IMPACT OF KANURI LANGUAGE ON PERFORMANCE AND RETENTION OF BASIC SCIENCE AND TECHNOLOGY CONCEPTS AMONG PUPILS IN MAIDUGURI METROPOLIS, NIGERIA

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ZARIA – NIGERIA

AUGUST, 2016

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A DISSERTATION SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES, AHMADU BELLO UNIVERSITY, ZARIA, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTERS DEGREE IN SCIENCE EDUCATION

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AUGUST, 2016

DECLARATION

I hereby declare that the work in this dissertation titled Impact of Kanuri Language on Performance and Retention of Basic Science and Technology Concepts among Pupils in Maiduguri Metropolis, Nigeria, was carried out by me in the Department of Science Education. The information derived from the literature has been duly acknowledged in the work and a list of references provided. No part of this dissertation was previously presented for another degree in this or any other institution.

_____ _____

Fati Ali MAINA Date

CERTIFICATION

This dissertation entitled "IMPACT OF KANURI LANGUAGE ON PERFORMANCE AND RETENTION OF BASIC SCIENCE AND TECHNOLOGY CONCEPTS AMONG PUPILS IN MAIDUGURI METROPOLIS, NIGERIA" by Fati Ali MAINA meets the regulations governing the award of Masters Degree in Science Education of the Ahmadu Bello University, Zaria, and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

I dedicate this dissertation to my:

- Late grandmother, Hajjia Hadiza (Yakurku), who was my anchor in stormy sea when no other anchors were available.
- Three lovely daughters Khadijat (Ummi), Hajara (Ammi) and Ismat (Isi Baby).
- My husband, Alhaji Babagana Muhammad Mustapha

ACKNOWLEDGEMENTS

No scholarly effort of any magnitude, in particular, a supervised scholarly effort, can be the outcome of any one individual, no matter how talented. This work is no exception. I therefore, owe depts. Of gratitude to many people who played various roles in completing this work. The large number of people who rendered vital help makes it impossible for me to name them all, but I owe a special debt of gratitude to the following people:

My two supervisors, Dr. F.K. Lawal and Dr. S.S. Obeka, for their unmatched kindness, illuminating wisdom and a degree of support and tolerance that far exceeded anything I could have ever dared hope for. They read and re-read numerous drafts of not just the completed dissertation, but every chapter submitted several times over without once showing any hint of boredom or frustration. Their energetic and unflagging support during the entire gamut of this work from conception to completion is nothing if not miraculous. The comfort and support they gave me, especially during my most challenging health crisis, gave me the strength and inspiration to see this vital work through. Without their generous and unstinting support and encouragement I cannot imagine how this work would have been completed. Their deeply insightful guiding comments have regularly turned what were initially drab pieces of drafts into dignified and worthy pieces of scholarly efforts.

In the Faculty of Education at the Ahmadu Bello University, Zaria are some of the best scholars in the country, passing through them is the most enriching experience any student could ever hope for. I wish to acknowledge Dr. S.B. Olorukooba, Dr. B. Abdulkarim,, Prof. Isa Usman, Dr. J.O. Olajide, the Late Mallam Garba Ladan, Dr. M.A. Lakpini and Dr. M. Atadoga's quality support and guidance in writing this dissertation.

I also wish to acknowledge my debt of gratitude to the pupils and teachers of Innovative Model Primary School and Ruby Model Primary School, the selected schools for this study, for graciously participating in the study. I especially wish to express my gratitude to the teachers and proprietors of these schools for allowing me to interrupt their normal routines in order to allow me to conduct the studies.

My friend, Mallam Adamu Gabasa, in the Borno State Polytechnic, Maiduguri, has been most helpful in assisting me to administer the instruments used in data collection. His contributions in this regard and in looking through my data analysis, offering useful comments, are immensely appreciated.

I owe a debt of gratitude to the authorities of Sir Kashim Ibrahim College of Education, Maiduguri and the Borno State Government for allowing and supporting me to

pursue this study. Their support and patience have been vital in allowing me to pursue and complete this work. In particular, I wish to acknowledge the support and kindness of the Provost of the College for allowing an extended time to enable me complete this work.

I have wonderful friends and colleagues in Kashim Ibrahim College of Education, Maiduguri, my work place, whose encouragement and good cheer have been crucial to completing this work. I especially wish to acknowledge the friendship and support of Mallama Hauwa Aliyu, Muhammad Ngamdu, and Mallam Balarabe for their invaluable support.

My colleagues with whom we shared many happy learning experiences together for the better part of 2009 and 2010, while doing the course work as part of the requirements for award of the Masters Degree, have lighted up my stay in Ahmadu Bello University, Zaria. They have all made our time together exceptionally pleasant and rewarding. Among them, one has been privileged to make friends for life.

I especially wish to acknowledge my friend Na'ima Sulaiman Lawal and Ya'u Ahmed, Mutum Y. Anderson, Ayuba Luka Sani, Danjuma Alhaji and Hadiza Umar Dalhatu, whose warmth, vivacity and generous disposition has made my stay at the ABU a most pleasing experience.

While acknowledging and crediting these wonderful people's contribution to this work, especially, my wondrous supervisors, I wish to state that any errors that remain are entirely mine and mine alone. Thank you and God bless you all.

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OPERATIONAL DEFINITION OF TERMS

The following are the definitions of the terms as used in this study:

Mother Tongue: This refers to the target language that is spoken by the parents of the child which is variously called, the "home language", "the first language", "preferred language", "native language", "heritage language" and sometimes the "best language", for the purpose of this study, the term mother tongue is used and when used it includes all those elements.

Medium of Instruction: A way of communicating information (medium, something used for particular purpose). Channel or instrument or tool or device used for a particular task. In this particular instance, language is the tool for imparting knowledge.

Kanuri Language: the Language spoken by the Kanuri people who are the major ethnic and linguistic group in Borno and Yobe States in Nigeria. They also form a sizeable ethnic group in Nasarawa, Jigawa, and Adamawa States. They are a major ethnic group in the nations of Tchad, Niger and Cameroon, being the component units of the ancient Kanem-Borno Empire.

Demonstration Method: An act of showing or explaining how something works or is done. This means showing by reason or proof, explaining or making clear by use of examples or experiment.

Retention: The action of keeping something rather than losing it or stopping it. The ability to remember/recall things in the mind, especially, the preservation of the after effects of experiences and learning that makes recall or recognition possible.

Academic Performance: Is the outcome of education – the extent to which a student, teacher or institution has achieved their educational goal. It is usually measured by examinations, tests, continuous assessments.

