear that there is a very thin line between indigenous and local knowledges; in fact, some scholars such as Breidlid (2013:31) observe that "Often indigenous knowledges are called local knowledges. Morgan (2005), for instance, shows that the notion of "local knowledge" has its basis in indigenous, in the traditional and the established. He further assets that the term local knowledge is at times used by some scholars in equivalent to culture. Scholars among them (Warren et al., 1995; Rajasekaran, 1993; Chiwome, 2000) define the two concepts borrowing the key words (indigenous / local) from each other. Indigenous knowledge for example, has been defined as local knowledge that is unique to a given culture or society. They view Indigenous Knowledges as the systematic body of knowledge acquired by local people through the accumulation of experiences, informal experiments, and intimate understanding of the environment in a given culture (Rajasekaran, 1993; Luna, 2005).

Nevertheless, divergent views from Morgan (2005) suggest that local knowledge may not necessarily be indigenous but that which has been established in a given locality. The locality may either be rural or urban. This therefore, means that Indigenous Knowledge may be used to refer to a unique, traditional, local knowledge existing within and developed around specific

conditions of people indigenous to a particular geographical area be it rural or urban. Similarly, local knowledge may entail non-indigenous people living in a particular area, also rural or urban with their own local knowledge (Ruddle, 1993). The notion of 'local' has been contested by some scholars as being restricted to local issues and has thus been sometimes perceived as "traditional", with the negative connotation of being outdated or primitive, and thus of little use to solve problems of modern society (Vandebroek et al, 2011). Moodie in Breidlid, (2013:31) states:

> "Local" can only be understood in relation to "universal," and thus the term indigenous knowledge incurs a string of negative judgements: "universal is identified with "mainstream" and hence with "progress." And so "local" comes to be understood as referring to an intellectual backwater, and whatever is indigenous is then regarded as primitive or, at best, quaintly ethnic.

Likewise, Banda (2008) offers a similar claim that in Zambia, and possibly other global south countries, any product labelled 'local' is considered to be of inferior value. He further illustrates that 'local court' is lower than 'high court'; 'local maize' or 'chickens' are perceived inferior to the hybrid ones and 'local footballers' are considered second class to the highly rated 'professional' ones. On the contrary, with the current crisis of Western science and the modernisation utopianism which has not delivered on its promises for most third world societies, there have been revivalist or romantic calls for a return to local knowledge and traditional solutions (Kraak, 1999). This is also expressed by my informants:

> This time a local chicken costs almost twice a hybrid chicken, why? People have realized that there is something valuable in those types of chickens than in the others. Right now, there is an influx of marketers selling traditional medicines, traditional vegetables, and traditional tubers… People have gone local (Kayombo (Ltr), 22nd September 2016).

By and large, this study uses the terms 'indigenous Knowledges and local knowledges interchangeably and synonymously.

3.4 Localized curriculum

Curriculum localization has been defined as the freedom for schools or local education authorities to adapt the curriculum to local conditions and, as relating the content of the

curriculum and the processes of teaching and learning to the local environment (Taylor, 2004). A comprehensive definition has been advanced by Cheong:

> Localization refers to the transfer, adaptation, and development of related values, knowledge, technology, and behavioral norms from/to the local contexts. Some characteristics and examples of localization are as follows: local networking; adaptation of external technological, economic, social, political, cultural, and learning initiatives to local communities; decentralization to the community or site level; development of indigenous culture; meeting community needs and expectations; local involvement, inter-institutional collaboration, and community support; local relevance and legitimacy; and concern for community-based needs and characteristics and social norms and ethos (Cheong, 2002:6).

From the above definitions and illustration, it can be noted that the concept of relevance is fully imbedded into the idea of localization and is therefore, crucial to the comprehension of the whole process of localization. If the education system is going to be relevant to the needs of the learners and the society at large, its curriculum content must take into account as UNESCO (2002) observe, the cultural and socio-economic realities of that particular society. In this way, the learning process becomes relevant and meaningful and the interaction between child and school become a more active and enriching experience, rather than a passive, tiring, or alienating experience for the child (Miller, 1995). A crucial failing of educational systems worldwide, observes Girma (Online) has been their lack of relevance to the lives of learners. This lack of relevance weakens the mentioned connection and bond between communities, learners, and schools; and thus, damages educational outcomes through decreased student, community, and teacher engagement in the learning process. This too was observed by Serpell (1993:2):

> When a school curriculum is designed in a manner which is alien to the cultural assumptions informing other socialization practices to which its students have been exposed, discrepancies are liable to arise between the goals of that curriculum and the cultural goals of the social group.

Thus, contextualization of teaching and learning to the local can strengthen the relations between the learning environments of school, home and community. In science, this entails building on pupils' indigenous experiences from outside the school and providing additional scientific experience within the school programme. This process could be enhanced through the use of metaphors and analogies, which allow children to integrate their own learning experiences and make new and unfamiliar concepts more meaningful to students by connecting what they already know to what they are learning (Taylor and Mulhall, 1997).

The Education system in Zambia is in the process of decentralization. Decentralization involves the devolution of power from the centre to the local level, in districts and schools. It promotes broad-based participation in the management of education with great emphasis placed on the creativity, innovation and imagination of the local-level education managers (MOE, 1996). By allowing various stake-holders to share in decision-making and to take responsibility for education at the local level, decentralization fosters a sense of local ownership and promotes better management. With regards the curriculum, this means increasing and strengthening the link between local communities and school curricula. The Ministry of Education is alive to this fact and thus stresses the need for a cultural sensitive and contextualized curriculum. The policy, for instance, urges that:

> The science syllabus, for all schools, should contain a core of environmental science, dealing with issues that are relevant to pupils in every part of Zambia. There should also be room within the syllabus for topics that are relevant to particular localities or to dominant characteristics of the local economy… The criterion should be the relevance of the material to the environment and to the possible later sphere of employment of the pupil (MOE, 1996:35).

The motivations for a localized curricular are many. Besides, the ultimate goal of improving the quality of educational delivery lays the idea to maximize the education relevance to local development and bring in community support and resources, local partnership, and collaboration in learning, teaching and research (Cheong, 2002). UNESCO (2002) underscores the relevance of curricular content as a vital dimension of quality education and its flexibility in encompassing the diversity of the local, their cultural and socio-economic realities.

A central factor in the process of school curricula and the schooling content localization is the ethnic and linguistic diversity of many nations. Zambia is home to 72 different ethnic groups meaning that the country precisely has 73 different spoken languages, although some researchers tend to categorize most of them as dialects of each other. Other huge different levels of economic and social diversity exist between urban and rural communities. UNESCO argues that this diversity must not be ignored but taken into account when designing school curricular and lessons, both in terms of local relevance and in terms of linguistic delivery, to create the links between learner and materials (UNESCO, 2002). This is important in all study areas but especially so in Integrated Science were the African child finds him/ herself having to cross worldviews and epistemological border that in many cases do not complement or accommodate

one another (Breidlid, 2002; Fakudze, 2003). To learn science is to acquire the culture of science (Maddock, 1981). To acquire the culture of science, students must travel from their everyday life-world at home to the world of science in the science classroom. Therefore, Aikenhead and Jegede conclude: Students' flexibility, playfulness, and feelings of ease in the world of science will help determine the smoothness with which students cross the border into the culture of science. This smoothness will likely affect the degree of culture acquisition that takes place (Aikenhead and Jegede, 1999).

The defining goal in the success of localization and inclusion of alternative knowledges is teacher's beliefs, perception and attitudes, their abilities and for them like Cowley and Williamson (1998:81) observe "to become owners of the curricula and more enthusiastic about its implementation". However, the process of localization or inclusion of indigenous knowledges like any other education policies has been met with lots of impediments and its success is stained. In the words of Penelope Peterson, "the pedagogical slate is never clean" (Darling-Hammond, 1990). Taylor (2004:3) observes, "Admittedly, such practice depends a great deal on the capacity and interest of individual teachers, since national education systems seem rarely able to support the development of such abilities on a large scale".

Significantly, the classroom should be viewed as the manifestation of any important policy change in education and teachers as an important part of the policy process. Yet, teachers are hardly presumed to be objective and talking to them as a way of illuminating policy is viewed by many as irrelevant (Darling-Hammond, 1990) and thus, they are seldom consulted in the policy formulation process. Fullan (1982) notes that, the communication of new policies often take the form of directives and admonitions rather than dialogue and education. Elmore (1983) attributes policy resistance by local implementers to 'the power of the bottom over the top". Top-down policies, he submits, 'constrain but not construct' practice. Therefore, local leadership and motivations for change are critical to policy success. Local ideas and circumstances will always vary; therefore, local agencies must adapt policies rather than adopting them. Policies should allow teachers and administrators opportunities for continued learning, experimentation, and decision making during implementation. Of equal significance is the understanding that reform should be demand-driven. As much as the people affected by reform want change, they too must be willing to change (Healey and Destefano 1997). If therefore, educators are unwilling to

change "...efforts need to be undertaken to generate (them)..." and as such, "local demand...and ownership" (Healey and Destafano, 1997:1)

Other barriers to the implementation of a localized curriculum policy include; Lack of competent staff, lack of funding; negative attitudes and resistance from teachers; Constraints of centralized cumulative exit examinations (UNESCO, 2002); coupled with the inability to involve key stakeholders and the inadequate preparation of school managers and teachers for curriculum change (Byron, 2000). UNESCO notes, "One of the practical implications of developing a local curriculum is to presume that at the local level competent staff will be available to carry out the tasks..." (2002:35). Although, localization brings with it increased autonomy at the local level, with it, also, comes the issue of additional responsibility transferred from the traditionally centralized educational hierarchy to these local levels. There is, therefore, need to question the abilities of local actors –teachers and school managers at the point of implementation to have the capacity for affecting change and enacting the reform handed down from the higher levels of government. This calls for a cross-disciplinary and participatory process involving key stake holders as Carm demonstrated in her study of the role of local leaders in cultural transformation and development in Zambia. In her study for instance, a localized HIV/AIDS-prevention strategy (Interactive School and Community Approach) was developed and implemented through close collaboration and interaction across traditionally vertical boundaries such as formal educational and traditional leadership structures resulting in a communicative space for the merger of Western and indigenous knowledges (Carm, 2012).

All in all, the inclusion of indigenous knowledges into the core curriculum is key in facilitating a link between home knowledge and school knowledge. Its success largely depends on the skill, motivation and professionalism of teachers as well as the availability of suitable resources. Teachers will have to develop skills in understanding the environment from which their students come from in order to utilize the local resources and make learning more relevant to their learners' local needs. Agnihotri et al (1984) sums it up, the further away the resources are from the environment of the child, both in terms of content and language, the greater the indifference, alienation and non-participating of the learners in the learning process.

3.5 Western versus Indigenous Knowledges

The qualities identified for both Indigenous and Western systems represent tendencies rather than fixed traits, and thus must be used cautiously to avoid overgeneralization (Gutierrez and Rogoff 2003). Indigenous knowledge systems have been described as ecologic, holistic, relational, pluralistic, experiential, timeless, infinite, communal, oral and narrative-based. Keeping in mind the limitations of a dichotomous framework and recognizing that there is also considerable overlap in some areas, Western science has been described as reductionist, linear, objective, hierarchical, empirical, static, temporal, singular, specialized, and written (Smylie, Martin, Kaplan-Myrth, Steele, Tait & Hogg, 2004). While Western science and education is viewed to be compartmentalized and decontextualized and taught in structured schools, Indigenous education is said to be holistic and lifelong, that is: from birth to death. For indigenous people, the particulars come to be understood in relation to the whole, and the "laws" are continually tested in the context of everyday survival (Barnhardt and Kawagley, 2005). Further contrasts between Western thought and Indigenous thought is perceived through the notion of competency. In Western terms, Barnhardt and Kawagley, (2005) claim, competency is often assessed based on predetermined ideas of what a person should know, which is then measured indirectly through various forms of "objective" tests. Barnhardt and Kawagley, (2005) contend that such an approach does not address whether that person is actually capable of putting that knowledge into practice. In the traditional native sense, they argue, competency has an un-equivocal relationship to survival or extinction. One either has or does not have requisite knowledge, and it is tested in a real-world context (Barnhardt and Kawagley, 2005).

With these differences between these two knowledge systems based on different epistemological foundations one wonders whether there can be an "interface between two theoretical models that seem, at first glance, to be diametrically opposed. Smylie contends that the compatibility between Indigenous and Western models of knowledge generation and transfer relies critically on the system of interactions among researchers and users that, for interface to exist, must be defined by the indigenous context in which the process is occurring" (Smylie, et al, 2004:141). "We have to face reality and look deep into the facts in such a way that we may understand both the traditional and the modern, and make use of both for our survival today" (Odora Hoppers

2002:26). Agrawal critically questions the clear line of demarcation between Western and indigenous knowledges and suggests coexistence between the two epistemological positions (Breidlid, 2013). Breidlid also reechoes the need for the co-existence of indigenous and western knowledge systems and for the disbandment of the superiority complex of Western knowledge in the quest for a sustainable future and proposes that indigenous knowledges be given space or demand space to query hegemonic epistemology (2013).

What then is the current status of indigenous knowledges today in relation to the Western knowledge system? Many scholars today generally see a growing worldwide acceptance among scientists and international aid agencies of indigenous knowledge. The developed and growing network of 33 national and regional Traditional Ecological Knowledge (TEK) and Resource Centres embracing six continents is highly reflective of the wind of change (Warren, 1991; Healey, 1993).

However, Odora Hoppers (2002:24) summarizes: "…indigenous knowledge today lies in the margins of science. It appears as the informal sector, as opposed to the formal sector of knowledge. In some cases, this situation is the direct consequence of an active process of repression". The curricula, teaching methodologies, and assessment strategies associated with mainstream schooling are based on a worldview that does not adequately recognize or appreciate Indigenous notions of an interdependent universe and the importance of place in their societies (Kawagley et al. 1998).

3.6 Globalization versus indigenous knowledges

Globalization is defined differently by different scholars. Cheong (2002) sees it as the transfer, adaptation, and development of values, knowledge, technology, and behavioral norms across countries and societies in different parts of the world. The driving forces and characteristics associated with globalization observes Cheong, (2002) include; growth of global networking such as the internet, worldwide e-communication, and transportation; a tendency for global transfer and interflow in technological, economic, social, political, cultural, and learning areas; international alliances and competitions, international collaboration and exchange, global village,

multi-cultural integration, and use of international standards and benchmarks. Similarly, Moahi (2007), views globalization as the opening up and interconnectedness of the world.

From the two definitions above it is seemingly agreeable that globalization has both positive and negative impacts on indigenous communities and their development. Therefore, how education should position itself and be responsive to the developments and challenges of globalization should be a major concern to educationists and policy makers (Cheong, 2002).

Cheong (2002) sees two types of interactions between local knowledge development and global knowledge dissemination in globalization: Growing local knowledge and disappearing local knowledge in globalization. The implication, he states, is that if the local knowledge is fostered in globalization, there will be increased contribution to local developments and also likely increased contribution to the growth of global knowledge and global developments if this increased local knowledge is also valid to other communities. Similarly, if the local knowledge is overwhelmed and even replaced by the external knowledge in globalization, the local knowledge will be unable to grow and will gradually disappear. Consequently, there will be decreased contribution to local developments due to the inappropriateness of external knowledge and the lack of appropriate local knowledge for the development of local community.

Today, the world is another place. While human lives continue to be lived in local realities, these realities are increasingly being challenged and integrated into larger global networks of relationships (Suarez-Orozco and Qin-Hillard, 2004) and education has not been spared. For example, "globalization is leading to the internationalization of education notably higher education, which presents several risks for students and for developing countries in the form of wider education gap, low-quality, or non-relevant programmes" (Hugonnier, 2007). In Zambia, the situation isn't different; globalization has necessitated rapid urbanization which has also hastened the demise of some of the customs and traditions. This is a loss which schools have done very little to prevent. Indeed, institutions of learning have too played a role by relegating the languages and cultures of Zambia (Kelly, 1999). Furthermore, globalization is responsible for increasing the technological gaps and digital divides between the global south and the global north and this has greatly hindered equal opportunities for fair global sharing. In this way, more

legitimate opportunities are being created for some global north countries to economically and politically colonize other countries globally (Cheong 2002). This use of economic, political, cultural, or other pressures to control or influence other countries, especially former dependencies is now referred to as neo-colonialism.

Cheong (2002) proposes several theories among them 'Theory of a Tree' on how education systems can maintain their cultural assets and local identities in the face of globalization challenges which forms part of the lens I use in examining the relationships between indigenous knowledge and western knowledge in today's global village. The theory will be discussed in this chapter under theoretical frame work.

3.7 Specific Research studies on Indigenous Knowledge Systems in Zambia

Sakayombo Rosalia in her study of 2014 explored the integration of indigenous knowledges (IKs) into the teaching of agricultural science as illustrated by the cases of selected secondary schools in the Southern province of Zambia. She stressed on the need to integrate Indigenous Knowledges in agricultural science education in Zambia as a way to reflect the local cultural settings. She observed that the agricultural science syllabus in secondary schools is Eurocentric since the current educational policies are situated deeply in Western hegemonic epistemology. She observed that in this way Western knowledge marginalizes Indigenous Knowledges which are mainly misconceived as irrational, backward and primitive. Her conclusion was that, since research has shown that Indigenous Knowledges are being gradually recognized as an alternative knowledge that can be used in the preservation of the environment (Warren et al.; 1989; Sillitoe, 2000; Breidlid, 2013), integrating them into agricultural science teaching is, therefore, meant to bridge the gap between the school and the learners' home environment, and make learning more relevant.

Banda, Dennis in 2008 conducted a study titled "Education for All (EFA) and 'African Indigenous Knowledge Systems (AIKS): the case of the Chewa People of Zambia". This study investigated whether "African Indigenous Knowledge Systems (AIKS)" can enhance the achievement of Education for All (EFA) with particular reference to the Chewa people of

Zambia. The study raised challenges that many countries have experienced in their effort to achieve EFA. Among the Chewa people of Zambia, quality, relevance and credibility of the education were some of the reasons affecting the provision of education for all. The research argued that formal schooling education, in its current form may not be the right vehicle to deliver EFA goals. The research proposed alternative forms of knowledge that could be hybridized with the formal schooling education to address some of the challenges identified. The research has tried to re-appropriate some Chewa AIKS to theorize curriculum and pedagogy reforms that could enhance the achievement of the EFA goals. Banda argued that hybridizing AIKS with the formal schooling system will only become significant if an economic value is added to the AIKS through some mechanisms put in place. He noted that practical skills embedded in AIKS could foster career building, entrepreneurship and apprenticeship if linked to the money economy of employment and wealth creation. He further, argued that there may be need to establish opportunities for AIKS holders to be accredited within the National Qualification Framework and policy framework on AIKS. This if enacted would regulate and protect Indigenous Knowledges, and guide the hybridization process he maintained.

The third study of interest to this research is a case study among the Chewa people of Eastern Zambia conducted by Professor Robert Serpell in 1993. The study focused on anticipated and actual outcomes of various amounts of schooling (ranging from none to a full secondary and tertiary program. Of relevance to my study are the three Agendas of schooling that Serpell (1993) identifies. He propounds that the process of education, institutionalized in schools of various sorts around the world hopes school to promote economic progress, the transmission of culture from one generation to the next, and the cultivation of children's intellectual and moral development. Serpell (1993) calls the three agendas as the economic, cultural and pedagogic agendas of schooling.