LIST OF ABBREVIATIONS

A.D: Anno Domini

ANOVA: Analysis of Variance

BCE: Before Christian Era

BSTPET: Basic Science and Technology Performance Test

CG: Control Group

CGPA: Cumulative Grade Average Point

EG: Experimental Group

EEG: English English Group

FME: Federal Ministry of Education

GPA: Grade Point Average

GSSE: General Secondary School Examination (UK)

IQ: Intelligence Quotient

LI: First Language

LOLT: Language of Learning and Teaching

MCQ: Multiple Choice Questions

MOI: Medium Instruction

NCCE: National Commission for Colleges of Education

OECD: Organization for Economic Co-operation and Development

SAT-M: Scholastic Aptitude Test

SIL UK: Summer Institute of Linguistics United Kingdom

SYPP: Six-Year Primary Project

UBE: Universal Basic Education

UNESCO: United Nations Educational Scientific and Cultural Organization

USAID: United States Agency for International Development

TIMSS: Trends International Mathematics and Science Study

YEG: Yoruba English Group

YLSTQ: Yoruba Language Science Teaching Questionnaire

ZPD: Zone of Proximal Development

ABSTRACT

This research compared the performance of primary pupils in the class five after teaching using Kanuri and English languages to teach lower Basic Science and Technology Concepts among pupils in Maiduguri Metropolis, Nigeria. It explored the impact of using the learners' mother tongue (Kanuri) and second language (English) as languages for teaching and learning science at the lower Basic Science and Technology class. The study additionally explores the influence of gender on academic performance of pupils when taught in their mother tongue. The population from which the sample for this study was drawn are primary five pupils of the five model primary schools in Maiduguri Metropolis with a total population of 2371 pupils. Two model primary schools were purposively sampled on their suitability for the study. The sample size is 95 primary five pupils in the selected schools made up of 55 boys and 40 girls. The research design is quasi-experimental. For data collection, Basic Science and Technology Achievement Test (BSTAT) was used. A pretest, post-test, post-posttest was carried out to determine the level of achievement and retention after teaching using Kanuri Language and English. Four research questions and four research hypotheses were stated and tested. The hypotheses formulated tested whether Kanuri and English, as media of instruction, and gender have impact on academic performance and retention when Basic Science and Technology concepts are taught to primary five pupils in the study area. The hypotheses were tested using t-test of significance at $P \leq 0.05$. The research findings showed, among others, that pupils performed better and had higher retention when taught concepts in Basic Science and Technology using Kanuri language than when taught using English language. The study also showed that gender has no impact on performance and retention when pupils were taught the same concepts of Basic Science and Technology in Kanuri. The study recommends that Kanuri should be adopted as the language of instruction at lower basic levels for teaching Basic Science and Technology in the area of this study, since it is the local language of the area. It also recommends for the training of teachers and the development of suitable teaching resources to create the enabling environment for learning to take place effectively.

CHAPTER ONE

THE PROBLEM

1.1 Introduction

Language is one of the most effective means of communication at any level by man. It is also a channel through which culture is passed from one generation to another and serves as a tool for instruction. According to Adeyebe and Nwodobi (1991), language is a means by which thoughts, ideas and knowledge are passed from one person to another in written or oral forms. The target language that is spoken by the parents of the child is variously called the mother tongue of the child, the first language or (L1), the vernacular etc., of the child.

According to International Opinion on Language Issues - Mother Tongue is the key to Education Knowledge, Science, and Learning *(http://www.antiessays.com/ International-Opinion-On-Language-Mother-695782.html).* Mother tongue plays tremendously useful role in the education of child, as it has great importance in the field of education such as:

- Medium of Expression and Communication and formation of social groups: Mother tongue is the best medium for the expression of one's ideas and feelings and formation of social groups
- Easy to Learn: best medium for acquiring knowledge: Of all the languages, the mother-tongue is the most easy to learn, facilitating thinking, as an instrument of acquiring knowledge, therefore, training in the use of mother-tongue, the tongue in which a child thinks and dreams, becomes the first essential of schooling and the finest instrument of human culture (Ballard, 1941).
- It brings about Intellectual Development: Intellectual development is impossible without language. Reading, expressing of oneself, acquisition of

knowledge and reasoning are the instruments for bringing about intellectual development; and all of these are possible only through language, most especially, the mother-tongue of the child.

The above constitute only a few among a broad range of the application of mother tongue in education.Therefore, the mother tongue must be given an important and prominent place in the school curriculum. This may be why many nations, such as China, Japan, Russia, India, the Arab Nations, etc., have achieved such huge technological and scientific advances on their own using the mother tongue as their thrust engines.

Science as a concept is a process that is geared towards problem solving in order to enhance the living standard of man. Nwagbo (2005) defines science as intellectual activity carried out by man and designed to discover information about the natural world in which he lives as well as to discover the ways in which the information can be organized to benefit the human race. Some scholars consider science as a body of organized knowledge and a process of acquiring knowledge (Jegede & Brown 1980). They further view science as a work of man trying to explain the happenings of the world around him and how such can be harnessed for the benefit of mankind. Shaibu (1992) sees science as a complex human activity that culminates in the production of body of universal statements which serve to explain the observable behaviour of the universe or part of it. From these observations, science could be seen as a discipline of enquiry or systematic study of phenomenon that can be examined, tested and verified. From earlier beginning, science has developed into one of the greatest and most influential fields of human endeavour. Similarly, the Microsoft Encarta Reference Library (2005) defines science to consist of the systematic observation of natural events and conditions in order to discover

facts about them and to formulate laws and principles based on these facts andorganizethe body of knowledge that is derived from such observations that can be verified or tested by further investigation.

From these definitions, science can be seen as not just a mere acquisition of facts but rather the active involvement of pupils through activity–based methods such as, demonstration method, discussion method, project method, fieldtrip method, discovery method, etc. These teaching methods along with a good language for communication make the teaching and learning of science more meaningful in such a way that pupils would be able to unfold concepts by themselves as a means of achieving one of the objectives of the National Policy on Education, (FME, 2004). Students' interest in science should, therefore, be aroused at the primary school level by teaching them using a language they can comprehend. This will give them a good understanding of the subject and as such prepare them for further studies in science courses at the secondary school level. Okoronka (2004) asserted that science is instrumental to technological and socio-economic growth across the globe. Oludipe, (2003) argues that science occupies unique position among other subjects because of the numerous applications to which its concepts are being put to improve man's environment. The teaching of science should, therefore, reflect the processes and methods of modern science, which could enhance technological development. According to Hermann (2005), the effectiveness of teaching any subject could be measured in terms of the knowledge of what to teach, how to teach it and when to teach it. The "how" of teaching constitutes what is called teaching method. That is why National Commission for Colleges of Education, NCCE, (2002) stated that teachers should use several methods of teaching when effective teaching and learning is desired. The language used is equally important, as no proper communicationcan be

made where language used is difficult for learner to understand. The fundamental significance of science in the pursuit and development of knowledge justify its inclusion in the lower and middle basic education curriculum.

Basic education is defined as the education given in an institution to children aged 6-11 years. In Nigeria today the current 9-3-4 system of education, the Basic Education is the first nine (9) years in school from primary 1to JSS 3. Of the first nine years the first three years of schooling is calssifeid as the Lower Basic, the next three years is further classified as the Middle Basic and the JSS 1-3 is classified as the Upper Basic. The major objectives of the Basic Education as documented in the Universal Basic Education (UBE) include among others, ensuring unfettered access to nine (9) years of formal basic education for every Nigerian child of school going age, drastically reducing the incidence of drop-outs from the formal school system through improved relevance, quality and efficiency; and acquisition of appropriate levels of literarcy, numeracy, manipulative, communicative and life-skills as well as ethical, moral and civic values for laying a solid foundation for life-long learning.

Science is taught at the lower and middle basic levels as Basic Science and Technology and later at the Upper Basic (Junior Secondary) School level separated into Basic Science and Basic Technology, and then taught as separate subjects. Jegede & Brown (1980) observed that "it has become necessary to teach science right from primary school". They further advanced the following reasons why learning of science is inevitable at the primary level using Nigeria languages some of these reasons include:-

- Changes that are affecting the life style of an average Nigerian;
- The massive number of primary school drop-outs, who may have only that opportunity to come into contact with science.

- Scientific development and national development go hand in hand; hence the teaching of science at the lower and middle levels will help in the achievement of national objective.

In view of these reasons, Basic Science and Technology has been made a core subject in the National Curriculum for all Nigerian pupils. Every child is thus expected to have some level of learning of science before completing primary school (Isyaku, 2009). Harlen (1992) also provided additional justification for the inclusion of Basic Science in the school curriculum when she cited the UNESCO Report (1983) on the incorporation of science and technology in the primary school curriculum as follows:

- Science can help children to think in a logical way about everyday events and solve simple practical problems as such intellectual skills will be valuable to them wherever they live and whatever job they do.
- Science and its applications in technology can help to improve the quality of people's lives. Science and Technology are socially useful activities with which we would expect young children to become familiar.
- As the world is increasingly becoming more scientifically and technologically oriented, it is important that future citizens should be equipped to live in it.
- Science if well taught can promote children's intellectual development.
- Science can positively assist children in other subject areas, especially language and mathematics.
- Middle basic school is terminal for many pupils and this is the only opportunity they may have to explore their environment logically and systematically. "Terminal" in the sense defined by Fafunwa and Bliss (1976), Jegede and Brown (1980) who pointed out that for many pupils,

primaryschooling is terminal in the sense that the pupils are unable to continue beyond this point due to ill-health, inability to pay tuition fees, and other multifarious reasons. For such the knowledge of science they acquire at the primary level remain usefull to them in their future endevour.

Basic Science and Technology at the lower and middle basic school can be real fun as children everywhere are intrigued by simple problems, either contrived or real ones from the world around them. If science teaching can focus on such problems, exploring ways to capture children's interest through the use of language they understand very well i.e. "catch them young", no subject can be more appealing or exciting to these young children than Science and Technology. Helen (1992) further asserts that, children's ideas of the world around them are being built up during the primary years and that the development of concepts and knowledge is not independent of the development of intellectual skills; unless children are helped to expand their ways of gathering and processing information through the use of language they understand "scientific approach" may be difficult to achieve. Children's attitudes to science are formed earlier than are their attitudes to most other subjects. This study thus intends to teach the concepts of soap making and its uses in Basic Science and Technology to primary five pupils using Kanuri language as medium of instruction. The aim is to determine whether the use of Kanuri language, the mother tongue of the pupils in the area of study would aid performance as well as retention among the pupils.

Performance is a measure of the outcome of education ie the extent to wich a student has achieved the educational set goals. According to Ward et al (1996), academic performance is the outcome of education-the extent to which a student, teacher or institution has achieved their educational goals. That academic

performance is usually measured by examinations or continuous assessment, but that there is no general agreement on how it is best tested or which aspects are most important-procedural knowledge, such as skills or declarative knowledge such as facts. In the context of this study, academic performance is the ability of the learner to undertake an academic task successfully using his or her own knowledge and skill to meet the standard expectation formally set by the teacher, or by other appropriate performance measuring authorities.

The overall poor academic performance in science among primary school pupils raises doubt as to the efficacy of the teaching methods as well as the medium of instruction used by teachers to impart knowledge (Eta, 2000). The achievement momentum of pupils in the classroom teaching and learning of science varies according to certain factors such as: pupils' background, teaching method, etc. and the child's developmental level in terms of chronological and cognitive maturity. Such variations lead to labeling pupils as "under-achievers" (limited learners), "slow learners" and "dropouts", all being descriptions of weak and low ability groups, and the "talented" generalized as high-ability group (Oxenhorne, 1992; Ali, 1998; Nkwo, 2003).

This current movement towards the direction of low achievement in science learning could likely suggest that tomorrow's scientist may be bereft of techno-science competencies required for further development. From examination records from the schools for the past four years (4 years), the science subjects' results were generally poor. The reasons identified for those anomalies by the head teachers and subject teachers include factors such as lack of infrastructure and suitable environment, shortage of qualified teachers, the perception of science by learners as very difficult subject, lack of opportunity for the learners to have direct experience

with learning materials and most fundamentally, the instructional medium used in teaching basic science. Of these factors, the most related one to this study is the factor of instructional medium (Ali, 1998; Nkwo, 2003).

Iroham (1991) observed that the present method of teaching science whereby teachers use lecture method does not in any way provide for sequence of learning experiences. Lecture method is a method of teaching in which the teacher delivers pre-planned lesson to pupils with little or no instructional aides. In using this method, the teacher talks about science while the pupils read about it, (Gbamanja, 1991). Lecture method, traditionally referred to as didactic approach, is defined as a technique in which a person, usually the teacher, presents a spoken discourse on a particular subject (Atadoga & Onaolapo, 2008). Lecture is used to elaborate; simplify, clarify and discuss new materials to learners .The materials may include facts or views on issues and problems related to the learners, which provide an aesthetically stimulating experience. Effectiveness of lecture method depends on the type of the learner, circumstances of the class, the subject, educational purposes and the teacher's own characteristics and skills. According to Adesoji (2009), many academics have accepted lecture methods as a proper way of imparting knowledge since our educational system puts so many premiums on external examinations. This, however, is a detriment to pupils' learning, since one of the objectives of science education is to develop pupils' interest in science and technology as today's society depends largely on development in science and technology. The teaching and learning of science concepts should, therefore, be done using teaching methods that are activity-oriented such as discussion method, demonstration method, project method etc. (Okebukola, 1997, 2004). Demonstration method will be used in this study to teach both experimental and control groups.