His findings were that schooling is expected by both the parents and their children and the community at large, to promote economic progress, transmit culture from one generation to the other and cultivate children's intellectual and moral development. All in all, Serpell's argument is summarized as follows:

> In contemporary African societies- as in many other parts of the Third World – the economic and cultural agendas of schooling often come into conflict. The conclusion is

> that the greater the degree of alienation between the culture of a child's socialization at home and the culture of schooling, the greater the resulting discrepancy between their goals. The pedagogic agenda of schooling is lost once the school curriculum is designed in a manner alien to the cultural assumptions informing other socialization practices to which its students have been exposed (Serpell, 1993:3).

It is this view that the pedagogic agenda of schooling may be lost when the cultural assumptions of the child are overlooked that is pertinent to the study of indigenous knowledges. Children in such situations feel lost and some withdraw or are pushed out of school. This could even be catastrophic when it comes to science where students, for instance, who experience such a conflicting culture gap between family and school find it virtually impossible to move into the culture of school science and might avoid (or drop out of) school science to sustain their self-worth whenever they experience the foreign culture of school science (Aikenhead, and Jegede, 1999).

3.8 The Research Gap Addressed

The study of an exploration into the extent to which the primary teacher education Integrated Science course addresses indigenous knowledges in both content and actual teaching practices at a college of education in Zambia may not have been conducted before. Therefore, this study is special in that it comes with a realization that Colleges of Education are important locations of knowledge production and re-production. Through its content and its methods, world views and values are created and perpetuated from one generation to the other through teacher training and the subsequent interaction of teachers and pupils thereafter. This study departs away from most studies that focus on schools ignoring the source or factory that produces teachers who in turn continue in the people processing industry. Thus, the study focuses on teacher education a place where pedagogical reform should be concentrated. The role of teacher education in the transmission of knowledges cannot be overemphasized. MOE (1996:104) notes: "The quality and effectiveness of an education system depend heavily on the quality of its teachers. They are the key persons in determining success in meeting the system's goals. The educational and personal well-being of children in schools hinge crucially on their competence, commitment and resourcefulness". Therefore, the manner in which teachers are trained to handle and negotiate between western and indigenous knowledges is very important not only to the success of

incorporating alternative epistemologies in Integrated Science but to the teaching process as a whole. This is due to the fact that, teachers are highly likely to teach in the way they themselves were taught. Thus, the attitudes and beliefs of lecturers and their students towards indigenous ways of knowing and coming to know in integrated Science in teacher education programme are not only key for identity construction but also for bridging the gap between western and indigenous epistemological and ontological views.

3.9 Theoretical Frameworks

3.9.1 Theory of Tree: Fostering Local Knowledge in Education in the Global Village.

The theory of a tree propounded by Cheong (2002) assumes that the process of fostering local knowledge should have its roots in local values and traditions but absorb external useful and relevant resources from the global knowledge system to grow the whole local knowledge system inwards and outwards. This means that local and indigenous ways of knowing such as observing natural process; adopting modes of survival; obtaining sustenance from the plant and animal world; and use of the natural materials to make tools and implements should be hybridized with Western ways of knowing to come up with a relevant non-biased curriculum. Therefore, nurturing local knowledge in globalized education needs local character and cultural roots and the curriculum design should be based on local values and cultural assets but absorb appropriate global knowledge and technology to support the development of the local community and individuals as local citizens. Kelly (1999:259) notes:

> Education must be rooted in a society and a culture which learners can comprehend. An alien education is unproductive and psychologically disturbing; often lending to a dangerous form of half-learning where children can answer questions on content yet do not fully understand what they are being asked or why they are answering, because it has little connection with their lives and experience.

Cheong (2002) in his 'Tree Theory' sees the selection of global knowledge in fostering local knowledge in globalized education instruction as mainly dependent on the needs of the local community and cultural preference but not the popularity in the outside world. The defining

point therefore, is taking into account the social-cultural and economic realities (UNESCO, 2002) of local inhabitants when designing educational content. This means that curriculum developers should rethink about education and schooling and begin a new path which departs from foreign interpretations of what is important to be included in the curriculum at the local level. The expected outcome in globalized education, Cheong argues, "will be to develop a local person with international outlook, who will act locally and develop globally" (Cheong, 2002:12). This goal should inform the education policies and practices in order to develop a well-balanced individual that will not only appreciate the connectedness and relationship between knowledge systems but also bring out the divergent ways of knowing together in a conscious and critical manner (Breidlid, 2013).

The strength of this theory Cheng observes is that the local population can maintain and even further develop its traditional values and cultural identity as it grows and interacts with the input of external resources and energy in accumulating local knowledge for local developments (Cheong, 2002). He contends that, since the process is mainly based on the cultural roots, it will be stable and gradual (p 12). Cheong further propounds that, the successful growth of a local community and its local knowledge system, to a certain extent, will contribute to the growth of the global community and knowledge, but, if the cultural roots of the local community are poor and narrow, the growth of individuals and local community will be tightly bounded and suffering. In the same view, Odora Hopers (2002) observes that this leads to a development of a critical and free relation both to our cultural and to the exogenous culture and to a further development of a pluralistic and dynamic view of our heritage as opposed to a static and simplistic approach. The environment is thus, characterized with local values, cultural traditions and assets in the design and content for guiding the search and use of external useful and relevant resources to facilitate individual and institutional learning and serve local developments.

Cheong (2002) elaborates; the conversion of global knowledge into local knowledge may be very selective and limited subject to the cultural bias. He concludes; it is not a surprise that without any cultural changes, the developments and growths of individuals and the local community may be mainly short-term technical changes and the knowledge to be accumulated may be only technical knowledge. Central in this theory is the need for local identity and cultural roots for growth.

3.9.2 Transformative role of Education

Transformative role of education theory is credited to Paulo Freire's work of the Pedagogy of the Oppressed. In discussing the transformative role of education, Freire (1970) argues that schooling should not seek to 'integrate' students into a structure of oppression, but to transform the structure so that students can be liberated and become 'beings for themselves. Freire advocates for critical education as opposed to a form of education that involves interactions between teachers and students that are dominated by a 'banking' concept of education where the teacher's task is to fill the students with the contents of his narration; contents which are detached from reality, disconnected from the totality that engendered them and could give them significance.

On the contrary, critical education has to integrate the students and the teachers into a mutual creation and recreation of knowledge unlike where knowledge is produced at some distance from the classroom, by researchers and scholars and textbook writers and official curriculum committees who in most cases are foreign to the context. Rather it should be jointly created and re-created by teachers and pupils in their contexts. This concept, which position students as containers into which the knowledge of the teacher can be deposited on a daily basis, is completely insufficient and will "never propose to students that they critically use reality" (Freire, 1970:74). The banking concept of education, which Freire sees as a mechanistic and alienating, enables certain groups in society to more easily dominate other groups by regarding them as marginal or on the outside. The elite who are in many cases themselves 'mentally colonized' (Ngugi, 1986) impose their culture and values as the standard and transfer this imposed standard through required syllabi, mandated curriculum, tracking and standardized examinations. "Any educational practice based on standardization, on what is laid down in advance, on routines in which everything is predetermined, is bureaucratizing and anti-democratic" (Freire and Fundez, 1984:41).

The curriculum for rural schools in most developing countries is centralized and inflexible with an urban, western, middle-class bias (Taylor and Mulhall, 1997). Such a curriculum observes Freire, interferes with the democratic and critical development of students and after years in a passive classroom, students cannot see themselves as people who can transform knowledge and

society. Freire argues that, education needs to be a series of conscious acts which educational content can be analysed and understood by both the teacher and the student. This way, the conflict, or dichotomy, that exists between the teacher and the student and their epistemological foundations and world views will be resolved. His critical method challenges teachers and students to question existing knowledge as part of the questioning habits appropriate for citizens in a democracy. Freire's pedagogy calls for the transformational relationship between teacher and students to be accompanied by collective consciousness-raising that taps personal and communal situations and daily lives to provide powerful knowing processes and growth. Conscientization as seen by Freire is "the process by which individuals, not as receipts but as active learners, achieve a deep awareness both of the sociocultural reality that shapes their lives and of their ability to transform the reality" (McNeil, 2009:30).

In conclusion, Freire sees it unnecessary to look from elsewhere in trying to make opportunities for study; instead, areas for learning can be found in the reality that surrounds oppressed communities. This means relating the content of the curriculum and the process of teaching and learning to the local environment. Taylor and Mulhall (1997) argue that such a process require engagement by pupils and teachers together in the curriculum transaction process. In using local resources, Freire sums up, the epistemological inquisitiveness and interest of the oppressed will allow them to contrast their own knowledge using their own lived experience. In other words, Freire proposes a potent bottom up approach to education that starts with the knowledge produced by students and teachers through the examination of their immediate conditions of existence. Bottom-up theories hypothesize that designers of any education programme begin their implementation strategy formation with the target groups and service deliverers found at the grass root, because they find that the target groups in this case teachers and pupils are the actual implementers of course of action. Bottom-up theorists contend that if local bureaucrats are not allowed discretion in the formulation and later in implementation process with respect to local conditions and realities, then the programme is likely to fail (Matland, 1995). By and large, Freire calls for 'cultural action for conscientization' if the oppressed are to be liberated from social, political and economic domination.

3.9.3 Theory of Curriculum Dependence

Holmes and McLean (1989) in their anthology 'The Curriculum a Comparative Perspective' develop a complex theory into the understanding of how in former colonial territories curricula have been adopted from the former colonial power either as a survival of the colonial rule or through post-colonial influences. Three kinds of arguments have been advanced to suggest how curriculum dependence occur and is maintained. Holmes and McLean, first see educational dependence as a result of the economic and political dependence of less industrialized peripheral countries on highly industrialized metropolis. Education in this way, they say, is a mere passive reflection of economic and political relations of the global north and global south countries. Similar propositions were advanced by the proponents of theories of economic dependence among them Andre Gunder Frank. For instance, they argued that 'education was the means by which the local elites were created and separated from the mass of the people' (p 138). Through the content of education, Holmes and McLean (1989) observe, local elites were encouraged to identify themselves with the values and ways of the 'developed' whose interest they supported.

Similar assertions were made by anti-colonialists such as Fanon (1967) and Ngugi Wa Thiong'o (1981) who analyzed the psychological or mental domination which was maintained over colonized national indigenous elites through education. "Economic and political control can never be complete or effective without mental control. To control a people's culture is to control their tools of self-definition in relationships to others" (Ngugi Wa Thiong'o, 1981:16). Education is perceived by anti-colonialists as a tool used by Europeans through the introduction of a foreign system of education whose aim was to ensure that Africans were subjugated and exploited. Ngugi (1986) describes it as a 'cultural bomb' a situation where children through educational institutions are made to experience a second-hand status of their identities and cultural practices.

The critics to the theory of education dependency among them Frederico Cardoso (1972) and Bill Warren (1973) see no correlation between education dependency and economic growth and development although economic dependency to some extent inhabited the freedom of action of the developing countries (Holmes and McLean, 1989). Secondly, the critics argue that the elites in developing countries though might be agents of developed countries capital, to some degree also retained a high degree of autonomy in influencing the activities of foreign capital enterprises

in their countries. With these arguments, doubts arise whether educational dependence could be associated with economic decline of the developing countries and whether the economic decline was responsible for the creation of passive and submissive elites in the global south.

Nevertheless, critics agree that it may be true and applicable to these countries, mainly in Africa and the Caribbean which after political independence continued to experience a domination of their economies by traditional primary products exports such as copper in Zambia (under the control of foreign companies) and of their administrative systems (including education) by expatriate personnel (Holmes and McLean, 1989).

Yet another criticism is how with the ending of colonial rule, is it possible to establish how foreign economic agencies could control, politically and administratively, the education systems of independent countries even if they were economically dependent? In rebuttal to this Klees (2012) sees the World Bank which, indisputably, is the major architect of global education policy and other neoliberal dominated institutions as exerting overwhelming influence on developing countries. The World Bank advocates for the provision of one model of education system through its undebated set of neoliberal policies shaped by its ideology and completely ignore alternative policies. The influence is purely an economical one through the provision of loans and aid which come with conditions that perpetuate educational dependency of the South.

All in all, Holmes and McLean (1989) conclude that there seem to be rather greater degrees of educational and curriculum dependence in many countries than can be explained simply by theories of economic dependency.

Secondly, Holmes and McLean (1989) hypotheses that curriculum dependence may be as a result of intra-educational relationships. They contend that the educational power structures which are found within countries also manifest themselves on an international scale. Some educationists and educational agencies in the global north have been able to exert influence and control over the behavior of their counterparts in the global south. Away from economic and political relationships are several models and theories that suggest mechanisms of academic or educational imperialism. McLean (1984) sees a tendency of domination among apex educational institutions to subordinate ones within and across national frontiers (Holmes and McLean, 1989).

The domination is said to take two forms. First, high status universities through appointment of staff, creation of new knowledge, definitions of paradigm of knowledge etc. tend to dominate lower-status institutions of higher education. Higher education institutions tend to define, dominate and control the knowledge which is transmitted in schools through the influence they maintain over teachers, inspectors and curriculum designers. Holmes and McLean, (1989) demonstrate that a similar mechanism is possible between industrialized and less industrialized countries. They show that academic staff in universities in peripheral countries look to high-status institutions in metropolitan countries for the definition of the knowledge they transmit. They further, illustrate that the connection is created by the placement of former students of the higher-status metropolitan institutions of the academic staff of peripheral country universities (originally expatriates but increasing indigenous staff who have undertaken foreign study programmes). This, Holmes and Mclean, claim is reinforced by the domination of the production of new knowledge and through books and journals by metropolitan institutions.

At school level, Holmes and McLean, (1989) illustrate three ways in which institutional educational dependency can work: One; university academics trained in metropolitan universities can have a major role in the definition of the school curricular. Two; teachers and educational administrators who design or implement curricular have been educated at national universities by academic staff trained in the metropolis and receive metropolitan conceptions at second hand. And three; educational administrators and curriculum designers may take educational studies courses in metropolitan university. Nevertheless, Holmes and Mclean caution that these propositions should be treated as provisional hypotheses rather than as iron rules.

Thirdly, Holmes and McLean view educational dependence to be a product of internal conditions within the peripheral countries. Local educationists may accept dependent relationships in some countries and reject them in others because of the widely-held norms or the educational power configurations in each country. Two kinds of local and specific conditions are at play in effecting the degree to which curriculum dependence is experienced in different countries. First, is the historical legacy of prevalent norms and institutions which may have a considerable impact on curriculum practice - strong pre-colonial traditions may reduce the impact of colonization and strong colonial legacies may create a greater continuing dependence than current institutional connections appear to justify. Secondly, the internal political or professional interests of those

involved in curriculum decision-making may encourage them either to accept or to reject dependence according to its perceived impact on these interests.

Holmes and McLean, (1989) see curriculum dependence to be most acute in countries that have most recently escaped European colonial rule because this control had such a strong and lasting effect both on institutions and on prevailing values. Indeed, these may persist without any continuing metropolitan post-colonial intervention. Educational consumers and educational policy-makers may still believe that the former, colonial ways of operating are better because of their internalized norms. Conversely, pre-colonial norms and institutions may survive so strongly that they reduce the colonial impact. Continued acceptance of dependence or its rejection my suit the wider political or narrower professional interests of those who affect curriculum decision-making. Educational consumers in Africa may prefer a 'British' education because this is seen to give economic advantages. University academics may support practices associated with universities in foreign country in which they are trained because of the greater possibilities of professional advantage this may give to them.

Curriculum dependence and transfer in Zambia has been alluded to in chapter two. British Educational influences in Zambia were strongly entrenched through a long period of colonial rule that lasted from the early 1900s to 1964. Zambia, like most developing nations follow the assimilationist curriculum model. These are curricula inherited from their colonial powers (Banda, 2008). In an assimilationist curriculum model, knowledge is said to comprise an independent body of facts that can be assimilated and transmitted through a good teacher and by means of thorough coverage of specific textbooks (Semali, 1999). The aim in these curricula is on abstract and universal stocks of knowledge to be mastered, memorized and reproduced by learners at the time of a standard selection examination (Allchin et al., 1999). On the contrary, Stenhouse felt "curricular were resources to help teachers reconstruct their views of knowledge and in its light their pedagogical relations with students in classrooms" (Elliott, 1998: 23). Curriculum should provide support for reflective practice rather than a 'straightjacket' into which the practice is required to fit (Elliot, 1998).

In summary, the contextual debate of the concept of indigenous knowledges in educational today finds itself surrounded by the discourses of the ideas of epistemology, globalization and localization. An understanding of this concept, therefore, demands that key concepts related to

this narrative are carefully defined and analyzed. The traditional definition of 'epistemology' – a way people see and interpret the world around them according to their lived experiences has been offered and would be used synonymously with 'world views'. The concept 'Western knowledge' has been used to refer to the global architecture of education. Alive to the important role that theoretic frameworks hold in providing a perspective in which to examine the topic so that new dimensions of the topic are brought to light, and bearing the pertinent nature of the topic at hand, the study uses three main theories in guiding this research. Cheong's theory of a tree attempts to explain how local knowledges could be natured and sustained in a global environment. He contends that the process of nurturing local knowledges should be rooted into local values and traditions but should also absorb useful and relevant knowledge from the outside. Freire's transformative role of education argues for a transformation of the oppressive structure of education in which students are found to a liberating one. He stresses the need for relevance demonstrating that knowledge grows out of the environment and thus should be directly related to the reality that surrounds oppressed communities. And finally, Holmes and Mclean's theory of curriculum dependence offers three propositions into the understanding of how curricula in colonial territories ends up influenced by former colonial powers. Holmes and Mclean see curriculum dependence as a result of a product of economic dependence, educational relationships and local, political, cultural and social conditions.

All in all, the under-laying emphasis in all the theories and conceptual frameworks employed is an understanding of the impact of cultural context on thinking and learning. The need for curriculum to be culturally sensitive since the conflict between culture and learning presents problems and often a mismatch between local subculture, and that of the wider society within which that subculture exists, leading individual learners to a sense of dissonance and classroom unease (Scott, 2003). Thus, the curriculum should take into account the local needs and priorities of the people and the community. The next chapter is a description into the rationale for this study's application of specific procedures and techniques used to identify, select, and analyze information applied to the understanding of the research problem.

CHAPTER FOUR
RESEARCH DESIGN AND METHODS

4.1 General Overview

This chapter is a complete description of the process and conduct of the research. It represents the research paradigm, the sources of data, sampling techniques, the instruments and procedures of data collection and the methods of data analysis. The methodological approach used in this study is qualitative. Reasons to the selection of this approach have been hereto stated. Further, the research design has been highlighted; research site and rationale for its choice, data and sources of sampling, techniques and procedures of data collection and its analysis have been elaborated. The triangulation techniques are used as a way of collaborating evidence from my informants and to allow these various methods to supplement one another and give further understanding to the study. The chapter concludes with; verification, ethical considerations and a reflection on areas of difficulty and challenges.

4.2 Research Design

In this study, a qualitative case study approach has been used to gain an insight into the extent to which the teacher education Integrated Science Course addresses indigenous/local epistemological discourse at a college of education.