Demonstration method: means showing by reason or proof, explaining or making clear by use of example or experiment. In teaching through demonstration, pupils are set up to potentially conceptualize class material more effectively because it is learner-centered. Demonstration method often occurs when learners have a hard time connecting theories to actual practice or when learners are unable to understand application of theories. Science educators like Jegede and Taylor (1998), Okebukola (2002), Tsui and Treagust (2002) revealed that teaching methods are activity-oriented which involve the learners taking active roles in the teaching/learning process that results in meaningful learning of science concepts. However, teachers in schools resort to the use of lecture method which, as several studies pointed out, only encourages rote learning and as such does not enhance academic performance and positive attitude towards science among both male and female pupils (James, 2000; Usman, 2000; Bichi, 2002). Therefore, in this study the influence of Kanuri Language as medium of instruction was used to see whether their academicperformance and retention level could be enhanced using demonstration method as instructional strategy.

Retention, is the ability to keep learnt things in the mind, especially, the preservation of the aftereffects of experience and learning that makes recall or recognition possible. Retention is one of the variables tested in this study. This is to determine whether using Kanuri language as a medium of instruction to teach the concept of soap making would aid learnig.

Gender, another important variable of concern in science education is the issue of gender-related differences in performance. The findings of science educators have revealed under-representation of girls in science, mathematics and technical subjects at both primary/secondary school levels (Yoloye, 1994 & Fakorede, 1999). In

addition to under representation is also the under achievement of girls in science and science related courses, Lieberrnan (1998), James (2000), while Nwosu (2001) stated that there was no gender difference in their performance in science. This study was carried out to find out the influence of Kanuri Language as a medium of instruction on academic performance and retention among lower basic pupils in Basic Science and Technology. The study also attempted to find out the impact of gender on academic performance and retention in Science and Technology, when the concept of soap making was taught using Kanuri language as medium of instruction.

Some science educators like Ivowi (1983), Adeyebe (1991) and Otuka (2006) considered that in a teaching-learning situation, language is central to communicating ideas. These studies revealed that students' achievements in science are retarded in understanding scientific concepts, laws, theories and formulae if the means of communication is defective. They unanimously reported that a child could internalize any given own language or any language of the immediate environment which he is familiar with. This view is supported by Bruner (1979), who argued that, a language that you have never been happy in, never been angry in, never made love in, cannot be advocated for the a child. Atadoga, (2007), argued that the child's mother tongue or language of his immediate environment is the best and most effective language to give him meaningful instruction. Rabiu (2000) also argued that the first year of the child's experiences with science is crucial as it can affect the child's attitude to science for the rest of his/her life. If a child does not have satisfactory understanding of the basic concepts taught in primary school, he/she may find it difficult to assimilate further concepts appropriately. The primary school teachers shoulderthe responsibility of producing children who also have well-formed basic concepts and who are able to use these basic concepts to further their knowledge in science. In

order to achieve these, the teachers must have a good understanding of the concepts to be taught, as well as being able to communicate these concepts to the child in a language that would aid understanding. The teacher must aid the learner to understand as well as apply these concepts to develop further concepts. According to Rabiu (2000), use of language of the immediate environment of the learner aids learning. The language of the immediate environment of the learner is usually the mother tongue of the learner. In the same vein Fafunwa (1990) and Atadoga (2007) have shown that mother tongue aided learning as concepts in science are easily assimilated.

This study therefore used demonstration strategy to teach the concept of soap making to primary pupils using Kanuri and English language as media of instruction, to determine the effects of these media on performance and retention of the the science concept taught.

1.1.1 Theoretical Framework

The study is premised on the cognitive theory of learning especially as propounded by Bruner (1966) and Vygotsky's (1978) socio-cultural theory. Bruner's theoretical framework is premised on the theme that learners construct new ideas or concepts based upon existing knowledge. Learning is an active process. Facets of the process include selection and transformation, decision making, generating hypotheses and making meaning from information and experiences. Bruner's theories emphasize the significance of categorization in learning. He posits that "to perceive is to categorize, to conceptualize is to categorise, to learn is to form categories, to make decisions is to categorise". Therefore, interpreting information and experiences by similarities and differences is a key concept. Bruner, early in his works introduced the ideas of readiness for learning and more importantly the "the spiral curriculum". Bruner believed that any subject could be taught at any stage of development in a way

that fit the child's cognitive abilities. Spiral curriculum refers to the idea of revisiting basic ideas over and over, building upon them and elaborating to the level of full understanding and mastery. It is his assertion that any subject could be taught any child in a way that fits the child's cognitivedevelopment that Bruner significantly departs from Piaget. He posits that development is continuous process not a series of stages. Bruner states that, the development of language is a cause not a consequence of cognitive development.

There are four features of Bruner's theory of instruction, namely, predisposition *to* learn*:* this feature specifically states the experiences of which move the learner toward a love of learning in general, or of learning something in particular. Motivational, cultural, and personal factors contribute to this. Bruner emphasized social factors and early teachers and parents' influence on this. He believed learning and problem solving emerged out of exploration. Part of the task of the teacher is to maintain and direct a child's spontaneous explorations. The second is the structure of knowledge*:* it is possible to structure knowledge in a way that enables the learner to most readily grasp the information. This, he realizes is a relative feature, as there are many ways to structure a body of knowledge and many preferences among learners. Understanding the fundamental structure of a subject makes it more comprehensible. Details are better retained when placed within the context of an ordered and structured pattern.The discrepancy between beginning and advanced knowledge in a subject area is diminished when instruction centres on a structure and principles of orientation. This means that a body of knowledge must be in a simple enough form for the learner to understand it and it must be in the form recognizable to the student's experience. The modes *of* representationis and visual, words and symbols the next.The last is effective sequencing- no one sequencing will fit every learner, but in general,

increasing difficulty. Sequencing or the lack of it can make learning easier or more difficult. Bruner also postulated three stages of intellectual development: the first stage he termed *"*enactive" when a person learns about the world through actions on physical objects and outcomes of these actions. The second stage he termed *"*iconic*"* where learning can be obtained through using models and pictures. The third and final stage he termed *"*symbolic*"* in which the learner develops the capacity to think in abstract terms. Based in this three- stage action, Bruner recommended using a combination of concrete, pictorial and then symbolic activities will lead to more effective learning. Some of the significant implications of Bruner's theory for learning process are that instruction must be appropriate to the level of the learners. For example, being aware of the learners' learning modes (enactive, iconic, and symbolic) will help the teacher to plan and prepare appropriate materials for instruction according to the difficulty that matches the learners' level. Teachers must revisit materials. Building on pre-taught ideas to grasp the full formal concept is of paramount importance. In other words, in line with the principle of "spiral curriculum", the teacher is at liberty to re-introduce vocabulary, points of grammar, and other topics now and then in order to push students to deeper comprehension and longer retention. In addition, materials must be presented in a sequence giving learner the opportunity to transform and transfer his learning. Teachers should assist learners in building knowledge, as in providing a scaffold; this assistance should fade away as it becomes unnecessary.