A qualitative research in general is primarily an inquiry approach useful for exploring and understanding a central phenomenon. To learn about this phenomenon, the inquirer asks participants broad, general questions, collects the detailed views of participants in the form of words or images, and analyses the information for description and themes (Creswell, 2012). It is exploratory research used to gain an understanding of underlying reasons, opinions, and motivations of a given phenomenon. It analyzes and codes the data for description and themes and interprets the meaning of the information drawing on personal reflections and past research. The final structure of the study is flexible and it displays the researcher's biases and thoughts,

(Creswell 2012). Qualitative researchers, observe Denzin and Lincoln (2000), study things in their natural settings, and attempt to make sense of or interpret phenomena in terms of the meanings people bring to them. Due to the nature of the topic under study and its value laden characteristic, qualitative or non-positivist approach, which strives to understand and interpret the world in terms of its actors is more preferred and appropriate to this study than the positivist paradigm, which strives for observability, measurability, predictability, controllability, patterning the construction of laws and rules of behavior, and the ascription of causality (Cohen, Manion & Morrison, 2011).

> By rejecting the detachment of the knower, by positivists, from the thing to be known, qualitative researchers argue that individuals' behaviors can only be understood by the researcher sharing their frame of reference. That means, understanding of the individuals' interpretation of the world around them has to come from the inside, not from the outside (Cohen, Manion & Morrison, 2000: 20).

On this ground, this study, the data collected, their description, analysis and interpretation largely depend on the participant's comprehension of their immediate environment and the researcher's justifications. This view is also expressed by Bryman, (2001:227) that "Qualitative researchers express a commitment to viewing events and the social world through the eyes of the people that they study. The social world must be interpreted from the perspective of the people being studied, rather than as though those subjects were incapable of their own reflections on the social world". Even though the review of the related literature in this research to a certain extent refers to different parts of the world, the data for the case study were predominantly collected from a college of education and has been interpreted from the lenses and reflections of the administrators, lecturers and student teachers of the institution under study.

A case study in particular, according to Bryman (2012: 709) is "a research design that entails the detailed and intensive analysis of a single case". It seeks to describe a unit in detail, in context and holistically by organizing educational data and looking at the object to be studied as a whole" (Kombo and Tromp, 2006). Cases, elaborates Patton, (2002: 447), "can be individuals, groups, neighborhoods, programs, organizations, cultures, regions or nation states". In this case, however, the study has focused on how primary teacher education Integrated Science course addresses indigenous knowledges in both content and actual teaching practices. Experiences, perceptions and attitudes of lecturers and teacher students towards indigenous epistemology have

also been explored. A case study investigates and reports the complex interactions of events, human relationships among themselves and with their environment and other factors in a unique instance. It can penetrate situations in ways that are not always susceptible to numerical analysis (Cohen, Manion & Morrison, 2011), and is concerned with a rich and vivid description of events relevant to the case.

Stake (1995) indicates that case study could be intrinsic (the study is done to understand a particular case), or instrumental (a particular case is examined to provide insight into an issue or refinement of a theory). In the latter case, the case becomes of secondary importance and plays a supportive role to understand something else. Some also consider a case as a choice of what is to be studied (Stake, 2000); others regard it as methodology (Berg, 2001: 225). This research is an exploratory case study intended to explore indigenous knowledges in integrated science at a college of education. An exploratory case study is used to explore those situations in which the intervention being evaluated has no clear, single set of outcomes (Yin, 2003).

As regard the strengths and weaknesses of case studies, Hitchcock and Hughes (1995) state that case studies catch unique features which may otherwise be lost in large scale data (example, surveys); they are immediately intelligible; they provide insight into similar situations or cases, and can embrace and build unanticipated events and uncontrolled variables. In addition, Yin in Cohen (2011) observe that case studies help catch the close-up reality and 'thick description' of participants' lived experiences of, thoughts about and feelings for the situation. On the contrary, case studies are not easily open to crosschecking, are prone to problems of observer bias and their results may not be generalizable. Notwithstanding this, triangulation aided the researcher to overcome bias in this research by avoiding a situation where research results are generated exclusively on one method. The assumption is that methods have weaknesses and exclusive reliance on one method could bias or even distort the researcher's work being investigated. This is in line with what Patton (1990: 244) says:

> Multiple source of information are sought and used because no single source of information can be trusted to provide a comprehensive perspective on the program. By using a combination of observations, interviews, document analysis and focus group discussions, the field worker is able to use different data sources to validate and crosscheck findings. Each type and source of data collection instrument, however, has strengths and weakness.

A qualitative case study, therefore, draws from both qualitative and case study approaches of research.

> A qualitative case study is an approach to research that facilitates exploration of a phenomenon within its context using a variety of data sources. This ensures that the issue is not explored through one lens, but rather a variety of lenses which allows for multiple facets of the phenomenon to be revealed and understood (Baxter and Jack, 2008:545).

Both Stake (1995) and Yin (2003) base their approach to qualitative case study on a constructivist paradigm. Constructivists hold a claim that truth is relative and that it is dependent on one's perspective. The constructivist paradigm, according to Crabtree and Miller (1999: 10) "recognizes the importance of the subjective human creation of meaning, but doesn't reject outright some notion of objectivity. Pluralism, not relativism, is stressed with focus on the circular dynamic tension of subject and object" It is built upon the foundation of a social construction of reality (Searle, 1995). One of the advantages of this approach is the close collaboration between the researcher and the participant, while enabling participants to tell their stories (Crabtree and Miller, 1999). Through these stories the participants are able to describe their views of reality and this enables the researcher to better understand the participants' actions (Lather, 1992; Robottom and Hart, 1993).

4.3 Research Site and Rationale for the Choice

My fieldwork was undertaken at a college of education in Solwezi District, situated in the North-western Province of Zambia. The college of education opened on 19th July 1977. Its motto is: Service above self. The mission statement is: To train teachers capable of offering quality teaching to the satisfaction of the Zambian society. Through its vision the college of education aspires to provide affordable but high quality training and mentorship through self-motivated and dedicated staff. Its core values include: Excellency; selfless service; team work; community service; collaborative learning; transparency; and accountability.

The college receives over 70% of its students locally from all over the province as per local admission policy. Other students are drawn from all over the country bringing to the already multicultural institution a rich ethnic diversity and a multiplicity of epistemological orientations. The current student population is estimated at 922 students split into 467 males and 455 females.

It is possible, to have students from almost all the provinces represented. The admission criteria are a full Grade Twelve Certificate or General Certificate of Education (GCE) with five (5) credits which include English, Science and Mathematics. The college trains primary school teachers (Grades 1 -7) for three years who graduate with a diploma in primary teaching. The programme aims at educating teachers who are able to function according to the values and guidelines set up in the National Education Policy. The essential core purpose of the course is to develop a comprehensive understanding of the learner-centered approach, highlighting activity-based education, critical inquiry, continuous and transparent assessment and a democratic perspective, recognizing the potential of the individual learner (MOE, 2012).

In order to purse the Primary Teachers' Diploma programme, a candidate will have to take Education and Professional Studies and other six study areas that include; Literacy and Language Education, Mathematics Education; Integrated Science Education; Technology studies; Social, Spiritual and Moral Education; and Expressive Arts. Besides, a student should undertake two terms of Teaching Experience, one in the second term of the second year and another in the second term of the third year. In order to be eligible for the award of the Primary Teachers' Diploma, a candidate is required to pass both Continues Assessment and Examinations set by Examination Council of Zambia in the seven study areas. The candidate should also pass Teaching Experience. The college of education is essential to the province since it stands out as the main supplier of primary school teachers to the province even though other traces of teachers trained from other regions could be found.

Given that my study focused on indigenous knowledges at a college of education, there couldn't have been any better place to conduct my fieldwork other than Solwezi, the headquarters of the province. The rationale for the research site was mainly influenced by the rich cultural diversity from which the inhabitants of this province emanate from, coupled with genuine interest and the easy access and less logistical problems I would encounter as a researcher. Besides, I already had a connection to the space whose culture I seemingly already understood. This in a way allowed me more easily to become a subject of my own research thereby increasing my own ability to conduct a reflexive analysis of the space and of myself. Selection of research site is thus, essential and depends on the purposes of the study and the possibility to get the needed data for

the intended research. It influences the usefulness of the information produced (Kombo and Tromp, 2006).

Bearing that colleges of education are under the control and auspices of the Provincial Educational Officer (P.E.O), written permission to undertake research was obtained from the Provincial Education Officer (See letter attached in the appendix).

4.4 Data Sources and Sampling

Sampling is the procedure a researcher uses to gather people, places or things to study. It is a process of selecting a number of individuals or objects from a population such that the selected group contains elements representative of the characteristics found in the entire group (Kombo and Tromp, 2006). In a case study research, the most common form of sampling is purposive sampling.

> The purposive sampling technique is a type of non-probability sampling that is most effective when one needs to study a certain cultural domain with knowledgeable experts within. Purposive sampling may also be used with both qualitative and quantitative research techniques. The inherent bias of the method contributes to its efficiency, and the method stays robust even when tested against random probability sampling. Choosing the purposive sample is fundamental to the quality of data gathered; thus, reliability and competence of the informant must be ensured (Tongco, 2007:153).

It is based on the assumption that the investigator can discover, understand and gain insights in what is studied. That means the investigator must select a sample from which the most can be learnt (Cohen, Manion & Morrison, 2011; Patton, 2002; Gay, Mills & Airaian, 2009). With this in mind, this study largely, makes use of purposive sampling with a very limited use of random and available samplings. I went to the study site and discussed with the Head of Department in the Integrated Science Department who gave me a list of the eight (8) Members (all male) in the natural sciences department and a list of student teachers from which I purposely selected local inhabitants as my sample.

I selected one Head of Department and three lecturers in the Integrated Science department who I used as key informants in the research. Four student teachers were also selected, two from a first-year class, and one each from second and third year respectively. In order to get a gendered

lens to the topic, two girls and two boys were selected. This is also from a realization that women are among the most individuals who produce, practice, and utilize knowledge of indigenous communities and cultures in rural areas. This was to ensure that the sample was as diverse and representative as possible.

The other sources of the data were collected from eight (Three females and five males) third year student teachers in a focus group discussion. Only third year student teachers were chosen to a focus group discussion so as to create homogeneity of members in terms of age, education level, and professional to allow for a balanced discussion. Besides interviews and focus group discussions, two class observations were conducted out of the six observations planned due to unforeseen circumstances and challenges discussed in this chapter later.

Furthermore, policy documents, curriculum materials, syllabi and Science textbooks were analyzed, assessing and inspecting the discourse and inclusion of indigenous/local knowledges. The total number of the informants (16) with some background information is presented in the table below:

S/N	Pseud Name	Gender	Position	Respondent Code
Semi-Structured Interviews				
1	Kipongo (Admn)	M	HOD	Admn/ 10.10.2016
2	Musamba (Ltr)	M	Lecturer	Ltr/ 21.09.2016
3	Kaponda (Ltr)	M	Lecturer	Ltr/ 23.09.2016
4	Kayombo (Ltr)	M	Lecturer	Ltr/ 22.09. 2016
Semi-Structured Interviews				
5	Sombo(Std)	F	Student Teacher	In/Std/ 26.09.2016
6	Bibusa(Std)	F	Student Teacher	In/Std/29.09.2016
7	Sawanda(Std)	M	Student Teacher	In/Std/03.10.2016
8	Maluba (Std)	M	Student Teacher	In/Std/03.10.2016
Focus Group Discussions				
9	Womba(Std)	F	Student Teacher	Fg/Std/ 22.09.2016
10	Lusa(Std)	F	Student Teacher	Fg/Std/ 22.09.2016

11	Kavuyi(Std)	F		Student Teacher		Fg/Std/ 22.09.2016
12	Mbuyu(Std)	M		Student Teacher		Fg/Std/ 22.09.2016
13	Kapya(Std)	M		Student Teacher		Fg/Std/ 22.09.2016
14	Kyembe(Std)	M		Student Teacher		Fg/Std/ 22.09.2016
15	Mokola(Std)	M		Student Teacher		Fg/Std/ 22.09.2016
16	Mukwemba(Std)	M		Student Teacher		Fg/Std/ 22.09.2016
Total	**16 Respondents**	**F**	**M**	**Students**	**Lecturers**	
		5	**11**	**12**	**04**	

4.5 Techniques and Procedures of Data Collection

The study involves enquiring, experiencing and examining the phenomenon under investigation. In relation to this approach, Patton (2002: 4) identifies three techniques of collecting qualitative data: "interview, observation and documentary analysis", all of which have been used in this study.

4.5.1 Interview

Interview was used to collect the necessary data from the selected sources. Using interview, one can explore and probe participants' responses to gather in-depth data about their experiences and feelings (Gay, Mills and Airanian, 2009). Interviews are useful to elicit factual data (Patton, 1990, Wallace, 1998) and are a very useful way of collecting data. Patton (1990) notes that people are more willing to talk in an interview than the case would be if they were asked to write. In fact, as is observed by McMillan et al., (1993: 250) "interviews are essentially vocal questionnaires whose preparation is somewhat similar to that of a questionnaire".

Interview could range from formal (structured) interview, in which a set of questions are asked and the answers are recorded on standardized schedule, through less formal interview, in which the interviewer is free to modify the sequence of questions, change the wording, explain them or add to them, to informal interview, in which the interviewer may have a number of key issues which are raised in a conversational style (Cohen, Manion & Morrison, 2011). It is suggested

that structured interview is useful when the researcher is aware of what s/he is searching for and is therefore, in a position to frame questions that will supply the knowledge required. However, unstructured interview is useful when the researcher is unaware of what s/he does not know and, therefore, relies on the respondents to tell her/him (Lincoln & Guba, 1985). A Semi-structured interview is a verbal interchange where one person, an interviewer, attempts to elicit information from another person by asking questions. Although, the interviewer prepares a list of predetermined questions, semi structured interviews unfold in a conversational manner offering participants the chance to explore issues they feel important (Longhurst, 2003). This flexibility allowed me to codeswitch English and the local language to the advantage of my respondents. Kombo and Tromp (2006) list two types of semi-structured interviews namely focused interviews which are aimed at gaining a complete and detailed understanding of the topic and case studies whose purpose is to collect comprehensive, systematic and in-depth information about particular cases of interest.

Semi-structured interviews are said to have the following advantages; they are flexible i.e. they consist of both open and closed-ended questions and by using both the open and closed-ended approach, the researcher gets a complete and detailed understanding of the issue under research. Semi-structured interview can be used even among those who may not read and write. It has the advantage to gather in-depth information through the use of closed ended questions and allows the researcher a chance to check on the truthfulness of the response by seeking the same information in several ways at various stages of the interview. Participants too, have an opportunity to ask for clarification when they do not understand the question and give the interviewer the opportunity to ask them to elaborate further on their answers. For instance, if the participant misinterprets the question the interviewer could follow up with a clarifying question and there is a guarantee that all questions will be attempted (Wallace, 1998; Sarantakos, 2005). All in all, the use of this instrument rewarded me a firm but flexible control of the interview situation as an interviewer and thus, benefited from most of these advantages offered by this tool.

Nonetheless, I was also conscious to some of the limitations and disadvantages of interviews such as: there being subjective, a characteristic that leaves researchers at a disadvantage in trying to remain objective. In interviews, the participants may be unwilling to report on their true feelings. Further, interviews have the disadvantage of the danger of the interviewer asking

leading questions in support of a particular view probably as a result of power structures and gender relations which in turn may affect free participation of some participants especially in in-group interviews. Overall, interviews can be time consuming due to the open-ended nature of questions and sometimes so much data could be collected than is relevant to the research. Finally, analysis of interview data may prove problematic (Wallace, 1998; Sarantakos, 2005).

Knowledge of these draw backs made me consciously trend carefully with this instrument trying as much as possible to avoid leading questions, and creating balanced power dynamics by for instance introducing myself as a secondary school teacher which in hierarchy is lower than a college lecturer. The use of various research instruments enabled me to remain objective.

The motivation for employing semi-structured interviews is based on and influenced by the nature of the topic under study. Semi-structured interviews are most commonly used with indigenous knowledge research like this one, which are about human affairs (Yin, 1994; Sillitoe et al., 2005). The semi-structured interview guide (Appendix) was prepared based on the review of related literature and modifications were made in the process of data collection in the field, considering the real situation of the local conditions. Most of the modifications were made during the first field work in September 2016. In this process, some of the interview questions were amended thus dropping some, modifying others and a complete addition of new ones.

Permission to record the proceedings was sought from individual participants. They were assured of confidentiality. Considering that in an interview, a researcher collects only what the participant chooses to tell him or her.

4.5.2 Focus Group Discussion

A focus group is a group discussion of usually between 6 and 12 people, who meet in an informal setting to talk about a topic but is otherwise non-directive, allowing the group to explore the subject from as many angels as they please, (Longhurst, 2003). They are a form of group interview whereby the reliance is in the interaction within the group who discuss a topic supplied by the researcher thereby yielding a collective rather than an individual view (Morgan, in Cohen, 2011). The group is relatively small enough that everyone can take part in the discussion but large enough to provide diversity in perspective (Ary, Jacobs, Sorensen, 2010). I

constituted a group of eight third year members consisting of three females and five males. Focus groups are somewhat informal techniques that can help you assess respondents' needs and feelings both before, say a policy intervention design and long after implementation. In a focus group, you bring together a number of respondents to discuss issues and concerns about the features of the problem. The group typically lasts about two hours and is run by an interviewee or a moderator who maintains the group's focus. Focus groups are a powerful means to evaluate services or test new ideas. Basically, focus groups are interviews, but of a group of people at the same time in the same group. The group I constituted composed homogenous members of the target population, for instance, similar age group, status, education level, profession (Kombo and Tromp, 2006). I carefully planned and designed the discussion to obtain information on the participants' beliefs and perceptions on indigenous knowledges. A focus group discussion is believed to give out lots of information as has been observed by Sillitoe et al., (2005:177) who hold that:

> Focus group is a tool of studying ideas in a group context and is based on the belief that the whole is greater than the sum of its parts. Its purpose is to generate new information, clarify further points of detail, validate information derived through other methods, and build consensus between group members. The goal is to get closer to participants' understanding of the topic.

Focus Groups are known for a number of reasons. One of them is that they often bring out respondents' immediate reactions and ideas, making it possible to observe some group dynamics and organizational issues. For participants, the focus-group session should make them feel free. This atmosphere allows the flow of ideas on the subject under discussion. This is so in that these discussions are often relatively unstructured (Ary, et al, 2010).

As moderator, I followed a pre-planned script of specific issues and set goals for the type of information to be gathered. During the group session, I had the difficult job of keeping the discussion on track without inhibiting the flow of ideas and comments. I had to ensure that all group members contributed to the discussion and avoided as much as possible letting one participant's opinion dominate. At the same time, I had to avoid putting words into the mouth of group members. McNamara sums up some of the challenges faced by interviewees as moderators in Focus Groups as follows: sorting out what is important; understanding implications; decoding

symbolism; unravelling complex situations; interpreting ambiguous behavior; designing persuasion and predicting behavior; developing strategies and new ideas (McNamara, 1999).

Focus group discussions can offer several merits to the research process. Below are some of them: It is an efficient data collecting technique as it generates data from a number of people rather than one in an interview. The group dynamics lead to a focus on the most important topics and issues. It is easy to assess the extent to which there is a relatively consistent, shared view by participants. Participants are free to agree or disagree and whichever the way, rich data on the topic is being generated. Respondents can decide to gather at a place of their choice making the discussion take a normal setting, conducive for a free and open discussion (McNamara, 1999; Denscombe, 2002; Silverman, 2001; 2005). In addition, participants respond not only to the researcher but also to other participants and their responses. The interaction between participants enables the researcher to see how subjects incorporate the viewpoints of others in structuring their own understanding (Ary, et al, 2010).

The following are however, some of the disadvantages: There is always a possibility of running more than one focus group as the outcome of any single session may not be representative. Discussions can get sidetracked. Keeping the discussion going on and not astray is a big challenge on the part of an interviewee as a moderator. There is also a possibility of some participants not participating and allow themselves to be inhibited by the dominators. More time is needed for this exercise to give required results. Number of questions to be discussed is limited as each member tries to talk. (McNamara, 1999; Denscombe, 2002; Silverman, 2001; 2005).

Being alive to these challenges, I took care not to impose my own agenda or biases during the process of the discussion. My main role centered on facilitating interaction between members of the group rather than on controlling the discussion. I remained as open as possible to responses that were contrary to my own knowledge, beliefs and perspectives by encouraging participants to freely express themselves in their own words and respond not only to me but also to other colleagues in the group and their responses. I watched out for discrepancies and had them resolved through probe and pause. The probe is a comment that leads to more detail, such as "Can you tell me more? Or can you give me an example?" A pause involves learning to be silent longer than the interviewee (Ary, et al, 2010). To prevent dominant members not to suppress

dissenting voices, I stressed the importance of listening to a range of views to ensure that all participants had an opportunity to contribute to the discussion. I further, allowed different opinions to be discussed fairly and tactfully engaged passive participants in the discussion by for instance asking for their views such as: "Ms. Womba, what is your view? Or how do you make of Mr. Kaponda's case?"

McNamara (1999: 4) illustrates:

> Focus groups are a laboratory in which you get much deeper feelings, implicit beliefs, hidden attitudes, and secret practices. But more importantly, focus groups are a laboratory in which you can experiment with going beyond the present to what can be, beyond what is there: You can discover, how to change beliefs and behaviour, how to persuade, how to teach, how to communicate. Focus groups are persuasion design laboratory in which you can develop and test new approaches.

I used focus group discussions with eight third year student teachers as another corroborating device in this study, based on its advantages given in this thesis. This is also in line with the justifications and comments given by Casley and Kumar (1988) on the purpose of focus group discussions in research studies: Focus group discussions help to assess needs, develop interventions, test new ideas or programs, improve existing programs and generate a range of ideas on a subject as background information for constructing more questionnaires [or interviews]. For easy accessibility, comfort and distraction free, a staff room was allocated for the group discussion. To avoid intrusion a notice "Group Discussion in Session, do not disturb" was placed on the staffroom door. The next section accounts for how observation was used.

4.5.3 Lesson Observation

Based on the literature review and information obtained through the interviews, it was necessary to conduct class observations to verify what was gathered using the other research instruments. This is in agreement with what Cohen et al., (2000:305) say about class observations:

> Enables researchers to understand the context of programs, to be open ended and inductive, to see things that might otherwise be unconsciously missed, to discover things that participants might not freely talk about in interview situations, to move beyond perception based data and to access personal knowledge.

Observations are an attractive method of data collection as they provide the researcher the opportunity to gather 'live' data from 'live' situations (Cohen, Manion & Morrison, 2011), and far the most penetrating of strategies, the most mode of gathering information (Lofland, 1971). Observation enables researchers to be open-ended and inductive, to see things that might otherwise be unconsciously missing, to discover things that participants might not freely talk about in interview situations, to move beyond perception based data (e.g. opinions in interviews) and to access personal knowledge (Patton, 1990).

Kombo and Tromp (2006) discuss three forms of observation namely participant observation, unstructured observation and structured observation. In participate observation; the investigator becomes an active functioning member of the culture under study. An investigator participates in any activity appropriate to the status which is assumed. In this case, the degree of subjectivity and empathy may be greater. The participant observer is part of the social life of the participants and records what is happening for research purposes. This participation helps reduce reactivity and there may be greater objectivity in this type of observation (Cohen, Manion & Morrison, 2011). Respondents are likely to become more comfortable with the researcher.

On the contrary, in unstructured observation, the observer takes the position of an onlooker. Data is collected in the form of descriptive accounts. Unstructured observations are helpful in understanding behavior patterns in their physical and social context. Like unstructured observation, the observer is an on looker in structured observation, although, the focus is on a small number of specific behavior patterns, and only those appearing on a pre-defined observation list are recorded. Here the researcher has to be clear on the behavior being observed.

In this research, I employed unstructured observations with the focus upon what can be learnt from lecturers and student teachers in their own habitant (classroom) acting 'normally'. The observation occurred in a natural setting with participants' full knowledge of being observed. Although, the observation was unstructured, without a pre-determined format, the focus was on establishing the presence of indigenous / local knowledges in the natural science classroom lesson and how it is approached. Although, unstructured observations tend to describe all the behavior in the situation (Dyer, 1995), only the behavior directly related to the topic was described. I was aware of Dunnette's three sources of error for reliability: Inadequate samples;

changes in the participants' behavior (reactivity because they know they are being watched); and changes in the environment due to the observation (Dunnette, 1996).

The following are some of the advantages of observation as recorded by (Patton, 1990; Yin, 1994, Cohen et al., 2000): Observation enables the researcher to gather data on a physical, human, and, classroom setting environment. It offers rare opportunities to the researcher to observe verbal and nonverbal expression, lesson notes, schemes of work, and the teaching aids used and displayed in the classrooms. First-hand information about what really happens in the classroom is revealed.

Observations are not without disadvantages. For instances, observers may get biased data if the observation is pre-arranged as things may just be staged. There may be need for several observations to come up with true picture of what really goes on in class other than just few sittings. Due to unforeseen circumstances, I couldn't afford more than two observations as such I cross-checked my observations with other methods. Since, constant use of observation guidelines and taking notes may influence or change the behaviour of those observed, I limited myself to the use of unstructured observations and rarely took notes but only if there was something really important.

In this kind of research, classroom observation offered me an opportunity to observe if students bring any indigenous knowledge to their everyday science classroom and if teachers make use of that knowledge in their lesson deliveries and helped me evaluate possibilities of indigenous inclusion. The classroom observations focused on investigating how the lecturers approached the teaching of indigenous knowledges in their daily lessons. Through observational data like Patton (2002) observe, I overcome discrepancies between what my participants said and what they actually did and this helped me uncover behaviour which the participants themselves may not have been aware. Three lecturers were scheduled to be observed twice each bringing the total to six observations but unfortunately only two observations from two lecturers were made. Nevertheless, the use of other instruments and triangulation supplemented these draw backs. For instance, thorough document analysis of lecturers' lesson plans and schemes of work reviewed overwhelming evidence of what at least would have been observed in actual classroom situation of course with minor variations. It is to this method that I now turn.

4.5.4 Document Analysis

Document analysis is a form of qualitative research in which documents are interpreted by the researcher to give voice and meaning around an assessment topic. It includes; gathering information used in a formal description of the electronic text; studying the content and structure of the documents; identifying and naming the components of some class of documents specifying their interrelationships and naming their properties. Weiss (1998:260) holds that documents are "a good place to search for answers. They provide a useful check on information gathered in an interview." He further adds that when "other techniques fail to resolve a question; documentary evidence can provide a convincing answer." Apart from providing evidence, Weiss (1998) has noted that documentary analysis also allows the analyst to become thoroughly familiar with the materials and helps to save on time. The usefulness of documents as research tools is that they help corroborate and strengthen the evidence gathered using other tools. Document analysis observe Ary are a good source of data that can provide good descriptive information, are stable source of data, and can help ground a study in its context (Ary et al 2010).

The indigenous / local knowledges narrative is a policy issue and any study that tries to isolate it from that context may be deemed incomplete. I employed document analysis in this study not only as collaboration to other instruments and a way of strengthening evidence but more so to locate the study in its proper context.

Document analysis are said to have the following advantages: they can provide reliable and quality information. Documents represent a good source for text (word) data for qualitative study. They provide the advantage of being in the language and words of the participants, who have usually given thoughtful attention to them. They are also ready for analysis without the necessary transcription that is required with observational or interview data (Creswell, 2012). If used with other sources, document analysis, counterchecks the information obtained by other tools. All in all, documents offer a chance to researchers to study past events and issues.

On the negative side, documents even public records may have built-in biases that need examination. They were generally not produced for research purposes and may be incomplete or unrepresentative (Ary et al, 2010). Some documents may be incomplete, inaccurate or inauthentic and sometimes with outdated information. It could be time consuming to read

volumes of these documents and moreover some documents may be difficult to locate and access due to legal implications (Creswell, 2012).

This research made use of document analysis. The researcher collected and analyzed published materials and information from an internal source. Secondary data was collected from a diverse source of documents such as the; Policy documents, Curriculum materials, Syllabi and text books. Other materials included schemes of work and lesson plans and CPD file. The analysis, was not only restricted to extracting statements from the documents related to indigenous knowledges but also extended to the nature of what is and is not said about indigenous / local knowledges. Identification was taken of both ideological and grammatical textual features. The documents reviewed some discrepancies in terms of the topic under study which needs serious harmonization.

4.5.5 Field Notes

"Field notes are text (words) recorded by the researcher during an observation", (Cresewell, 2012:216). Field notes have two components firstly, the descriptive part, which includes a complete description of the setting, the people and their reactions and interpersonal relationships, and accounts of events (who, when, and what was done); and secondly, the reflective part which includes the observer's personal feelings or impressions about the events, comments on the research method, decisions and problems, records of ethical issues, and speculations about the data analysis (Ary et al, 2010). The researcher's field notes present the data that will later be analysed to provide an understanding of the research setting and the behavior of the people in that setting (Ary, Jacobs, Sorensen, 2010).

Field notes were used in rare circumstances to collect data for the study. Field notes were usually taken while observing the actual class room teaching, recording activities by the lecturer, the students, the interactions between the students and the lecturer, and the student to student conversation during pair and group work. Field notes were also used when ideas about the research came to my mind spontaneously when reflecting upon personal thoughts about the topic and the sense made of the site, the people and the situation. Many of the critical points for analysis of data were also recorded in the field notes hence a helpful tool in the research process. The next section will now focus on the methods of data analysis.

4.6 Methods of Data Analysis

Since collected raw data cannot be immediately available for analysis as Berg (2001) correctly observes that, data requires some sort of organizing and processing before it can be analyzed, that the tape- recorded information needs to be transcribed and field notes to be edited, corrected and made more readable, the process of data analysis is therefore very important. Data analysis involves organizing, accounting for and explaining the data; in short, making sense of data in terms of the participant's definitions of the situation, noting patterns, themes, categories and regularities (Cohen et al 2011). Adèr, and Adèr, (2008:333) defines data analysis as "a process of inspecting, cleaning, transforming, and modelling data with the goal of highlighting useful information, suggesting conclusions, and supporting decision making".

The process of data analysis in this research can be traced back to the data collection phase. Inconsistences within as well as between my participants in the process of data collection - such as contradictory answers to the same question - had to be resolved within the field. While conducting interviews, having focus group discussion and observations are processes and sources of data collection, the ability to recognize the inconsistency between these sources is data analysis. Thus, part of the process of data analysis was done side by side with data collection. This is similarly supported by Gibbs as quoted by Cohen (2011:537) "Qualitative data analysis is distinguished by its merging of analysis and interpretation and often by the merging of data collection with data analysis". The side by side data collection and analysis process prompted the collection of new data thereby resolving the discrepancy. This confirms the view that data collection and analysis continuously interact in an iterative, back-and-forth process (Teddlie and Tashakkori in Cohen, 2011). This view is too expressed by Patton (2002) who holds that as the researcher continues interacting with the data, the researcher starts making sense out of what people have said by looking for patterns and integrating what different people have said after which they are interpreted. Therefore, collecting data and some analysis progressed in a repetitive manner during the process of data collection to build a coherent interpretation of the data while in the field.

Data analysis according to Berg (2001) involves three concurrent flows of action: data reduction, data display, and conclusion and verification. Data reduction is focusing, simplifying and transforming raw data into a manageable form (Berg, 2001).

The data obtained through semi-structured interviews and focus group discussions were transcribed to provide important detail and an accurate verbatim record of the interview and discussion. The data obtained through observations and those written down in the field notes were reorganized and themes identified. As Miles et al (1984), advise, I started off the analysis through data reduction. This process entails carefully reading of the recorded material, identifying of the main developing themes and categorizing of the data and organizing data by transforming long interview texts into short statements. In this way, information is assembled around certain themes and points. In many cases, the themes that emerge are related to the research questions devised. This text reduction method is also known as condensation technique (Berg, 2001). Braun and Clarke, (2006:79) see thematic analysis to include: "identifying, analysing and reporting patterns (themes) within data. It minimally organizes and describes your data set in (rich) detail. However, frequently it goes further than this, and interprets various aspects of the research topic."

The themes used were arrived at after doing some coding. Miles et al., (1984:56) define codes as: "Tags or labels for assigning units or meaning to the descriptive or inferential information compiled during a study. Codes usually are attached to 'chunks' of varying size, words, phrases, sentences or whole paragraphs, connected or unconnected to a specific setting". The process used in this coding was firstly to review the transcripts as many times as I could. The review involved splitting and dissecting these transcripts into meaningful interpretations, which were reduced to quotations. It is these quotations from various participants that were put under some themes using what Miles et al., (1984:69) calls "pattern coding," and describe pattern coding as "a way of grouping summaries [quotations] in to a small number of themes.

Data display as seen by Berg (2001) is the presentation of an organized, compressed assembly of information that permits analytical conclusions. The data obtained through interview were presented in phrases and statements in verbatim as well as in paraphrasing. The document analysis was presented in a table using qualitative interpretation. Lastly, the data were interpreted, consolidated and presented. It should be noted that, great caution was taken during

analysis and interpretation so as not to divert from the participants' points of view. Bearing that there is a close intertwined relationship among, data reduction, data display, verification and conclusion, I have brought much of the conclusion toward the end as indicated by Berg (2001).

All in all, the process of listening to the records many repeated times, rereading, identifying themes and reducing repeated issues become the usual routine and sometimes proved to be tedious.

4.7 Verification

Verification is a twofold consideration. First, it refers to confirming the reliability of conclusions drawn from the data. The correctness or credibility of the description, conclusion, explanation or interpretation (Maxwell, 2005) is of great concern in qualitative research. In relation to this, I was carefully checking my path of data collection and analysis which helped me to modify my questions and collect additional data and do the analysis repeatedly by improving my work. Use of several instruments in data collection among them: interviews, discussions, and observations, were carried out to clarify the emerging ambiguity in the process of data collection by personally engaging with research participants (Creswell, 1998: 193). This involved getting feedback from the informants about the meaning of data they offered.

Triangulation, cross-checking of information obtained through interview, documentary analysis observation and field notes were used in the study to assess the convergence of the information. "Triangulation is the use of more than one method in the study of a social phenomenon so that findings may be cross-checked" (Bryman 2012 :717). Triangulation also involved using the same questions for different respondents to see the similarity of the responses. Triangulation of data through these various collection methods helped to verify and validate the data I collected and consequently minimize inadequacies and determined the areas of divergence and convergence during analysis. This stems from a realization that exclusive reliance on one method may misrepresent the researchers image of a portion of reality under investigation. A multifaceted view of an issue improves accuracy thereby increasing reliability and validity.

In general, I have learnt a lot in the process of doing this research. For instance, first, I attempted to present the analysis of data following the order of my research questions. When I read the first draft of my work, I found repetitions in many areas. Then I read it again and again and formed themes under each research questions. I re-organized similar contents under each theme. It is through this continuous rereading and reorganizing of data that this piece of writing continues to unfold.

4.8 Ethical Considerations

Among the most serious ethical concerns that have received attention recently is the assurance that participants are voluntarily involved in the research and are informed of all potential risks (Berg, 2001). Therefore, researchers need to clearly explain to the research participants the rights and responsibilities of both the researcher and the participants. My participants were not coerced into taking part; rather they were given an opportunity to make an informed and free choice to participate in the study. Their right to freely withdraw from the focus group or interviews at any time without risk or prejudice was guaranteed (Fairbrother, 2001). Participants were briefed about all implications through an elaborate explanation of the purpose of the study. Appointments were made prior to interviews or focus group discussions. The Head of Department was assured he would receive a copy of the final report for the department.

Anonymity was observed with all informants including the name of the institution although there is leading information which identify with the institution. In order to maintain anonymity, pseudo-names with the following abbreviations for the purposes of accurately identifying informants' positions have been used throughout this thesis: Std. for Student teacher, Ltr. for Lecturer and Admn. for administrator. In some instances, official titles have too been used.

I authored a letter to the Provincial Education Officer (PEO) seeking permission to undertake research. It is the reply to this letter that facilitated entry into the field.

4.9 Areas of difficulty and challenges during the study

There are limitations obviously to all forms of research because it is impossible to control all variables. Patton (1990) establishes that there are no such things as perfect research designs, but instead always trade-offs. Making two classroom observations for each of the three scheduled lecturers proved very difficult. This was mainly owing to poor health of one respondent who fall ill and the preparation for the graduation ceremony due in a week that paralyzed almost all class lessons.

Limited time in which to conduct the study was another major constraint. Obtaining written permission from the PEO bureaucratically took a lengthy time than anticipated. This unnecessarily caused panic in especially conducting a pre-test on my data collection instruments. Keeping schedules by my respondents also proved problematic as something either came up or they had presumably forgotten the appointment for some reason and the interview had to be rescheduled to another day. I recall driving 134 KM from home for an interview at 14:00 hours and only to be told the interview would not be possible because the lecturer like every other one in the department was conducting an assessment.

Financial constraints prevented me from extending the research to other similar colleges of education as they are located far away from each other.

In conclusion, it is no doubt that the qualitative approach and the methods of data collection used in this research helped to collect data in a natural setting but with some limitation in some cases as discussed in this chapter. The structural frameworks employed guided this study too. This is a confirmation that various research tools used supplemented one another and enhanced the validity and reliability of this work. Although initially there was no main method but that all were to be of equal strength, the truth on the ground was that interviews and document analysis proved to be more effective than the others. The next chapter presents the research findings and discussions using the thematic approach.

CHAPTER FIVE
PRESENTATION OF RESEARCH FINDINGS AND DISCUSSION

> A culture evolves when practices originating in this way contribute to the success of the practicing group in solving its problems. It is the effect of the group, not the reinforcing consequences for the individual member, which is responsible for the evolution of the culture (Skinner, 1981: 213)

This chapter has endeavored to present findings and elicit a discussion into the contextual reflections of the extent to which the Primary Teacher Education Integrated Science Course addresses indigenous knowledges in both content and actual teaching practices at a college of education. The study has explored the experiences, perceptions and attitudes of lecturers and student teachers towards indigenous epistemology in integrated Science. Challenges faced by educators in the implementation of a localized curriculum are also discussed. The chapter is focused at the presentation of findings through the data collected using various instruments.

For a coherent presentation, thematic approach has been used in reporting these findings. Themes will cover broad or major topics that surround and come up in the discussions. I have generated main and in some cases sub themes from the data collected in an effort to respond to the research questions posed in the introduction and to further, explain how the results support the answers and how the answers fit in the existing narrative of indigenous knowledges. These themes are in line with the research questions that have guided this research. The first theme will examine the state of indigenous knowledges in the Integrated Science Curriculum. To do so, other policy related materials will also have to be examined. The second theme, will explore the presence of alternative knowledges in the actual science classroom teaching at the college of education and the third will examine Student teacher and lecturer experiences, perceptions and attitudes regarding indigenous / local knowledges. The last theme but not the least, will attempt to discuss the challenges faced in the indigenization or localization process. The last three themes will mainly rely on the data collected using semi-structured interviews, focus group discussions, observations and field notes. In some cases, findings will cover more than one research question. Likewise, some responses overlap the themes and have been discussed under

other themes as well, though applying a totally different lens. The aim here is to attempt to deduce what the findings mean, not only with a restricted view to answering the research questions but more so with the implications on broader assumption about inclusion of indigenous / local knowledges in science teaching in institutions of learning.