Vygotsky's sociocultural theory perceives language as a tool for developing thoughts, and believes that all learning is social; it also takes into consideration the role of social interaction in learning and development. Schrum &Glisan, (2000), opine that, socio-cultural theory sees learning and development as cognitive and social

processes that occur as a result of interaction between "experts" (more capable) and "novices" (less capable). In the context of our study, the experts are the teachers and the novices are the learners who have to be assisted to get to a higher level of development by means of interaction through language. For effective learning to take place collaborative interaction between the expert and novice is necessary.

There are three concepts involved in learning in the socio-cultural theory, namely, the Zone of Proximal Development (ZPD), mediation and scaffolding and scientific concepts (Freeman &Freeman, 1994; Schrum & Glisan, 2000).

Vygotsky's Zone of Proximal Development (ZPD) assumes that the learner brings two levels of development to the learning task: (1) what the learner can do or the actual developmental level, (2) what the learner should be able to do in the future or potential developmental level. As the learner interacts with others, he /she progresses from the actual developmental level to the potential developmental level. The distance between these two developmental levels is referred to as the Zone of Proximal Development (Nomlomo, 2007).

For learning to take place, instruction must occur in the learner's ZPD (Freeman & Freeman, 1994). In other words, the learner must be guided by an adult, the teacher in this case, to reach his/her potential developmental level. The ZPD or the learner's attainment of his potential level has implications for the teaching approaches that the teacher employs in the lessons, as well as the kind of interactions that occur in the classroom between the teacher and the learner, and between the learner and his peers. Schrum & Glisan (2000), see problem-solving under the teacher's guidance (or parent or more capable peer) as one of the effective strategies of achieving the ZPD. Collaborative or interactive learning in the form of group work is also essential as children learn from each other. Ohta, (2000), opined that effectiveness in the ZPD

depends on a number of factors such as the expertise of the helper, the nature of the task, the goal of the task, and the developmental level of learner. For instance, if the helper is not more knowledgeable than the learner, (e.g. i+1), or the task is too easy, or there is too much resistance, the development of the learner may be negatively affected.

Within the socio-cultural paradigm, learners make sense of the world around them by means of certain tools. Such tools include the language used in social interaction, visual materials, learning activities, direct instruction or teacher assistance, etc. These tools mediate between the learner and the world. In simple terms, mediation can be defined as a way of assisting the learner to make sense of what is being learned by making use of various tools. Therefore, the influence of Kanuri Language as medium of instruction in teaching Science and Technology will give support for pupils to strengthen connections between new concept and prior ones, and build up their knowledge of Science hence perform better. Based on these it is assumed that Kanuri Language as a medium of instruction will assist learners to form their own concepts and consequently enhance academic achievement and retention in Science.

1.2 Statement of the Problem

The use of English as the language of classroom instruction has become significant, especially, in the third-world countries such as Indonesia, Malaysia, and some African countries like Kenya, South Africa, Egypt, etc., Bilingual schools exist incorporating the use of English and National language in the teaching and learning environment especially in mathematics and sciences. Bilingual education is defined as "the use of two (or more) languages of instruction at some point in a student's

teaching and learning environment which facilitates positive impact on future career of learners for national development; this is lacking in Nigeria" (Lai and Law, 2010).

The concepts of Basic Science and Technology taught in English language at the lower basic level in Nigerian schools seem to be difficult to be understood by the pupils since most of the science concepts are abstract. Ishaku (2009) has identified several factors standing against the successful learning of Science at the lower basic school level; among the major factors identified was the use of foreign language as medium of instruction at that level. In Nigeria, Basic Science and Technology is still being taught in a foreign language (English) at the lower basic class level. Ishaku (2009) stated that pupils are finding it increasingly difficult to comprehend Science and Technology at lower basic class level which contributes to the massive failure in the subject as a result of weak foundation at the lower basic class level. In some countries like Russia, Bangladesh, China and India etc., the language of instruction for the teaching of science has been their mother tongue. These countries have since become a force to reckon with in Science and Technology.

It is against this background, therefore, that this study intends to use Kanuri language, one of the prominent and popular languages of over four million Nigerians, as instructional medium to teach lower basic pupils the concepts of basic Science and Technology. This is to determine whether the use of the language will improve the pupils' academic achievement and retention span in the learning of the concepts.

The impact of gender on academic performance, which is another variable of this study, has been the subject of a very lively debate for long and it is far from being settled. While some studies indicate male superior academic performance over females (OECD, 2001; Young and Fisler, 2000; Mattox, 1997), other studies show the opposite (Fergusson and Horwood, 1997; Liu and Wang, 2005; Ismail and Othman,

2006). Another group of studies, on the other hand, show that gender has no effect on academic success (Abdu-Raheem, 2012; Kang'ahi et al, 2012; Afuwape and Oludipe, 2008; Berkant, 2009;Udousoro,2011; Ebenuwa-Okoh, 2010;Kano, 2004; and Okon, 2003).

This has necessitated the need to find out from our study if there is any difference in performance between male and female pupils when taught both in English and their mother tongue, Kanuri language.

1.3 Objectives of the Study

The study has the following objectives:

i) Determine the impact of Kanuri Language as a medium of instruction on academic achievement of primary five pupils taught soap making.

ii) Establish the differences between the academic achievement of male and female subjects when Kanuri Language is used as a medium of instruction to teach the concepts soap making in basic Science and Technology.

iii) Determine the retention ability among primary pupils taught basic Science and Technology using Kanuri Language and English language as media of instruction.

1.4 Research Questions

The following research questions are formulated to guide the study:

1. What is the difference in the academic achievement of pupils taught concepts of soap making in basic Science and Technology in Kanuri and those taught using English Language in the selected primary schools?

2. What is the difference between the academic achievement of boys and girls taught concept of soap making in basic Science and Technology using Kanuri Language as medium of instruction?
3. Is there any difference in the retention ability of pupils taught the concept of soap making in Basic Science and Technology using Kanuri Language and those taught using English language in the selected primary schools?
4. Is there any difference in the retention ability of boys and girls when taught the concept of soap making using Kanuri as the medium of instruction?

1.5 Hypotheses

The following null hypotheses are formulated for testing at$P \leq 0.05$ level of significance:

HO_1: There is no significant difference between the academic achievement of pupils taught concepts of soap making in basic Science and Technology using Kanuri Language and those taught using English Language.

HO_2: There is no significant difference between the academic achievement of boys and girls taught the concepts of soap making in basic science and Technology using Kanuri Language.

HO_3: There is no significant difference between the retention ability of pupils taught using Kanuri language and those taught using English Language as medium of instruction.