5.1 Indigenous/Local Knowledges in Integrated Science Course

The resolve to employ documentary analysis was the impetus to respond to the first research question. Sources of data analysed included the National Policy on Education (1996), the National Curriculum Framework (2013), the Integrated Science Curriculum for Colleges of education (2015), the syllabus and the text books. The criteria used to guide the analysis included two main factors: First, any specific reference in the documents to discourses of 'Indigenous knowledges', 'localization', 'relevance', 'worldviews', 'culture', 'customs', and 'traditions' were sought and examined. And secondly, the availability of Indigenous content in the documents was investigated. While the main task here is to explore indigenous knowledges in the integrated science course, references have been made to the National policy and National Curriculum Framework. This theme will be covered under two subthemes namely, Indigenous Knowledges in Integrated Science Curriculum; and Indigenous Knowledges in Integrated Science syllabus and in Text books.

5.1.1 Indigenous Knowledges in Integrated Science Curriculum

A closer look at the data collected indicate a gap between the National Policy on education; the National Curriculum Framework, and the Integrated Science curriculum in the manner they tend to emphasize Indigenous knowledges and or the localization process. While the national policy and national curriculum on one hand are somehow elaborate and passionate about the localization process, the discourse on indigenous knowledges and its inclusion in schooling is on another hand completely or almost absent in the Integrated Science curriculum.

For instance, the national policy on education strongly advocates for flexibility in allowing schools to adapt aspects of the curriculum to match local needs and circumstances and recognizes the need for the science syllabus, for all institutions of learning, to encompass a core

of environmental science, dealing with issues that are relevant to pupils in every part of the country and to leave room within the syllabus for topics that are relevant to particular localities (MOE, 1996). Similarly, the National Curriculum Framework re-echoes the need for curriculum flexibility and responsiveness and encourages institutions of learning, teachers and teacher-educators at all levels of the education system to localise some aspects of the school curriculum (MOE, 2013). Likewise, the Education Act - a legal document guiding education principles and decisions - alludes to the same although in a much simplistic and exaggerated way of promoting altogether a complete new discipline. It states: "A public, community, aided or private educational institution may introduce a maximum of two non-examinable or skill focused subjects that reflect the local environment where the educational institution is situated" (Education Act No. 48, Cap 97 of 2011).

From the above illustration, although, the Education Act in a way contradicts the National Policy and the National Curriculum Frame work in advocating for the creation of a separate discipline that deals with local knowledges as opposed to the inclusion process, the issue of indigenous / local knowledges as far as these three national guiding documents on education are concerned, is somewhat clear and elaborate and therefore, one hopes that drawing from these, all subsequent documents should reflect this policy decision. But is this the case? On the basis of the evidence currently available from the analysis, the indigenous / local knowledge narrative is largely absent and surprisingly disappears from the Integrated Science curriculum.

The general outcome of the Integrated Science Education curriculum is "to develop pedagogy, knowledge, skills, and attitudes which will help them encourage their learners to explore and understand their immediate environment and the world at large" (MOE, 2015:148). The understanding of one's 'immediate environment' and the 'world at large' is crucial to the discourse of inclusion of Indigenous Knowledges in formal schooling. Although, this in away suggests rhetorical reference to the concept of localization, the Integrated Science curriculum makes no further reference to the concept of indigenization both in its rationale, aims and goals. There is absolutely no reference made for the need for educators to localize and utterly no guidance whatsoever in concreteness and specificity terms to the issue of localisation. Ironically, curriculum goal three (3) is aimed at developing "an appreciation of science education in the pupils' daily lives" (p.148). One therefore, wonders how this is possible when the curriculum

marginally addresses the very knowledges that are supposed to trigger and foster this appreciation. "Curricular are representations of knowledge for the purpose of teaching. They are the language teachers employ to talk about things and events in the world and as such they imply a stance – a point of view about the use of the mind in relation to these things and events" (Elliot, 1998:22). The absence or limited representation of indigenous knowledge in the curriculum may thus be interpreted as a lack linguistic code on the part of educators to stimulate the indigenous discourse.

While the National Curriculum Framework (2013) can be seen as a positive attempt by government to reduce centralized administrative regulation and through that increase the delegation responsibility for curriculum decisions to institutions of learning, teachers and teacher-educators; the curriculum to a larger extent, fails to demonstrate that into practical terms but does so only rhetorically. A case in point is the delegated indigenization policy which potently diminishes as it trickles down to the point of delivery. There is no doubt that delegation of curriculum responsibility may come at a cost and as Elliott, (1998) observes government is faced with a dilemma between national governments feeling a need to steer educational outcomes at the centre and its inability to do so in the growing social complexity and diversity. As a result, contends Elliot, the aim of delegating many curriculum decisions to the local level such as a school may be highly ambiguous. On this ground, it seems fair therefore, to argue that, although, the national policy and curriculum 2013 forms a basis and provides an opportunity for the inclusion of local or indigenous knowledges, it is in the words of Breidlid, (2013:97) "probably intentionally so vague and ambiguous that one wonders what was to be included and excluded from the variety of values, worldviews and knowledge systems…" While on one hand national curriculum aims and statements are fairly considerate of the localization process, curriculum content on the other hand is not locally sensitive and thus not reflective of the indigenous policy decision. Therefore, curriculum content is still predominantly dominated by the western hegemonic epistemology at the expense of Indigenous knowledges (Dei, 2002; Shiza, 2010). This curriculum dependence can be understood in terms of the strong colonial legacy that Zambia built which even today manifest in some educational consumers and educational policy-makers who still believe that the former colonial ways of education are the best (Holmes and McLean, 1989). Odora Hoppers (2002) attributes the perpetuation of this dependence to the ways in which knowledge about indigenous people was collected, classified

and then represented to Western audiences, and then, through the eyes of the West, represented back to these who have been colonized.

A further look at the National Curriculum Framework (2013) reveals inconsistences. According to the curriculum, the localization process "will provide some compensation for the indigenous knowledge, values and practical skills that learners would have acquired in their home environment if they had not been attending school" (MOE, 2013:15). This assumption is controversial. It presupposes that indigenous knowledges are home values which those that attend school may be prevented from acquiring and as such school should compensate for that likely loss. Secondly, this statement reduces indigenous knowledge to an insignificant concept that is a domain of the home and with little academic benefit in formal schooling. The statement ignores the most important role that indigenous knowledges can play in the process of negotiating border crossing from the culture of home to the culture of school. This is impractical, vague, too theoretical and unfeasible and only rhetorically referred to as a compensation of what the pupils could have otherwise acquired in the absence of school. Its relevance, for instance, for identity construction and sustainable development has not been referred to but more so as a heritage worthy of preservation for prosperity. On the contrary, indigenous researchers see the need to develop culturally sensitive curricula and advocate for cross-cultural science teachers' need for a curriculum that recognizes a community's Indigenous knowledge or worldview in a way that creates a need to know Western Science (Cobern, 1994; Pomeroy, 1994). Put differently, indigenous knowledge should be integrated into Western modern science in a way that allows new forms of rationality, enlarged and more comprehensive than the forms prevailing today (Odora Hoppers, 2002).

The data yielded by this study provide strong evidence that the Integrated Science Course is to a larger degree still dominated by western worldviews that unconsciously appropriates the views of the local people. Morgan (2003:36) share a similar view that:

> Despite growing support for the principles and practice of equal opportunity and multiculturalism, and the growing appreciation and apparent accommodation of indigenous knowledges in western institutions, higher education is still dominated by a western worldview that appropriates the views of other cultures.

Snelson (1990) saw the characteristic features of Western Education such as its greater breadth and depth of knowledge, its superior resources and techniques, and its more efficient

organization as being responsible for replacing much of traditional knowledge. Today, however, with a desire for democratic principles of efficiency, equity, accountability and cost effectiveness of institutions of learning, the education system is being liberalized and decentralized in accordance with democratic principles. As such, colleges of education boards have been established and the management and control is accordingly vested in the board. "The board is responsible for the interpretation and implementation of the policies of the Ministry of Education" (MOE, 2005). Nevertheless, the Head of Department observed that "the Boards have been more pre-occupied with issues of local governance than so with curriculum content and thus discussions about alternative knowledges has not been opened at that level" (Kipongo (Admn) 9th October 2016). This is likely due to the continued provision by government of a centrally tight curriculum, which oratorically and in theory is flexible but rigid in practice. The growing quest for a decentralized education system, states Elmore (1983) should, on the contrary, invoke governments to provide a less tightly prescribed core curriculum which leaves space for schools to construct specific learning experiences for the pupils through local networking. In this way a platform upon which local communities are enabled to participate in planning and decision-making for the education of their children is likely to be created. OECD propounds a similar view:

> Interaction between the school and agencies outside the school is a vital point of interest. Just as people acquire many of their experiences from the local community, so must the school obtain the subject matter for teaching from this source. The pupils will be able then to build upon experiences that they bring to school, and seek new experiences and after inspiration from the school. The teaching will become more active and close to life and a bridge will be built between the common national content of education and the pupil's own environment, (OECD, 1995:69).

The Education Act which is a legal document that regulates the provision of accessible, equitable and quality education likewise fails to recognize and appreciate the role local knowledges play in the inclusion process and contradicts the policy and the national curriculum. The Act, for example, gives a leeway to public, community, aided or private educational institution to, if they like, introduce a maximum of two non-examinable or skill focused subjects that reflect the local environment where the educational institution is situated. Now, this decision is wholly dependent on the school to either consider these alternative knowledges or not and not as a core epistemological area that could co-exist with western knowledges but as a separate non-examinable subject. This is unrealistic and especially so in a society like Zambia, that places so

much significance on examinations, performance and scores. One wonders therefore, whether Indigenous knowledges could receive any positive attention with this approach. This is contempt and undermines the important role inclusion plays in negotiating and navigating a complex array of conflicting mental states of students (Breidlid 2013).

All in all, I wish therefore, to contend that the Integrated Science curriculum in its current form may not be able to spur the inclusion of indigenous knowledges and unless these policy pronouncements and curriculum statements about the inclusion of the other ways of knowing are also reflected in the science curriculum, Indigenous knowledges are at the verge of disappearing and these statements may remain a mere acknowledgement in the official policy. I shall now explore the indigenous discourse in the Integrated Science syllabus and textbooks.

5.1.2 Indigenous Knowledges in the Syllabus and Text books

This subsection will present a discussion into the extent to which Indigenous knowledges have been incorporated in the Integrated Sciences syllabus and text books. The focus is to ascertain how much of indigenous knowledge content finds itself in the designated science syllabus and textbooks in the college of education. As alluded to earlier, Integrated Science is a combination of four main study areas namely Agriculture Science, Biology, Physics and Chemistry. This syllabus was "necessitated by the need to provide a curriculum that is interrelated and interconnected at all the levels of the education system in order to provide quality education" (MOE, 2013: vii) and it is "envisaged that it will transmit to the young learners the knowledge, skills, positive values and attitudes that allow them to live and grow into resourceful and useful members of their communities" (p vii).

The text books analysed were the most used in the college by both students and lecturers. These included: Biology for Higher Tier by B. Beckette and R. Gallagher (2001); O-Level Agriculture Science by G.H Owen (1984); Senior Secondary Physics by Muunyu (1998); and Becoming an Effective Science Teacher by P.M. Muzumara (2009). While the first three are science content based books, the last one is pedagogic and largely concerned about how science should be taught and managed as opposed to what should be taught. The analysis was aimed at finding, selecting, making sense, and scrutinizing indigenous related data contained in these documents. The science syllabus like the curriculum revealed similar findings. It made no direct reference to

indigenous knowledges. However, its rationale was eye catching. Part of its rationale is to provide the student-teacher with the appropriate knowledge, skills and competencies needed to function as a basic school teacher. The course is considered as a guide for teachers who will be expected to design their own specific learning/teaching outcomes that match their particular strengths and the local potential (Primary Teachers' Diploma Science Education Syllabus, 2012). 'Appropriate knowledge' and 'ability to design one's learning/teaching outcome' are quite relevant to the topic of indigenous knowledges and therefore, worthy the analysis and discussion. This rationale is not just critical to the subject under study but begs the answers to the question of what appropriate knowledge is and whether teachers have the ability to design their own teaching/learning specific outcomes that match local needs. What then is this appropriate knowledge that this syllabus seeks to provide? Apple (2000) holds that the knowledge of the subject area that is deemed most worthy or legitimate is the official knowledge that is embodied in the formal curriculum. A closer look at the syllabus demonstrates a greater lack of indigenous content. It seems clear that the Integrated Science course is predominated with content aligned with the Western Scientific Knowledge while indigenous knowledges have been marginalized and therefore, borrowing from Apple not official in that sense. A lecturer for instance laments: "The syllabus is already prescribed to us with content bias towards Western Modern science, so the authority given to us to add indigenous knowledge is simply superficial …" (Musamba, (Ltr), 21st September 2016). This western knowledge prevalence in the syllabus could be explained in terms of the curriculum dependency theory bearing that this syllabus was necessitated by co-operating partners among them JICA in collaboration with Hiroshima University and UNICEF both rendering financial and technical support (MOE, 2013).

Nevertheless, various topics listed in the syllabus among them: Nature of Science; Health and Hygiene; Drugs and substance abuse; The Human Body; Nutrition; Materials and Energy; Matter; Water; Soil: Fish farming; Principles of Crop Production; Weather and Climate; Agriculture Economics; Livestock Production; Farm tools and machines; Communication etc. although tend to be viewed and approached from a western perspective, indicate that these are simply broad concepts that need to be broken down into specifics that reflect inclusion of both indigenous and western science. In this case, I therefore, argue that from the syllabus point of view, inclusion of indigenous ways is possible even though no specific reference has been made to it. The task of breaking down these broad concepts into indigenous / western hybridized ideas

may call for teachers with the ability to design their own specific learning/teaching outcomes that match the local potential as has also been propounded by this very syllabus and their ability to manage classroom indigenous discourses. The question, therefore is: is the science course in its current form able to produce teachers with the ability to design their own specific outcomes that will reflect the community in which they serve? O'Hern and Nozaki (2014:143) argue that:

> "students of former colonized nations who follow a formal curriculum of natural science education that exclusively contains western (i.e., colonizer) bodies of knowledge are unable to dismantle the colonial-and current neo-colonial-paradigms. The knowledge taught in schools that have been conceived, organized, administered, and evaluated through such colonial curriculum paradigms excludes their indigenous heritages that overtly or covertly influence and inform their everyday lived experiences".

O'Hern and Nozaki (2014) further contend that in order for students of former colonized nations to transform their society, the knowledge must be rooted in their practices and experiences with their social, historical, cultural and natural environments-that is, born from their own lives and understood through the eyes of new consciousness with human agency.

Nevertheless, it suffices to say that topics such as "The Environment, Plants and Animals, and crop production" were fairly integrated. A case in point is the objectives under 'crop production' which are listed as: "identify the crops commonly grown in Zambia; Describe the importance of crop production in Zambia; Demonstrate the growth of maize from land preparation to harvest; and identify common pests and diseases affecting crops" (MOE, 2015: 159). Although, the context is Zambia, the use of the term 'local community' would have been more precise and appropriate bearing the complexity and diversity of the country. For instance, the main crops grown in the West of Northwestern province (Mwinilunga) are Cassava and Pineapples while Maize is mainly grown to the Eastern part. It would thus, be more relevant and interesting for learners in this part of the region to learn not only about crops grown elsewhere but also in their immediate environment. I shall now discuss the findings from the textbooks.

The findings from the text books provide confirmatory evidence that western domination of the production of text books could be the cause of the continued curriculum dependence in developing countries (Holmes & McLean, 1989). Beckette's book (2001) utterly makes no reference to indigenous knowledges. It's highly likely on account that it is a western authored book and meant for use in higher education and in a subject (Biology) with a somewhat

international communality of knowledge. Similarly, Muunyu (1998) a local author makes no attempt in making any reference to local knowledges in his physics book. Levy Muunyu's book was the first ever physics learner's book to have been published by a Zambian writer. It was approved in 1992 by the Ministry of Education as part of the Zambian school curriculum. But like many other authors, the book fails to make specific reference to indigenous / local knowledges. While the technical difficulty of representing indigenous knowledges in Physics is acknowledged, the complete lack of reference to it is questionable.

Much of the Physics topics in the syllabus and those extensively covered in his book such as Matter; Heat; Light: Force: Pressure; Work; etc. could allow for inclusion. A case in point is the highly sophisticated and local scientific 'Kachasu' brewing which could be integrated under 'Matter'. Kachasu or Lituka as it is sometimes called is a traditional Zambian brew that is drunk in many rural parts of Zambia and in some urban townships. What is central here is not the beer making but the scientific process of fermentation and distillation behind it which indigenous people applied. This, like many other indigenous physics related concepts such as energy conservation, weather forecasting is missing.

Owen (1984), with an extensive experience of teaching Agriculture Science in Zambia and writing for Central and Southern African audiences, somewhat makes references to traditional and customary ways of farming and fishing but only does so in very tiny bits. It seems Owen is influenced by his desire to equip his audience for Cambridge O-Level agriculture examination confirming Holmes and McLeans's (1989) assertion that local curriculum content may be organized for assessment purposes in ways which meet British norms of achievement and standards. This is deeply rooted in a colonial origin thus, contends Mazrui: "There is a need to rewrite school text books and build them on African experience" (in Odora Hoppers, 2002:242).

Muzumara (2009) in his science pedagogy book, although seems highly influenced by a western scholarly biasness, realize the need for Science educators to employ a learner centered and known to unknown approach to the teaching of science. Learner home experiences are seen critical to learning in formal schooling even so in a science classroom where the home and school cultural boundaries are so eminent. Although Muzumara realizes the important need of teaching from the experience and understandings of the learners, he seems to ignore the necessary need to incorporate a diverse range of ideas and experiences of various indigenous

groups into science teaching. For example, materials on a wide range of cultures in Zambia, the contributions to scientific understanding of historical and contemporary non-western scientists, and the culturally constructed nature of scientific work is largely missing. Nevertheless, Muzumura seems to emphasize constructivism. However, constructivism submits Ninnes (2000) does not necessarily problematize the cultural construction of scientific knowledge, rather it attempts to use knowledge of learners' personal constructs to generate more effective strategies for persuading students to adopt Western scientists' social constructions. In addition, Muzumara (2009) fails to provide the history of how Western Modern Science purposes, theories and methodologies have changed and do continue to change with the encounter with indigenous knowledges. Further, these Science text books fail to provide examples of the numerous contributions of Indigenous Knowledges, to the fact that traditional science enabled indigenous people to live in environments over long periods of time (Odora Hoppers, 2002). Similarly, the science text books fail to emphasize the relationships between science and technology and the culture, values and decision-making processes of the society within which it is practiced.