HO4: There is no significant difference between the retention ability of boys and girls taught using Kanuri Language as medium of instruction.

1.6 Significance of the Study

The findings of this study will redound to the benefit of society in the following ways:

- provide insight into the use of Kanuri language for the teaching of Basic Science and Technology as proposed by the National Policy on Education, as it empirically exposes the viability and efficacy of Kanuri Language (Mother Tongue) as medium of instruction in the teaching/learning of Basic Science and Technology in Borno State of Nigeria.
- bridge the research gap that exists in the use of Nigerian languages as media of instruction, as only few researches are reported to have been conducted using Kanuri Language as a medium of instruction in the teaching of basic Science and Technology in Borno State of Nigeria.
- help both educational planners and curriculum designers in making sound decisions, as the strengths and weaknesses of Kanuri language as medium of instruction will be revealed.
- help the school authorities, teachers and pupils to appreciate the mother tongue as an effective medium of instruction through which teaching and learning of science at the primary level can be done.
- be of help to science educators by opening up new vistas for more research into the use of other Nigerian languages as media of instruction at the primary levels.

Be of benefit since language of mother tongue increases the degree of students' interest; consequently students develop principles based on their observations, encourage enquiry and group work.

1.7 Basic Assumptions

In the course of this study the following assumptions are made:

- Pupils in the study area understand the Kanuri Language very well under the assumption that it is their mother tongue.
- Pupils at the middle basic levels of schools have been experiencing difficulties in understanding science concepts in English.
- Both boys and girls are capable of studying Basic Science and Technology in Kanuri language.

1.8 Scope of the Study

The study is restricted to finding the influence of Kanuri Language as medium of instruction on pupil's academic achievement and retention in the learning of the Basic Science and Technology. Two classes of lower basic five pupils of model schools in Maiduguri Metropolis will be used for the study. At that level, they are better exposed to the concepts in Science and Technology and are not preparing for the Common Entrance Exams. Model schools were chosen for the study because of the availability of science instructional materials, better equipped laboratories and trained teachers. The concept "Soap making" is also selected from the approved curriculum for Basic Science and Technology (2011).

The concept of soap making is chosen for several reasons:1) it is on the syllabus of the middle basic science course 2) the topic also falls within the time-frame of the study 3) soap making is a local industry in the pupils' local communities and is as old the local communities. It is also an economic activity that is widely practiced in the local communities the pupils come from. Their parents generally involve them in the process of soap-making although not in the formal and

systematized form that will take place in the science class setting. Therefore, it should not only be a fairly familiar concept but one which the pupils would have participated fairly regularly at home; no matter how marginally.

The rationale for selecting the topic “soap-making” in addition to the above stated reasons was because it is an activity that easily lends itself to practical teaching and demonstration in the classroom and has relevance to the pupils’ daily life; soap is locally made within the community, it is a pervasive item in the household as a general cleaning agentand item of trade within the community. It is a very familiar item, indeed.

The concepts in the curriculum would be strictly adhered to, which will later be broken into teachable units;

i) Definition of Soap
ii) Active ingredients used in making soap
iii) Procedures involved in soap making
iv) Uses of Soap.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter is a summary of the review of related literature for this study. The review has been categorized into the following subheadings and discussed as follows:

- Teaching and learning Basic Science and Technology at the middle basic level
- The History of Kanuri people of Kanem-Borno
- Importance of Language for Communication in Teaching and Learning
- Outcomes of National Languages for Teachers, Administrators and Parents
- Factors Affecting Gap Closure in National Language Programmes
- Impact on Students' Achievement in Science: English as the medium of instruction.
- Retention and its Value in Learning
- The Impact Of Gender On Academic Achievement
- Overview of Similar Studies on the use of Mother Tongue Instruction and Achievement in Science
- Implication of Literature Reviewed on the Present Study.

2.2 Teaching and Learning Basic Science and Technology at theMiddle Basic Level.

National language is an immediate language generally used for communication in an environment and Kanuri language is one such among the National languages in Nigeria. According to Thomas (2003), in the analysis of comparison between one-way and two-way instruction, schools were carefully matched and became similar in neighborhoods but low in percentage of socioeconomic backgrounds. Some students' outcome in dual language programs

from recent research (Thomas, 2003) is the experience of two rural school districts in Northern Maine, located at the border with Canada, very close to both French-speaking and English-speaking Canadian province. Over 90 percent of the students in these two districts are of Franco-American/Acadian national language. Their grandparents still speak French, but their parents were reprimanded for using French in schools and they came to view their variety of French language as a street Language not worthy of academic use. Given the economic downturn of the region with few job openings for young adults, some of the school board members proposed that they try a bilingual immersion program to develop the students' lost heritage or National Language. Their ultimate goal was to keep some of their young people in the region for economic revitalization, by developing businesses operated in both French and English languages. Approximately half of the parents chose for their children to be schooled in the two-way instruction schools with equal instructional time for the two languages. The other half of the students chose to remain in all-English instruction. Both groups were of similar background, socio-economically and ethno-linguistically. As found in the longitudinal findings, the bilingual schooled students benefited enormously from the schooling in two languages. After four years of the dual language program, former English learner who were achieving at a lower level before the program started had reached the higher level in English reading well above the minimum grade level.

According to Thomas (2003), the national language (French) has been in strong decline in their region, over the past half century, yet those families who have chosen for their children to be schooled in both French and English were experiencing dramatic renewal of their national language at no cost to their children's English achievement. The high academic achievement of the bilingually schooled children

was an added benefit that has amazed the parents. The community goal with this bilingual program is to produce more student graduates who are academically proficient in both languages of the community for economic revitalization of the region. There are many parallels between this situation and that of school district serving Spanish speakers in the South-West U.S. Both one-way and two-way bilingual programs lead to grade-level and above grade level achievement with second language, the only program that fully closes the gap. Gap of English learners attending one-way bilingual classes typically reach grade level through the reminder of their schooling. With the stimulus of native English speaking peers in two-way bilingual classes, groups of English learners typically reach grade level achievement with second language. This is truly astounding achievement when it is considered that this was higher achievement than that of native English speakers being schooled in their own language, and who have all advantages of nonstop cognitive and academic development and socio-cultural support. Native-English speakers language and identity is not threatened, because English is the power and status language and they know it, so they have a hinge advantage in confidence that they can make it in school, from a socio-cultural perspective. Yet English learners can out-pass native English speakers year after year until they reach high grade level in their second language, when they are schooled in a high quality enrichment program that teaches the curriculum through their primary language and through English. But as Okebukola (2012) argues, there is a debate regarding the elastic nature of this provision, especially in Nigeria. It has been argued that the language of the local environment in many urban settings, especially in the Southern parts of Nigeria, is more often than not, English, albeit Pidgin English. Thus, a lower primary science class in the heart of Lagos, Port Harcourt or Benin will have English (a foreign Language) as the language

of immediate locality. Others, for instance, Akinbote et al (2008) have argued that the language of the immediate environment is not different from the mother tongue of the learners in a given locality. In urban centres, the argument, proceeds, the language of instruction in the lower primary classes should be the language that is predominant in the homes of the children in class. Since this is hardly English but one of the local languages, it will be against the policy to use English as the medium of instruction in primary schools classes (1-3). The swing of the argument would appear to favour the former view that the choice of language should be the locality of the school rather than the home, in which case it can be English. It is in the light of the foregoing arguments, Okebukola (2012:21) notes, which bring up a cloud of uncertainty to the meaning of "language of immediate locality" causing tension in the prescription of the national policy and the practice in schools. Within this context, it is argued, that the teacher who uses English in teaching primary science classes in schools in urban centres like Lagos may have not fallen foul of the prescription of the national policy. In the light of the above it can be appreciated that the definition of what constitutes an L1 differs from community to community, and therefore, context determined.

2.3 The History of the Kanuri People of Kanem-Borno

Relevance of the History of the Kanuri People to the Study. We consider the history of the Kanuri people relevant to this study because it is helpful to know the history of a people whose language is being studiedand whose (the study's) outcomes are expected to bring about significant life-changing decisions to their (Kanuri peoples') communities.

The Kanuri people had a long history of learning and scholarship, predating Western Education by hundreds of years, acquired through contacts with the Arab and Islamic education. Borno and Yobe States constitutes the heartland of the Kanuri

people in Nigeria and they number well over four million. In Niger, Chad, Cameroon and Sudan, they constitute considerably large portions of these nations' populations. These people were under one Empire, the Kanem-Bporno Empire, which celebrated it a one-thousandth year (1000th) in 2006.

In the Nigerian context, the two Kanuri States of Borno and Yobe are considered educationally disadvantaged states, especially in science and technology. Andyet, this has not always been true of the Kanuri people. They hada distinguished culture of learning and scholarship and in successfully instructing their young in its hundreds of years of history.

The present inability of the Kanuri society to successfully couple to the science and technology vehicle of today, it is felt, is largely to do with the unsuitable medium of transmitting knowledge- the language.

The outcomes of this study are expected to redound to the benefits of the entire Kanuri people in various nations.What binds them in these nations, after all, are their shared history and backwardness in science and technology.

The Kanuri People, whose language is the subject of this study, were the descendants of the ancient Kanem-Borno Empire. It was known to the Arabian geographers as the Kanem Empire from the 9th century AD onward and lasted as the independent kingdom of Borno until 1900. At its height, it encompassed an area covering not only much of Chad, but also parts of modern Southern Libya, Eastern Niger, Northeastern Nigeria and Northern Cameroon. The history of the Empire in the *longue duree*is merely known from the Royal Chronicle or *Girgam*discovered in the 1851 by the German traveler Heinrich Barth (1858).

Kanem was located at the southern end of the trans- Saharan trade route between Tripoli and the region of Lake Chad. Besides its urban elite it included a

confederation of nomadic peoples who spoke languages of TedaDaza (Toubou) Group.



Figure 2.1: Kanem-Borno Empire (ca. 600 BCE-1376 AD)

The origins of Kanem Empire are very unclear. Until today, historiographical debates oppose the followers of a foundation of Kanem-Borno by populations from the Ancient Near East and followers of a more local development. Some researchers tried to connect the creation of Kanem Borno with the exodus from the collapsed Assyrian Empire c. 600 BC to the northeast of Lake Chad. The intensity of scholarly discussions around this theory proves that the question has not yet been resolved (Dierk Lange, 1977).

According to a more accepted theory, the empire of Kanem began forming around 700 AD under the nomadic Tebu-speaking Kanembu. The Kanembu were supposedly forced southwest towards the fertile lands around Lake Chad by political pressure and desiccation in their formal range. The area already possessed independent, walled city state belonging to the Sao culture. Under the leadership of the Dogawa dynasty, the

Kanembu would eventually dominate the Sao, but not before adopting many of their customs. War between the two continued up to the late 16th century (ibid).

The major factor that influenced the history of Kanem was the early penetration of Islam. North African traders, Berbers, and Arabs, brought the new religion. Towards 1068, Hummay, a member of the Sayfawa establishment, who was already a Muslim, discarded the last Duguwa king, Selma, from power and thus established the new dynasty of the Sayfawa. Islam offered the new rulers advantage of new ideas form Arabia and the Mediterranean world, as well as literacy in administration. But many people resisted the new religion favouring traditional beliefs and practices. When Hummay had assumed power on the basis of his strong Islamic following, for example, it is believed that the Duguwa/Kanembu began some kind of internal opposition. This pattern of conflict and compromise with Islam occurs repeatedly in Chadian History, (Urvoy, Yves, 1962).

When the ruling dynasty changed, the royal establishment abandoned its capital of Manan and settled in the new capital Njimi further south of Kanem. By the 13th century, Kanem's rule expanded. At the same time, the Kanembu people drew closer to the new rulers and increased the growing population in the new capital Njimi. Even though the Kanembu became the main power-base of the Sayfawa, Kanem's rulers continued to travel extensively throughout the kingdom and especially towards Borno, west of the Lake Chad. Herders and farmers alike recognized the government's power and acknowledged their allegiance by paying tribute to it.



Figure 2.2: The Court of Mai of Kanem in the 13th century

Kanem's expansion peaked during the long and energetic reign of Mai DunamaDabbalemi (ca. 1203-1242), also of the Sayfawa dynasty. Dabbalemi initiated diplomatic exchanges with sultans in North Africa and apparently arranged for the establishment of a special hostel in Cairo to facilitate pilgrimages to Mecca. During his reign, he declared jihad against the surrounding tribes and initiated an extended period of conquest. After consolidating their territory around Lake Chad, the Fezzan region (in present day Libya) fell under Kanem's authority, and the Empire's influence extended westward to Kano(in modern day Nigeria) and thus included Borno, eastward to Ouaddai and southwards to the Adamawa grasslands (present day Cameroon).

Dabbalemi devised a system to reward military commanders with authority over the people they conquered. This system, however, tempted military officers to pass their positions to their sons, thus transforming the office from one based on achievement and loyalty to their Mai into those based on hereditary nobility. Dabbalemi was able to

suppress this tendency, but after his death, the dissension among his sons weakened the Sayfawa dynasty. Dynastic feuds degenerated into civil war and Kanem's outlying peoples soon ceased paying tributes.