The absence of local knowledges in the literature further raises the question of teachers' access to policy documents. The immediate and easily accessible documents to a teacher are syllabus and text books which unfortunately are devoid of indigenous / local knowledge narratives. In a system with a centralized syllabus catering for over several diverse localities and social complexity phenomenon spread throughout the country, inclusion may prove to be problematic and logistically impossible.

In sum, the analysis reflects that both the Sciences Syllabus and textbooks still predominantly represent the Western Scientific theme at the expense of local knowledges despite significant curriculum reform that have evolved through the education system in Zambia. They confirm Ngũgi's (1981) notion of "colonization of the mind" in that, despite considerable strides at inclusion of Indigenous knowledges especially at policy level de-colonization of the education system has not quite come to realization and still carry signs that are demonstrative of a colonized curriculum. A case in point is the use of English as an exclusive scholarly media. Findings revealed that there are no specific text books authored for Integrated Science in the college of education but rather students and lecturers relied upon general Eurocentric science textbooks authored in English from the West and mainly by the West without or with a very

limited coverage of indigenous knowledges. Most of the local authored literature has not successfully been epistemically transplanted from their western roots. The next section will now devote to analysis and discussion of the findings as obtained from the students', and lecturers' interviews, class observations and focus group discussions.

5.2 Indigenous Knowledges in Science Teaching and its Pedagogical Approach

> To deny cultural fusion in the teacher education programme denies teachers the skills and techniques for successfully incorporating indigenous knowledges in the formal curriculum (Shizha, 2007:315).

While the previous section focused exclusively at analysis and discussion of the indigenous discourse in the Integrated Science curriculum based entirely on document analysis, this section presents findings, analysis and discussion based on interviews, observations and focus group discussions. This is in order to seek convergence and corroboration through the use of different data sources and methods. This section is an attempt to respond to the second research question about the extent to which indigenous knowledges are present in actual practice and the lecturer methodological approach to indigenization.

There has been an inconclusive debate about the presence of indigenous knowledges in Integrated Science. While all my respondents agreed without doubt the overwhelming evidence of the presence of indigenous knowledges in other study areas such as Expressive Arts, Social Spiritual and Moral Education (SSME), Technology Studies and Literacy and language Education, many of them doubt its official presence in Integrated Science education. The interviews with lecturers revealed that half believed that indigenous knowledges are integrated in science education in Junior Engineers, Technicians and Scientists (JETS) and Production Unit (PU) Projects. Notice their responses:

"Okay I would say yes, there are some aspects of indigenous knowledges present in the college curriculum through JETS project" (Kipongo (Admn), 9th October 2016). Another lecturer claims,

> Indigenous Knowledges were incorporated in when we started conducting JETS project and Production Unit. We have poultry, piggery, and a garden. Certain convention

> practices which we usually use don't even actually apply well, but when a student brings his idea from home, it works well than what is on the ground (Kaponda (Ltr), 23rd September 2016).

On the contrary, the other two lecturers were completely opposed to the presence of indigenous knowledges in science education and maintained indigenous knowledges were not institutionalized and only come in as one's initiative. In addition, some student teachers took a middle-ground position on this issue and argued: "it is only at times where you are given a project on something that is when you tend to do one or two things regards indigenous knowledges otherwise if it's learning it's probably in a small percentage" (Maluba (Sdt), 22nd September, 2016). However, due to the limitation in time, JETS and Production Unit projects were not explored further to ascertain these claims. But, whatever the case, it seems fair to suggest that indigenous knowledges are a by the way and afterthought concept in science education in institutions of learning and may be only present in extra-curricular activities such as JETS and PU.

Nevertheless, class observations conducted, revealed conflicting findings from those obtained through interviews and focus group discussions. The first lesson on wild life conservation successfully incorporated and adequately made use of indigenous knowledges. The lecturer asked students in groups of 5 – 6 to identify and discuss both traditional and modern ways of conserving wildlife and identifying similarities and differences between the two perspectives. Later students were allowed time to present their findings through their representatives in groups. Finally, the lecturer made summaries and evaluations of the entire process and an individual task was given to design a chart depicting their findings. The lesson demonstrated a lot of creativity on the part of the students and the teacher who provided teaching and learning aids from locally available materials. And like Freire (1970) observes knowledge seemed to emerge through not only the invention inquiry human beings pursue in the world with the world but also with each other. The educator completely freed himself from the oppressive "depositing" of information into his students to the application of a liberating problem solving method.

Similarly, the next class observation, was a lesson on Plants. The lecturer employed a brief field trip excursion with the students tasking them to observe different types of plants in the college environment and identifying the main parts of a plant (Roots, Stem, Leaves, Branches, Fruits, Flowers and its parts). Working in pairs, students were tasked to compare and classify different

plants in the environment. Like in the previous lesson, local knowledges were highly utilized and in Freire's (1970) view, students and teachers become less structured, and both engaged in acts of dialogic enrichment to effectively ascertain knowledge from each other. As a way to prepare for the next lesson the lecturer using the Inquiry/ Discovery approach tasked the students in groups of five to collect different propagative parts of plants and explain how different plants are both traditionally and modernly propagated.

The data yielded in this study particularly under class observation provide convincing evidence that lecturers are well vested with modern day teaching methods of learner centered. Lecturers seemed to understand that true comprehension can only be fashioned though conversation, questioning, and sharing of one's interpretations by all persons in the classroom. Creating 'an equal playing field', a concept, Freire (1970) advanced, enables teachers and students to become Subjects of the educational process by overcoming authoritarianism and an alienating intellectualism. However, power relations are a problematic issue especially so in a Zambian culture were elders relatively wield a lot authority over the young. Not surprisingly, the lessons observed demonstrated a somewhat classroom imbalance power structure between the lecturer and the student teachers. It seems likely that Freire underestimated the influence of culture to issues of power relations. Moreover, for all intents and purposes, the teacher is always an authority. Thus, in the lessons observed the teachers were at the centre of instructions. Nevertheless, it seems clear that the teaching methods employed by both lecturers to some extent appeared to have diminished their authority to a level that did not obstruct the exchange of ideas. Students freely and mutually interacted with themselves and with the teacher and through these collective viewpoints built the knowledge within their setting. Although, lecturers ensured necessary participation, attendance, gave assignments, and instructions – a sign of authority, however, within the classroom dialogue arose a natural conversation that was not hindered by authoritativeness.

To be sure about the results of my observations and at least knowing that documents may have an advantage - of their lack of reactivity - over observation, I had to validate my findings by further examining the termly schemes of work and the lesson plans. At least, I understood the documents did not have the potentially distorting effects of the observer presence in the field in comparison to people with all sorts of behaviours, attitudes, and feelings.

Therefore, the examination gave out mixed findings. While the objectives in the schemes on plants was aimed at identifying and classifying plants in the local environment, the objectives in the wild life conservation schemes of work (termly plans) made no reference to traditional / local methods of conservation. The lecture's lesson notes for the observed lessons were not made available for validation. A further examination of the second and third terms schemes of work revealed insignificant reference to indigenous / local knowledge content. The methods of teaching covered in the schemes of work included: Group Work; Field Trips; Inquiry; Discovery; Project: Experimentation; Investigation: Demonstration; Problem Solving; Role play: and Think pair share. Methods, such as sharing; story telling; situating self and culture, which flow from tribal knowledge and allows for information to be shared through relationships with people in their localities and within their culture (Kovach, 2010) were missing. Its relevance and worthwhile in providing vital opportunities to contribute to the body of scientific knowledge about the natural world and Indigenous peoples was silent. The narrative of preserving Indigenous voices, building resistance to hegemonic discourses, and most importantly in strengthening the community (Linda Smith, 1999; Wilson, 2008; Kovach, 2010) was not equally referred to in both the literature analysed and the discussions.

The available evidence suggests that despite potential opportunities for inclusion of indigenous knowledges especially in Agriculture Science and Biology, there is very little indigenous inclusion in the actual science teaching at the college of education. The findings expose conflicts between state policies and actual classroom practices, between theoretical government education indigenization policies and practical Integrated Science education in the college of education. Further evidence supporting this claim may lie in the findings of Gitari who argues that despite stated government intentions to indigenize the science curriculum, knowledge and principles of local communities are not accounted for in Science education that students receive in institutions of learning (Gitari, 2003). Thus, it suffices to say that it's unlikely that many student teachers in Zambia will be able to make positive epistemological contributions to their local community unless indigenous/local knowledges are integrated into formal schooling.

The absence of indigenous knowledges in actual classroom teaching was seen by three quarters of lecturers as a result of a lack of a coherent strategy and guideline on how the policy statements of indigenous inclusion are to be implemented. The lecturers, wondered the possibility of a

successful localized curriculum with the insignificant level of attention given to this concept in the official documents and its enabling rather than prescriptive nature. And so, when teachers that are supposed to implement it are trained with a Western lens or orientation which still tend to dominate indigenous world views and when they are actually strictly trained to follow a textbook which is devoid of indigenous / local knowledges and is authored in a foreign language by mainly westerners or at least locals with a western predisposition. Mbuyu a student laments: "I think indigenous knowledges are supposed to be emphasized from here so that we are equipped but even when you look at the schemes of work, indigenous knowledges are not even there!" (Mbuyu (std), 22nd September 2016).

Along similar lines, a lecturer argues that:

> …. we are under pressure to teach what the syllabus prescribes and since the indigenous knowledge in most cases is not emphasized in the syllabus, you only use it as a way of delivering 'scientific knowledge' it becomes a bit of a challenge to via away from the core and concentrate on let's say indigenous knowledge in science… (Musamba (Ltr), 21st September 2016).

Another lecturer adds:

> …. it's mostly 'modern knowledge' which you find in the syllabus, if you're to talk about indigenous knowledge, then it must come from you, may be just trying to teach one or two things, one or two values in these children - the teachers that we are training - but otherwise from the syllabus point of view this kind of indigenous knowledge is not there (Kaponda (Ltr), 23rd September 2016).

All in all, there seems no compelling reason but to argue that there is very little going on in terms of Indigenous/local Knowledges in Science at the college of education. This resonates with the findings of other scholars such as Snively and Corsiglia (1998) who argue along similar line that, scholars freely acknowledge the existence of indigenous art, music, literature, drama, political and economic systems in indigenous culture, but somehow fail to apprehend and appreciate indigenous science. They further contend that this is the more reason that in many educational settings where western modern science is taught, it is taught at the expense of indigenous science which may precipitate changes of epistemological hegemony and cultural imperialism. Similarly, Morgan's (2003) findings lend support to the claim that indigenous people's knowledges are given no legitimate academic role in higher education, are ignored, insensitively dominated or

separated from their cultural and spiritual context. They are given little opportunity to influence the ideas and practices of higher education. This trend, Morgan contends, must change and indigenous world views and knowledges must be included as non-exotic part of learning. The next section will now explore the perceptions, attitudes and beliefs of student teachers and lectures about indigenous knowledges.

5.3 Lectures / Students Attitudes and Beliefs about Indigenous Knowledges

This section presents the findings, analysis and discussion to respond to the third research question. Lecturers' and student's perceptions, attitudes and beliefs were identified in terms of their understanding of the concept of indigenous knowledges, and their ideas about the significant of science education inclusion of indigenous content.

5.3.1 Lecturers and students Conceptions of Indigenous Knowledges

Both student teachers and their lecturers expressed positively a general understanding of the concept of indigenous knowledges. Findings however, showed that respondents had a limited and restricted understanding of Indigenous knowledges. Below are some of their submissions:

"Indigenous knowledges are traditional kind of knowledges like initiation ceremonies where some information is passed on" (Musamba (Ltr) 21st September 2016). This conception of indigenous knowledges limits it to the boundary of initiation rites which marks transition from childhood into adulthood. Rather indigenous knowledges were a lifelong process that began at birth through to death and thus, initiation ceremonies formed only a small component of the concept of Indigenous knowledges. "Indigenous knowledges are traditional views" (Kayombo, (Ltr) 22nd September 2016). Similarly, Kayombo's definition restricts indigenous knowledges to mean 'tradition' which is an inherited or customary pattern of thought, action, or bahaviour. Traditions are but just a component of indigenous knowledges. "These were knowledges passed on orally from one generation to the other (Kaponda (Ltr) Kaponda, 2016). This definition only describes the mode through which these knowledges were transmitted. "There are basically knowledges that have been created by the locals out of their own experiences locally" (Kipongo

(Ltr), 9th October 2016). Kipongo doesn't necessary give a definition but describes how these knowledges are generated and brings the idea of local to the discussion. "Indigenous knowledges are knowledges to do with ancestors" (Maluba (std), 22nd September 2016). This definition positions indigenous knowledges in the past as something that ended historically. "It's the knowledge that deals with the culture" (Kavuyi (std) 22nd September 2006). Culture knowledge is more embracing because of its broad nature that imply the whole way of life of a given people which may include, among others, their language, taboos, festivals, values, beliefs and traditions. Culture, includes all aspects of a people's way of life such as the food they eat, the clothes they wear, the type of housing they live in, their sporting activities, music, dance, symbols and meanings, ideas of beauty, economic activities, education system, their legal and political system, the fundamental rights of a human being, spiritual, material, intellectual and emotional aspects of a human being.

The general understanding of the respondents of the concept of indigenous knowledges could be summarized as: tradition; orally passed on from generation to generation; knowledge created out of a sustained stay to a locality; local; ancestral and cultural. While the key terms listed maybe somewhat accurate in their description of indigenous knowledges, they are also problematic and posse a challenge when used in the context of the locals. The terms, local, traditional, ancestral, and orally passed on tend to reflect the Western perspective of the concept of indigenous knowledges, which is mainly associated with the ideas of primitive, static, inferior, wild and the natural (Semali & Kincheole 1999). This "inverted mirror of Western identity" (Odora Hoppers, 2002:8) breeds negative connotations about indigenous knowledge and significantly contributes to the devaluation of indigenous knowledge in Science education. The West often seems to perceive indigenous practices as irrational, mythical, unscientific and superstitious and incapable of contributing to 'development'. While the conception of indigenous knowledges as a preserving national heritage came out prominently among all respondents, the aspect of it being a national resource was missing. Odora Hopers (2002) sees indigenous knowledges as a combination of knowledge systems encompassing technology, social, economic and philosophical learning, or education, legal and governance systems.

Evident too, was a tendency by most respondents to view indigenous knowledges as static knowledges that are contextualized in the past as can be seen from the following submission:

> This is some kind of knowledge that was passed on from one generation to the other. It was static and just through oral means. The elderly would sit in the Kinzanza (Traditional shelter) and then share their experiences to the young ones. So, that is indigenous education and knowledge that was acquired by the younger ones at that time (Kaponda (Ltr) 23rd September 2016).

To the contrary indigenous knowledges are dynamic, and enables people to live harmoniously with their environment and as Breidlid (2013) observes, many a people and majority population groups in Africa still adhere to cultures, belief systems and epistemologies that differ from the hegemonic Western ones.

Kipongo's definition however fits with many other scholars among them the United nations (2004), who view indigenous knowledges as a body of knowledges that indigenous people of a historical and geographical locality have lived on for a prolonged period and have developed and transmitted to future generations. This perception could be problematic to multicultural communities such as Solwezi in that it tends to exclude inhabitants of that particular area who may not be otherwise indigenous to the area and may not have used the indigenous knowledge of the people of that area. Similarly, associating indigenous knowledge to the long occupancy of a given people to a given place could be thought-provoking.

Nevertheless, the respondent's views confirm similar expressions held by many scholars that indigenous knowledges are a highly complex, and contentious subject and as such there may be no standard definition of the concept (Adidepe 2004). Likewise, the United Nations stressed that one should identify rather than define indigenous people (Dunn, 2014).

Some examples cited by student teachers regards their knowledge of indigenous knowledges in the focus group discussion included: various examples of medicinal herbs; various fishing and farming methods; methods of food preservation; traditional methods of conserving wild life; knowledge of trees and their uses, fire making; reading and interpreting the weather; beer brewing; blacksmithing, weaving and handicraft (FGD, (std) 22nd September 2016).

To sum up, available evidence suggests that there is a general understanding of the concept of indigenous knowledges among respondents. However, there is a tendency to view these knowledges with a derogatory Western lens and consequently acceptance of the status core. Colonialism is still a factor and its subjugation extends to peoples' way of seeing their way of

life (Odora Hoppers, 2002). The subsequent section will now explore lecturers' and students' perceptions and attitudes about ideas of the significant of inclusion of indigenous knowledges in science education.

5.3.2 Ideas of the Significant of Science Education Inclusion of Indigenous Content

While there seems to be a general agreement about the importance of indigenous knowledges and the need for educators to introduce their students to perspectives of both Western Modern Science and Indigenous knowledges, there were conflicting views on whether the science classroom was the right platform for inclusion. Majority of students and half of lecturers positively expressed the need for inclusion of indigenous knowledges not only in science but also in other study areas. They see indigenization not only as a way of making science a reality in the lives of the learners but also as a way of improving performance. For instance, a lecturer recounts the importance of inclusion in science:

> It is very important. Science is taken to be one of the most difficult study area in schools by the learners. It is viewed as a foreign concept that is just imposed on them. Indigenization, demystifies science and makes it look like it's something around them, not something from outside, and if we take that approach I feel that, the learners' interest will increase and thus the performance (Musamba (Ltr), 21st September 2016).

Another respondent in commenting on the importance of indigenous knowledges in science teaching had this to say:

> "They are very important in the sense that, within this indigenous knowledge, there are key things that have really brought the communities of most of us Africans together - that knowledge is culture and that has kept us together as a people. Education is too part of that culture and you see, it is this very system of education that helps transmit this culture. So, indigenous knowledge is crucial…" (Kaponda (Admn), 23rd September 2016).

On the contrary, some lecturers were skeptical about the possibility of inclusion in Science education. A science lecturer, to the question whether a science classroom would be an ideal platform for indigenization, reacts as follows:

> In social sciences! Yes, but in natural science, I doubt. I was just teaching a class about world life conservation. There is an opportunity to present indigenous knowledges in a way but not in every aspect. What I simply mean here is that certain topics; certain study areas can present these indigenous knowledges to the learners. But it's not in every study area and certainly not in every subject. (Kipongo (Admn), 9th October 2016).

The above citation confirms Aikenhead and Jegede (1999) observation that there is a tendency among many scientists and science educators to continue to view the contributions of indigenous science as "useful", but outside the realm of "real science". While inclusion may be a bit problematic in some science topics, to claim that indigenous knowledge is only a domain of the social sciences and not the natural sciences is faulty. Such claims are deeply rooted in the colonization of the African mind (mental universe of the colonized, the control through culture, of how people perceived themselves, (Ngugi, 1989) where western hegemonic epistemology was, in the wake of modernity, hailed as the savior and the only means with which to achieve progress and development and the only basis and standard to ascertain objectivity and validity of knowledge and its ways of coming to know (Breidlid (2013).

Evident among lecturers is also the perception that Western Modern Science should be used to validate and legitimize Indigenous knowledge and therefore, whatever fails short of that objective measure is not science. Why should a Western methodology be the basis on which to analyse, approve or disapprove an indigenous phenomenon? Notice my informer's claim:

> Students are given projects to carry out, discover findings and present them. From these projects, some of them incorporate traditional aspects. But they fail to prove them scientifically. Someone may come up with medicine to cure measles or chicken pox using the herbs which their forefathers had been using. Now, if asked what chemical are found there which helped to cure this or that, they fail to substantiate (Kayombo (Ltr), 22nd September 2016).

Morgan (2003:36) argues along similar lines: "The underlying assumption is that Western Science is the objective measure of what is factual. Unless, it can be proven through these scientific methods, it is not "science" and no matter how efficacious a process it is for those that use it, it is relegated to the realm of wisdom. Unless therefore, educators transform their individual perceptions about what makes up legitimate and valuable school knowledge, effective integration of indigenous knowledges into curriculum content will not succeed (Wright and Abdi, 2012). A similar view is also expressed by a respondent:

> …because much of our knowledge is considered to be backward, evil and we have assumed a new identity as Christians, we are trying to conceal that knowledge no matter how useful and we are suppressing it and treating it as something that is very sinful (Musamba (Ltr), 21st September 2016).

The idea that there is only one science is refuted by Ogawa who argues: "Western science is only one form of science among the sciences of the world" (Ogawa, 1989:248). Also, the people living in an indigenous culture itself may not recognize the existence of its own science; hence, it may be transferred from generation to generation merely by invisible or non-formal settings (Ogawa, 1989).

Of interest were also the differing views between female and male students as regards their attitudes to indigenous knowledges. The findings seem to reveal that the female informants have a much more positive view of Indigenous Knowledges compared to their male counterparts especially in relation to the use of indigenous medicine in the homes and their traditional communities. Female respondents discussed the efficacy of traditional medicines passionately and at breadth, bringing out examples of their own lived experiences at home and many of the conflicts faced in the interaction between herbal and conversional medicines. For instance, one respondent recounts how the nurses continuously reprimanded her mother for using herbal medicine while admitted to the hospital and threatened to prematurely discharge her if she did not stop (Lusa, (std) 22nd September 2016). The female informant's expressed enthusiasm agrees with O'Hern's and Nozaki's (2014:139) assumption that "this is perhaps due to the fact that many of the individuals who produce, practice, and utilize knowledge of indigenous communities and cultures in rural areas are actually women..."

The negative attitudes among some educators may be explained in terms of their weak roots in local values and traditions there by failing to grow the local knowledge both outward and inward (Cheong, 2002). Moreover, these lecturers may have themselves been educated in western knowledges and most likely by academician influenced by the global architecture of education. Student / lecturer attitudes and perceptions are crucial and have implication for curriculum development in general and for the Integrated Science Syllabus in particular. I will know turn to the challenges that educators face in the process of inclusion.

5.4 Challenges in Science Education Indigenization

Research suggests that, despite increasing talk about indigenization of the curriculum, its actual implementation often meets challenges of anomalies and conflicts at national as well as local levels. Actual implementation involves transformation of power dynamics surrounded and embedded in education. Forging effective strategies to promote inclusion of indigenous knowledges into natural science education requires insights into the specificities of struggles and contradictions that find themselves into the arena of its curricular and pedagogical deliberations and initiatives (O'Hern and Nozaki, 2014).

This section presents the findings, discussion and analysis in response to the fourth research question about the challenges that educators face in the process of indigenous inclusion in science education. The presentation is segmented into four subheadings. The first cover the challenge related to teacher apathy and competence. The second focus on lack of indigenous resources. The third explores impediments posed by centralized bureaucratic examinations and curriculum institutions. The last and not the least cover the challenges that come with globalization.

5.4.1. Teacher Apathy and Lack of Indigenous Knowledges

The general findings reveal that teachers are either reluctant or lack the necessary knowledge to implement indigenous science. This is evident by the many views expressed by third and final year students who felt they were not well equipped and therefore, had no capacity to go and implement inclusion of alternative knowledges in Science. For example, a third and final year student teacher had this to say:

> For us to be ready, first the curriculum at the college should be changed. Let them include indigenous knowledges. If indigenous knowledges will not be taught here, I doubt if there will be a teacher that will go and change things out there. Because even the teaching materials, do not have any of those knowledges. The starting point is here… (Kyembe (Std), 22nd September 2016).

Another student teacher questioned: "Since, we are not equipped in indigenous knowledges, how can we possibly teach it to learners? For example, when I was on TP (Teaching Practice), you ask students where we get medicine. Children do not know and so if you as a teacher do not

know as well then we at a loss", (Mukwemba (Std), 22nd September 2016). This revelation brought into perspective the question of not only indigenous knowledge possession but also the ability to make sense of different ways of understanding the world and how to reconcile this with indigenous understanding.

This view is also expressed by Baynes, (2015) in his Australian Journal on Indigenous Knowledges. He states that the education authority both (policy and curriculum) requires teachers to embed indigenous perspectives; however, many teachers express concern that they lack the necessary knowledge and skill to implement this … Teachers are also reportedly hesitant about incorporating indigenous content when they feel that they do not have the expertise to do this in an authentic way. An informant had this to say, "Unfortunately, indigenous knowledges may not be so much prominent amongst people in schools because many times, we fail to find a link between indigenous knowledges and the scientific knowledge that is documented…" (Kipongo (Ltr), 9th October 2016). Another contends:

> Yes, the syllabus is there, but this kind of knowledges is not there. This is one challenge…what is there is modern knowledge. So, it will be up to this educator to bring out those skills and values to inculcate in the students, otherwise, if you check in the curriculum, no reference is made to this kind of knowledges. Otherwise it is up to a given lecturer to find time and bring out those values, skills and knowledges to inculcate in the learners (Kayombo (Ltr), 22nd September 2016).

Knowledge according Freire (1970) should be constructed by both the learners and teachers in their localities. The apathy and lack of indigenous knowledges among some teachers may entail moving away from a traditional model of learning of putting in information (Banking Theory) to one that emphasizes on the concept of drawing out new knowledge and understanding. In order to efficiently find a bridge between the classroom culture and the home culture that will enable communication across epistemological and cultural dividing lines in which students find themselves in (Carm, 2012), there is need to employ a model of learning that takes a holistic view of a learner, relies on dialogue and shifts the responsibility for learning from individuals to emphasise corroboration in the construction of knowledge (Coleman and Earley, 2005). In Freire's view, critical education has to integrate the students and the teachers into a mutual creation and recreation of knowledge unlike where knowledge is produced at some distance from the classroom (Freire, 1970). Notice, how a lecturer laments:

> Believe me you, I really have no knowledge of most of these herbs only a few that may be my father, my grandfather, my aunt knew and used. That which she did not use, I don't know. Now you can imagine my children, if me I have missed a few, my children will also miss a few, the children to my children will completely miss everything and in the next few years, we may not have these knowledges (Kipongo (Admn), 9th October 2016).

Its seems likely from the above citation that Indigenous knowledges currently remain only in the memory of some old age people who live in remote rural areas. With the demise of these old people, indigenous knowledge may be lost forever. Therefore, the dynamics of learning with others in groups and the significance of context and purpose are crucial. The claims of student teachers in the focus group discussion that most of their lecturers lacked indigenous knowledges and the subsequent admittance of some of these lecturers to these claims, is a challenge to the inclusion process and could be resolved through the use of dialogue. Dialogue propounds Coleman and Earley (2005) prompts reflection, critical investigation, analysis, interpretation and reorganization of knowledge. In this way feedback and reflection become part of the same process, enabling the learner to review his or her learning in its context and related to previous experiences and understandings. Dialogue is grounded in the assumption that learners are teachers and teachers are learners. Hierarchies are broken down and boundaries less evident. This is even so especially important in most African Science classrooms where, as Breidlid (2015:15) observe,

> Students operate within complex discursive and cultural spaces that constrain them as well as offer multiple options for defining themselves. Pupils are influenced both by their own cultural roots and by so-called modernist tendencies, thus making navigation difficulty with social and cultural practices that are fluid and often contradictory.

Baynes, (2015) states that, the science curriculum should within it investigate and include ways traditional knowledge and western scientific knowledge can be complementary. Findings in this research show that the teacher Integrated Science curriculum in both theory and practice does not adequately address and support this aspect of how these two knowledges can interact and supplement each other. This calls for a robust indigenous resource and Continuous Professional Development (CPD) sustained within the culture of the institution to which I now turn my attention to.

5.4.2. Lack of Resources and Access to Continuance Professional Development

Findings revealed a collective agreement from both lecturers and student teachers on the lack of indigenous/local teaching resources in implementing indigenous science and thus echoed the need to write and publish indigenous knowledges and a further need for inclusion of indigenous/local knowledges in Continuous Professional Development activities. Translation of science into local text as a solution to some of these challenges featured most prominently both among students and teachers. Continuous Professional Development (CPD) was seen as an opportunity and ideal platform for giving a renewed hope and attention to the discourse of indigenous Knowledges. This narrative was, however, as far as the lecturers where concerned, almost if not completely absent in the departmental Continuous Professional Development activities. For example, The Head of Department responding to a question whether indigenous knowledges discourses are discussed in continuous professional meetings had this to say: "…to be honest with you, no, may be as a by the way thing but not tabled as a special theme and any way we are overwhelmed with work. CPDs are in the programme but it's been difficulty having them. But yes, this is an ideal platform for discussion and reflection …" (Kipongo (Admn), 9th October 2016).

And commenting on the challenges, a lecturer observed:

> One of the challenges is to marry 'scientific knowledge' to the indigenous knowledge without having to change the meaning of the concept itself. So, the challenge of terminology comes in. How can you explain the concept of an atom for instance in a way that is understandable to the child in a local language? How do you explain those concepts in a scientific way for the students to understand them? Yes, the challenges are there, terminology, cultural conflict, and so on (Musamba (Ltr), 21st September 2016).

The importance of professional development cannot be underestimated, especially during recent times when there have been increased demands throughout the world on teachers' expertise and growing expectations for their achievements. Policy makers, administrators and others increasingly see professional development as central to any change efforts, (Coleman and Earley, 2005). The curriculum places the responsibility for localization of curriculum content entirely on the teacher and teacher educators. This raises questions of teacher capability. The quality of teaching will largely be dependent on the quality of the teachers, who in turn depend to some extent on the quality of their ongoing professional development. The more teachers get skilled

and acquitted with indigenous knowledges and methodologies, the better and more confident they become in the process of inclusion. However, Coleman and Earley (2005:230) advises: "The prime responsibility for securing individual professional development of teachers is not, however, the exclusive concern of the employer - teachers themselves must expect to play a key role - and professional development opportunities must be available for individuals to help them become better practitioners".

The underlying argument against this is whether teachers are ready to dedicate their time in CPDs on an issue with no or less attention as is evident from the literature analyzed point of view and worse of on an issue that is non-examinable in a system centered on examinations. It is to the issue of examinations I will now turn to.

5.4.3 Examinations and Indigenous knowledges

The Examination Council of Zambia externally examines candidates to qualify for the award of the primary teachers' diploma. It is responsible for the registration of candidates, administration and processing of examinations, certification and equation of certificates from other examining boards. The college of education administers continuous assessment and teaching experience which weigh two thirds of the total weight while the examination weighs one third. The findings reviewed that in an exam orientated system, the performance of individual students, teachers, administrators and schools in general is all judged by test scores. Thus, teaching is centred on passing examinations and as such strict adherence to the syllabus is crucial. It is therefore, almost impossible for one to drift away from what the syllabus prescribes.

The bureaucratic arrangement of the education system in Zambia is embedded in its colonial past. Institutions such as the Examination Council of Zambia (ECZ) and the Curriculum Development Centre (CDC) exert significate influence over the everyday practices of teaching and learning in institutions of learning. For instance, the state, through its use of a single, cumulative, high stakes exit examination, as a sole measure of student's academic potential, exerts significant control over the types of knowledge taught in schools and through such curricular pedagogy and evaluation means, as O'Hern and Nozaki (2014) observe, Western knowledge of natural science concepts has been positioned as the only valuable official knowledge. This is evidently expressed by most respondents:

> When you are looking at preparing a paper to give as an examination, you are looking at the syllabus and then if the syllabus doesn't contain that kind of material then there is that limitation, so that knowledge is somehow not taught and therefore, not tested because it's not there. So, if it has a slot in the curriculum then it also must be contained in the syllabus… (Kayombo, (Ltr), 22nd September 2016).

Nevertheless, as a rebuttal to this point, one would argue that indigenous / local knowledges are simply local and it would be wishful thinking to expect them appear in a national standardized examination set by the Examination Council of Zambia for candidates across the country with diverse traditions and world views. This stands out as one big obstacle and was also alluded to by the Head of Department:

> It's not easy because when they set an exam, it has to be set for everyone across the country. So, if they put an item let's say local to one region, what happens to other regions? Other regions get disadvantaged. Examinations are important but I think the emphasis should shift from exams to learning. These are some of the reforms our education system should address (Kipongo (Admn), 9th October 2016).

However, there still seems room for indigenous inclusion possibilities. For instance, indigenous / local knowledges could still be examined locally within the two thirds continuous assessment framework and as suggested by some respondents in JETS and Production Unit projects. Moreover, a shift from a centralized exam oriented system to a more decentralized continuous based assessment is possible and may greatly reduce this pressure.

All in all, pressure exerted by centralized bureaucratic entities such as ECZ and CDC was viewed as a threat to the localization process as it greatly influences what is taught and how it is taught. Amidst pressure for curriculum content coverage, teachers resort to dictation and lecture based instruction methodologies and continuously make references to the exam, filling students up with contents detached from their reality and disconnected from the totality that engendered them and could give them significance (Freire, 1970). But of what value are indigenous / local knowledges in a global village? Is there space for indigenization in an increasingly global village? The next section will discuss the challenges that come with globalization.

5.4.4 Indigenous / Local Knowledges vis-à-vis Globalization

The significance of teaching indigenous knowledges in an increasingly global village featured highly especially in a focus group discussion. It therefore, became necessary to include it in the

findings chapter. There were mixed feelings observed especially among students on the need to localize the curriculum in a global village. Although, most respondents generally agreed that cultural globalization on one hand contributes to the erosion of indigenous cultures and indigenous languages, few, on the other hand, viewed globalization as an opportunity for the inclusion of indigenous knowledges. The effects of globalization were seen to serve as both pull and push forces for the inclusion process. For instance, two respondents advanced the following views:

> Yeah, due to culture fusion, most of our norms and cultural practices are dying out, because we mostly feel more comfortable and educated if we are found in possession of modern things, we feel proud, we feel happy and more sophisticated. So, with the coming in of globalization and modernization, everyone would what to embrace whatever comes on board and in so doing most of our practices are dying out... (Mokola, (Std) 22nd September 2016).

On the contrary Kavuyi was more positive:

> …, well, it could be on both sides, that, the world becoming small is an opportunity to make Indigenous Knowledges known by every person outside the country because it is very easy for me to communicate to a person in America, to send a picture to a person in America, to send a picture to anyone out there through the internet which is really part of what is making the global village small…, (Kavuyi, (Std) 22nd September 2016).

Kelly (1999) shows that Zambians understand little about their past and, therefore, many today have uneasy sense of homelessness and rootlessness. Several seem unable to reconcile traditional values and approaches with the imperatives of urban living, though to a great extent their mode of responding to social, cultural, and economic situations is dominated by a traditional outlook.

It is true that globalization can have both positive and negative education implications for inclusion of indigenous / local knowledges. For instance, globalization is creating numerous opportunities for sharing knowledge, technology, social values, and behavioral norms and promoting developments at different levels including individuals, organizations, communities, and societies across different countries and cultures (Cheng, 2000; Brown, 1999; Waters, 1995). On the contrary, globalization is potentially creating serious negative impacts on the indigenous developments, particularly among developing and underdeveloped countries of the global south. Some of the negatives sighted by Cheong (2002) include: Exploiting local resources and

destroying indigenous cultures of less advanced countries to benefit a few advanced countries and; Promoting the dominant cultures and values of some advanced areas and accelerating cultural transplant from advanced areas to less developed areas.

Nevertheless, globalization does not mean the death or end of localized or indigenous knowledge production and transfer but rather as, Bhola (2003) observe a desire for localization, the search for community, indigenous values, mother tongues, and the wish to preserve cultural heritage and indigenous knowledge. Cheong (2002:2) writes: "Localised globalization in education can create more values for local developments if local creativity and adaptation can be induced in the process of operational change and cultural change".

Indigenous / local and Western knowledges should not be perceived as two separate opposites contending each other, but rather as two phenomena that could supplement each other in the face of globalization and, therefore, the remedy does not lie in forsaking one form of knowledge for another. Supplementation of these knowledges is even crucial now that:

> …the dominant epistemology is incapable of resolving key crises confronting the globe in its own terms, that the concepts of 'green development' and the belief in technological innovations and breakthroughs are insufficient to break with the hegemonic paradigm; therefore, a more fundamental critique and reconstruction is needed (Breidlid, (2013:7).

Similarly, Bray in Kelly, (1999:17) concludes, "Indigenous forms of education tend, more than the Western form, to serve the needs and aspirations of the community …There is, therefore, need to harmonize and integrate the best elements of both indigenous and western forms of education to create a more viable system of education in Africa". Cheong (2002:10) warns:

> If the local knowledge is overwhelmed and even replaced by the external knowledge in globalization, the local knowledge will be unable to grow and will gradually disappear. In turn, there will be decreased contribution to local developments due to the inappropriateness of external knowledge and the lack of appropriate local knowledge for the development of the local community.

This view is also advanced by some of my informants who felt most education reforms implemented in Zambia were heavily borrowed from western systems with completely different contexts. The failed Zambia Teacher Reform Programme (ZATERC), funded and implemented by DANIDA stands out as an example of such. The project attempted to train Primary Teachers for the period of two years split into one year college based for the purposes of learning

methodologies and another year for field experience. It was soon disbanded when it became apparent it wasn't possible to fit a triangle into a cycle. This agrees with Dimmock (2000) who warns that importing policy reforms formulated elsewhere under different economic, political and cultural conditions presents challenges for the new host cultures and therefore, any transfer of such, needs to be more cultural sensitive. This means that, for education to make a positive impact on society, the knowledge, skills and attitudes acquired in school must have applications that are beneficial within that society to both the collective and the individuals involved.

In sum, the informers have put forward many challenging views that are faced in the process of localization. These challenges rage from teacher apathy and lack of capabilities, lack of indigenous resources, examinations centered education to challenges brought up by global forces. Others include lack of accessibility to policy documents coupled with issues of poor reading culture and cost and logistic problems in localizing the curriculum in the face of diverse cultural differences between students' life-world and school science. It seems probable that value addition may foster the nurturing of indigenous knowledges, a theme I know turn to.

5.5 Economic Value vis-à-vis the Indigenous /Local Knowledges

Although this theme does not necessarily refer to any specific research question in this paper, it however, featured highly in the discussions and thus it has become inevitable to briefly discuss it. The low level of the presence of indigenous / local knowledges in institutions of learning may be attributed to the failure to add an economic value to it. Banda (2008: xi), for instance, argues that:

> Hybridizing AIKS with the formal schooling system will only become significant if an economic value is added to the AIKS through some mechanisms put in place. The practical skills embedded in AIKS could foster career building, entrepreneurship and apprenticeship if linked to the money economy of employment and wealth creation.

Most informants share the view that indigenous knowledges should be made attractive and value addition should be the goal of those that advocate for indigenization. A Respondent had this to say:

> To learn western knowledge, you are offered a certificate, but if you went to a villager who to me even possess much more than even a professor in a university does, you will

> not get a certificate there. Of course, you get the knowledge and everything but you will not graduate with a certificate and you are not employable. The point here is value addition to indigenous knowledges (Kipongo, (Adm), 9th October 2016).

In addition, another respondent commented:

> Make it attractive, integrate the concept of marketing and money economy that never featured in African tradition. Package it competitively, incorporate the internet and social media not just in the books. People will be able to be attracted and it will be passed on. So, how it is influenced, matters. The people that possess that knowledge, how they influence others to get interested in it matters (Kaponda, (Ltr) 23rd September 2016).

Serpell (1996), however, saw a conflict between the economic progress as an agenda for schooling and culture transmission. He states that, while education in theory aspires to address both agendas together in harmoniously coordinated manner, in practice, however, educational programmes have consistently fallen short of such an ideal synthesis.

It should be noted that indigenous knowledges stress on communal and social aspects as opposed to modern education that emphasizes individual and competitiveness and as such, with the coming of the money economy, indigenous people remained conservative and thus failed to cope with the dynamic needs of the modern world. There is need, therefore, contends Kelly, to cultivate a spirit of inquiry, innovation and change in indigenous/ local knowledges and synthesize it with modern western education and produce a true national education for development (Kelly, 1999).

CHAPTER SIX
SUMMARY OF FINDINGS, CONCLUSION AND REFLECTION FOR FUTURE DEVELOPMENT AND RESEARCH

This chapter sums up the whole research process. It unfolds by providing a brief summary of the whole study with particular reference to the research problem, research methodology, and the main contribution of the research. It then provides a summary of the main findings of the study, conclusion and reflections for future development and research.

6.1 Summary of the whole Research Process

The overall aim of this study was to explore to what extent the teacher education Integrated Science course addresses Indigenous epistemological discourse both in content and actual classroom practice at college of education in Zambia. In view of the aim of the study alluded to in chapter one, the thesis sought to respond to the raised research questions. Chapter two provided a historical contextual background on Zambia's educational reforms with specific reference to indigenous knowledges. The chapter demonstrated that there is now more recognition than has been before on the advocacy of alternative knowledge inclusion in formal schooling. However, it is still not clear what strategy the government intends to take to spur the process of inclusion in Zambia.

In the third chapter the study drew on concepts of epistemology, indigenous knowledges, Western knowledges, globalization and localization. The chapter further consolidated on the structure of the study by formulating a theoretical framework. The analysis hereto has been informed by the use of three theories to give divergent lenses to the topic under study. The theory of a tree proposes a co-existence between indigenous and western knowledges where local knowledge is rooted in local values and traditions but absorb external useful and relevant resources from the global knowledge system for a holistic development. Transformative role of

education seeks to transform the structure of schooling so that learners can be freed and become beings for themselves that are able to transform knowledge and society as opposed to an imperialist one that pursues to 'integrate' them into a structure of oppression. And lastly, the theory of curriculum dependence opened an understanding into how in former colonial territories such as Zambia curricula have been adopted from the former colonial power either as a survival of the colonial rule or through post-colonial influences and provides arguments and suggestions on how curriculum dependence occurs and is maintained.

In this study, a qualitative case study approach was employed. The targeted sample was the staff in Natural Science Department at a college of education and its students. Data was triangulated from semi-structured interviews, focus group discussions, classroom observation, use of official policy documents and field notes. The collected data were transcribed to provide important detail and reorganized and themes identified. The themes used were arrived at after doing some coding a process which facilitated the findings, discussion and analysis whose summary I now turn to.

6.2 Summary of the Main Findings

Indigenous / Local Knowledges in the Science Integrated Curriculum

The findings show a gap between the National policy on education; the National curriculum, and the Integrated Science curriculum, syllabus and textbooks in the presentation of Indigenous knowledges and the localization process. The emphatic potency diminishes as you go down to the point of delivery. The science syllabus is lacking in significate content related to indigenization. The data yielded by this study provide strong evidence that the Integrated Science Course is to a larger degree still dominated by western worldviews that unconsciously appropriates the views of the local people. While curriculum aims and statements are fairly considerate of the localization process, curriculum content is not locally determined and thus predominantly Western dependent. Encouraging, however, is the number of local authors coming on board even though many need to be decolonized to overcome the western bias and counter the idea that the only true science is Western Modern Science.

This is further worsened by a lack of clear strategy and guideline on how the policy statements of indigenous inclusion are to be implemented. The policy merely encourages educators to localize

some of the aspects of the curriculum but fails to demonstrate a clear road map of how this is to be achieved. They reflect a more permitting rather than prescriptive nature. In additional to the lack of clear strategy and working formula is the contradictions therein between these policy documents which may need serious harmonization.

Nevertheless, the official position of indigenous / local knowledges in policy documents is clear and should therefore; serve as a base for further research and works on how best it could be implemented.

Indigenous Knowledges in Science Teaching and its Pedagogical Approach

Technically, it seems fair to contend that indigenous knowledges are a by the way and afterthought concept in science education in institutions of learning only in some cases present in in obvious indigenous related topics such as Plants and Animals and in extra-curricular activities such as Production Unit and JETS. The policy satisfactorily fails to trickle down to the base through curricula materials which are highly biased against indigenous knowledges. The nexus between theory and practice and the practical is not harmonious.

Nevertheless, there exist potential opportunities for inclusion especially in Biology and Agriculture Science, even though the analysis revealed that inclusion of indigenous science at the college is a by the way thing and an afterthought at the discretion of the lecturer. Teachers, however, are abreast with modern teaching methods of pupil centred even though pressure to cover the syllabus for examination purposes compel them to resort to dictation and lecture methods.

Lecturer/Student Teacher Attitudes and Beliefs

There is a common understanding of the concept of indigenous knowledges among many respondents, although many exhibit a tendency to view these knowledges with a derogatory Western lens that reduces indigenous knowledges to a legacy for heritage only and not a resource for social and economic development. There are positive attitudes from both students and lecturers about the significance of science indigenization with only a few negative expressions from indigenous skeptics on the impossibility of its inclusion in science. Student / lecturer attitudes and perceptions are crucial and have implication for curriculum development in general

and for the Integrated Science Syllabus in particular. A lot more work needs to be done in an effort to change the colonial mentality and decolonize attitudes, perceptions, institutions and communities, if inclusion is going be a success.

Challenges

Several challenges surround the inclusion of indigenous knowledges in science. Teacher apathy and the lack of cultural knowledge and skill and ability to integrate indigenous knowledges into formal schooling was eminent. Students felt ill prepared in this regard, to adequately implement the localized curriculum. A deliberate initiative to capacity build staff in this regard is necessary. Inadequacy of indigenous teaching and learning resources was another impediment and probably the greatest to the inclusion process. The high dominance of western production of text books especially in science contributes highly to curriculum dependency. Translation and production of science text books into local text and without a cultural imperialist bias should be considered to preserve and protect indigenous knowledges. Continuous Professional Development (CPD) is an opportunity and ideal platform for giving a renewed hope and attention to the discourse of indigenous Knowledges. Unfortunately, the indigenous narrative was missing and meetings were erratic due to the alleged pressure of work.

Exams significantly influence what is taught and how it is was taught. Lecturers feel obligated to complete the syllabus and as such strictly follow the syllabus impacting negatively on concepts such as indigenous knowledges that seldom feature in curriculum materials. There is need to strength local continues assessment methods, slowly shift emphasis from examination to learning and work towards the decentralization of examinations and curricular decisions which are still highly centralized.

Finally, while globalization is a threat to indigenous knowledges, it too comes with opportunities for inclusion. Cultural globalization is one such area that substantially contributes to the erosion of indigenous cultures and indigenous languages. But globalization creates considerable opportunities for the inclusion of indigenous knowledges in formal schooling. Thus, indigenous value addition is key to the survival of indigenous knowledges. The drive, therefore, should be "to develop a local person with an international outlook, who will act locally and develop globally" (Cheong, 2002:12).

6.3 Conclusion; Reflections for Future Development and Research

Although considerable useful amount of work has been done at policy level on indigenous knowledge science curriculum integration, there remain a need to redress the Western knowledge hegemony and decolonize the school science curriculum, text books, students and teachers. At policy level, this entails developing an innovative indigenous/local knowledges inclusion strategy that will provide a clear roadmap, consisting of a clear set of guiding principles or rules that define the actions that the educators should take to achieve the desired goals. It means working towards decentralization of bureaucratic intuitions such as Examination Council of Zambia and Curriculum Development Centre and empower communities to effectively participant in curriculum decisions. This has implications on financial resources but is worthy attempting. Begin to query the knowledge production control of the west and the Western-English hegemony as the exclusive media for scholarly communication and develop and strength indigenous languages for scholarly works.

At the local level, it means developing local capacities to write and publish literature reflective of both indigenous and western worldviews. Work towards a decolonized curriculum in science and help balance indigenous knowledges with western knowledges by overcoming the indigenous-Western knowledge dichotomy.

In conclusion, bearing that this study was constrained with time, I wish, to strongly suggest that further research into this may possibly include an action research to assist the teacher educators in improving and/or refining their actions in the process of inclusion. This is so on account that practitioners who engage in action research inevitably find it to be an empowering experience. Most importantly, relevance is guaranteed because the focus of each research project is determined by the researchers, who are also the primary consumers of the findings (Cohen et al, 2011).

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http://www.exams-council.org.zm/

Appendices

Appendix A: Interview Guide for Lecturers

Background questions for Lectures:

I. Name:

II. Age:

III. Sex:

IV. Academic / Professional qualification

V. Tribe:

VI. Designation:

Interview Questions:

1. What in your view are indigenous knowledges?
2. What are some of the characteristics of indigenous knowledges found in the province?
3. Why is it important to incorporate indigenous knowledges in the curriculum?
4. To what extent are indigenous knowledges covered in the Integrated Science curriculum?
5. How are indigenous Knowledges taught in colleges of education?
6. In your teaching experience, what methodologies have proved effective in teaching of indigenous knowledge in integrated science?
7. What are some of the challenges in teaching or integrating indigenous knowledge systems in science education if any?
8. What can be done to solve those challenges?
9. Do you have any suggestions on how indigenous knowledges content in integrated science syllabus could be improved?
10. What aspects of indigenous knowledges should be included in the integrated Science curriculum?
11. What are the student teachers perceived attitudes towards learning indigenous knowledges in science? Do they appreciate it? What makes you say so?
12. How is it necessary to teach indigenous knowledges in schools in this age of globalization?

13. How is the power hierarchy between the Western Scientific knowledge and indigenous knowledges? Why?
14. Do you think that those who possess indigenous knowledge possess power to influence what is done with their knowledge?
15. Have indigenous values and world views been overrun or worked over by colonial and epistemic imposition? How? (What should be done to reverse the situation?)
16. Is there anything else you would like to say regards indigenous knowledges in science?

Appendix B: Interview Guide for Student teachers

Background questions for Students teachers:

1. Name:

2. Age:

3. Sex:

3. Year of Study:

5. Tribe:

6. Position of responsibility in the institution:

Interview Questions:

1. What in your view are indigenous knowledges?
2. What are some of the examples of indigenous knowledges found in the province?
3. Why is it important to learn indigenous knowledges?
4. To what extent are indigenous knowledges present in the Integrated Science lessons?
5. What are some of the challenges in learning indigenous knowledges in science education, if any?
6. What can be done to solve those challenges?
7. Do you have any suggestions on how indigenous knowledges content in integrated science syllabus could be improved?

8. What aspects of indigenous knowledges should be included in the integrated Science curriculum?
9. What are the lecturers' perceived attitudes towards learning indigenous knowledges in science? Do they appreciate it? What makes you say so?
10. How is it necessary to learn indigenous knowledges in schools in this age of globalization?
11. What are some of your experiences of being taught and examined about an alien world view? What are the effects?
12. How do the teaching/ learning of indigenous education help in the construction of one's identity? What are your experiences?
13. Is there anything else you would like to say regards indigenous knowledges in science?

Appendix C: Focus Group Discussion Guide for Student teachers

Curriculum 2013 states that,

> In making the curriculum flexible and responsive to learner and societal needs, institutions of learning, teachers and teacher-educators are encouraged at all levels of our education system to localise some aspects of the school curriculum. The localisation of the school curriculum will allow schools to adapt aspects of the curriculum to match local needs and circumstances. In this way, the curriculum will provide some compensation for the indigenous knowledge, values and practical skills that learners would have acquired in their home environment if they had not been attending school, (MOE, 2013:15).

1) How is this being implemented at the college of education?
2) What tangible or noticeable examples of some of the aspects of the curriculum that have been localized?
3) Are there any challenges? What are some of them?
4) How best could these challenges be resolved?
5) What examining body exams colleges of education?
6) How does the examining body ensure that the localized curriculum is examined?

7) To what extent is this aspect of the curriculum being implemented in science?

Serpell (1993) establishes that, when a school curriculum is designed in a manner which is alien to the assumptions informing other socialisation practices to which the students have been exposed, inconsistencies are liable to arise between the goals of the curriculum and the cultural goals of the social group. And that the greater the degree of alienation between the culture of the child's socialisation at home, and the culture of schooling, the greater the resulting discrepancy between their goals.

1) How does the dis/regard for indigenous knowledges impact on the academic performance of learners?
2) How is it necessary to learn/teach indigenous knowledges in schools in this age of globalization?
3) Are you satisfied with the way you are taught indigenous knowledge in science? Do you have any suggestions about how best this could be done?
4) What aspects of Indigenous Knowledges should be done away with and which ones should be preserved?
5) What aspects of indigenous knowledge should be included in the integrated Science curriculum
6) How are student teachers prepared or equipped to go and integrate indigenous knowledges in science in schools?

Appendix D: Consent Correspondences

OSLO AND AKERSHUS
UNIVERSITY COLLEGE
OF APPLIED SCIENCES

To Whom it May Concern

Date: 5. April 2016 **Executive officer:** Kaja K. Ahlgreen

FACILITATE IN THE CONDUCTION OF FIELDWORK

This is to confirm that the student, KATONGA. H, born 01.02.75 is a student at the Master's programme in Multicultural and International Education at the Faculty of Education and International Studies at Oslo and Akershus University College of Applied Sciences, Norway.

In the second year our students are required to write a Master thesis of approximately 100 pages. The Master's thesis should preferably be based on field studies. The fieldwork may incorporate interviews with educational practitioners and decision-makers, class-room observations and documentary analysis. The type of data gathered should of course be discussed with the relevant authorities.

We kindly ask you to give Mr/Ms KATONGA. H, all possible assistance during her fieldwork in ZAMBIA

Yours sincerely

Ellen Carm
Associate Professor
Section head:
Master in International and Multicultural Education
Oslo and Akershus University College

Kaja K. Ahlgreen
Executive Officer

Faculty of Education and International studies
Postboks. 4 St. Olavs plass, 0130 OSLO
www.hioa.no

Harrison Katonga,
Jiundu Secondary School,
Box 11o319,
Solwezi.

19th July, 2016

The Provincial Education Officer,
Northwestern Province,
Box 110098,
Solwezi.

Dear Sir,

RE: Permission to Undertake Research at Solwezi College of Education:

Harrison Katonga TS 074047

With reference to the above, I wish to seek permission to conduct research at Solwezi College of Education preferably in September.

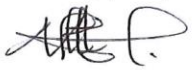
I am currently a Master's student in Multicultural and International Education at Oslo and Akershus University College of Applied Sciences in Norway. My research title is: *Teacher Education and Indigenous Epistemological Discourse in Integrated Science: The case of a College of Education in Zambia.* The aim is to explore to what extent the teacher education integrated science course addresses Indigenous epistemological discourse in Zambia. The research is supervised by Ellen Carm a professor in the faculty of International Education Studies.

I plan to employ four techniques of data collection namely; analysis of documents (Policy documents, curriculum, syllabus, text books), one on one interviews with lecturers and student teachers, lesson observations, and focus group interviews. The data to be collected shall exclusively be for research purpose and confidentiality and anonymity of research participants will be highly protected.

It is hoped that this study will help in giving a renewed attention to the teaching and learning of indigenous knowledges and maybe beneficial in Zambia's educational reform process.

Your positive and timely response will be highly appreciated. Attached is an introductory letter from my supervisor.

Faithfully yours,



Harrison Katonga Cell: 0968 382996 or 0977 285628

To The Provincial Education Officer
And not Individuals.
Telephone: 821037 / 821038 / 821363 / 821386 / 821672
Telegrams: PROVED SOLWEZI

In reply please quote: .....

REPUBLIC OF ZAMBIA
MINISTRY OF GENERAL EDUCATION

OFFICE OF THE PROVINCIAL EDUCATION OFFICER
P.O. Box 110098
SOLWEZI

25th August, 2016

REPUBLIC OF ZAMBIA
MINISTRY OF EDUCATION
SOLWEZI COLLEGE OF EDUCATION
19 SEP 2016

V.P ⇒ HOS
Science
Lets assist him carry out his research
HOS Principal

The Principal
Solwezi College of Education
SOLWEZI

RE: INTRODUCTORY LETTER

The bearer of this letter Mr. Harrison Katonga TS. 074047 is an employee of the Ministry of General Education at Jiundu Secondary School. He is currently pursuing post graduate studies in Norway at OSLO and Akershus University College of Applied Sciences.

He has been permitted to conduct research in your institution as a requirement for fulfilment of the programme.

Kindly assist him accordingly.

Stephen Chishiko
PROVINCIAL EDUCATION OFFICER
NORTH WESTERN PROVINCE

/jw

List of Figures: Map of North-Western (Zambia)

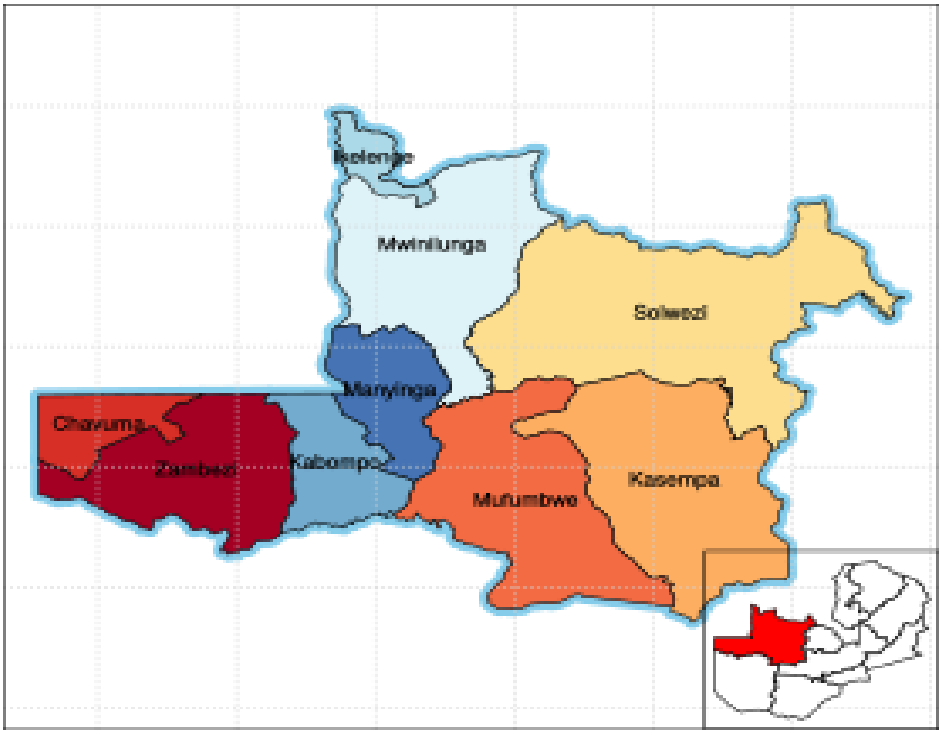


Figure 1(Source: (On line) https://www.google.com/imgres)