According to Dierk Lange (1984) by the end of 14th century, internal struggles and external attacks had torn Kanem apart. Between 1359 and 1383, seven Mais reigned, but Bulala invaders from the area around Lake Fitri to the east killed five of them. This proliferation of Mais resulted in numerous claimants to the throne and led to a series of internecine wars. Finally, around 1380 the Bulala forced Mai Umar Idrismi to abandon Njimi and moved the Kanembu people to Borno on the western edge of Lake Chad. Overtime, the intermarriage of the Kanembu and Borno peoples created a new people and language, the Kanuri.

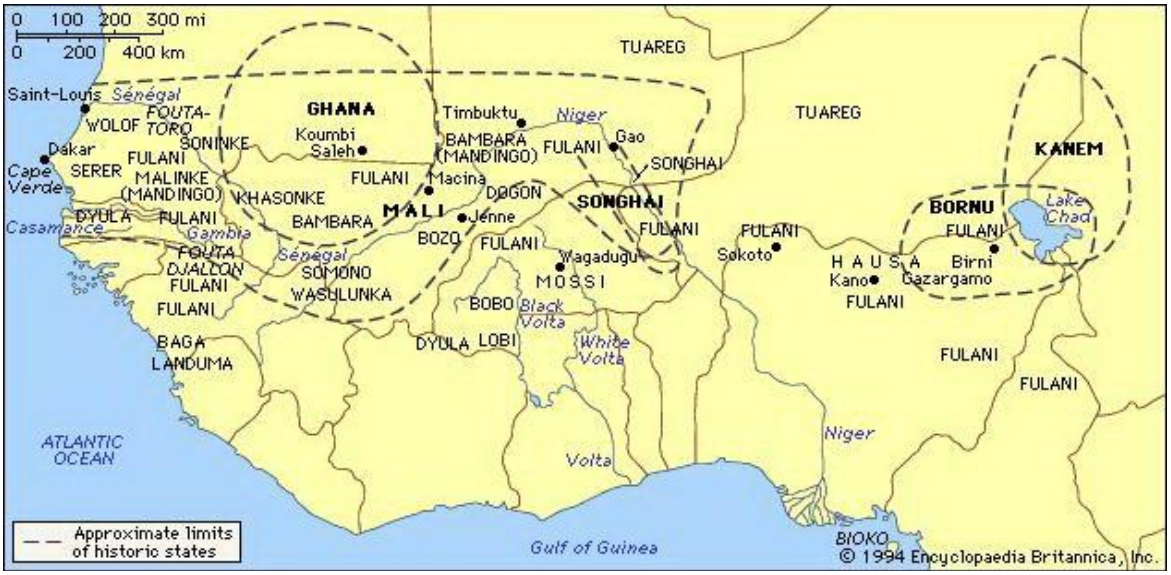


Figure 2.3: Map of Kanem and Borno in the 14th Century

But even in Borno, the Sayfawa dynasty's trouble persisted. During the first three quarters of the 15th century, for example, fifteen Mais occupied the throne. Then, around 1460, Mai Ali Dunama defeated his rivals and began the consolidation of Borno. He built a fortified capital at Ngazargamu, to the west of Lake Chad, in present day Niger, the first permanent home the Sayfawa mai had enjoyed in a

century. So successful was the Sayfawa in rejuvenation that by the early 16th century Mai IdrisKatakarmabe (1487-1509) was able to defeat the Bulala and retake Njimi, the former capital. The empire's leaders, however, remained at Ngazargamu, because its lands were more productive agriculturally and better suited to the raising of cattle.

Kanem-Bornu peaked during the reign of the outstanding statesman, Mai IdrisAlauma (c. 1564-1596). Alauma is remembered for his military skills, administrative reforms, and Islamicpiety. His main adversaries were the Hausas to the west, the Tuareg and Toubou to the north,and the Bulala to the east. One epic poem extols these victories in 330 wars in more than 1000battles. His innovations included the employment of fixed military camps (with walls); permanent sieges and scorch earth tactics, where soldiers burned everything in their path; armoured horses and riders; and the use of Berber camelry, Kotoko boatmen, iron helmeted musketeers trained by Turkish military advisers. His active diplomacy featured relations with Tripoli, Egypt, the Ottoman Empire which sent a two hundred member ambassadorial party across the desert to Alauma's court at Ngazargamu. Alauma also signed what was probably the first written treaty or cease fire in Chadian History (like many cease-fires, negotiated in the 1970's and 1980s, it was promptly broken).



Figure 2.4: The warriors of Kanem-Borno Empire

Alauma introduced a number of legal and administrative reforms based on his religious beliefs and Islamic Law (Sharia). He sponsored the construction of numerous mosques and made a pilgrimage to Mecca, where he arranged for the establishment of a hostel to be used by the pilgrims from his empire. As with other dynamic politicians, Alauma's reformist goals led him to seek loyal and competent advisers and allies, and he frequently relied on slaves who had been educated in noble homes. Alauma regularly sought advice from a counsel composed of Heads of the most important clans. He required major political figures to live at the court, and he reinforced political alliances through appropriate marriages (Alauma, himself was the son of Kanuri father and a Bulala mother).

Kanem-Borno under Alauma was strong and wealthy. Government revenues came from tributes (or booty, if the recalcitrant people had to be conquered), sales of slaves, and duties on and participation in trans-Saharan trade. Unlike West Africa, the Chadian region did not have gold. Still, it was central to one of the most convenient trans-Saharan routes. Between Lake Chad and Fezzan lay a sequence of well-spaced wells and oasis, and from Fezzan there were easy connections to North Africa and the Mediterranean Sea. Many products were sent north, including natron (sodium

carbonate), cotton, kola nuts, ivory, ostrich feathers, perfumes, wax, and hides, but the most important of all were the slaves. Imports included salt, horses, silk, glass, muskets, and copper.

Alauma took a keen interest in trade and other economic matters. He is credited with having the roads cleared, designing better boats for Lake Chad, introducing standard units of measure for grains, and moving farmers into new lands. In addition, he improved the ease and security of the transient through the empire with the goal of making it so safe that:

"*Lone woman clad in gold might walk with none to fear but God*".

According to Smith, (1985) the administrative reforms and military brilliance of Alauma sustained the empire until the mid-17th century, when it started to fade. By the late 18th century, Borno rule extended only westward, into the land of the Hausa. Around that time, Fulani people invading from the west were able to make major inroads into Borno. By the early 19th century Kanem Borno was clearly an in empire in decline, and in 1808 Fulani warriors conquered Ngazargamu. Usman Dan Fodio led the Fulani thrust and proclaimed a jihad on irreligious Muslims of the area. His campaign eventually affected Kanem Borno and inspired a trend toward Islamic orthodoxy. But Muhammad Al-Kanemi contested the Fulani advance. Al-Kanemi was a Muslim scholar and non-Sayfawa warlord who had put together an alliance of Shuwa Arabs, Kanembu, and other seminomadic peoples. He eventually built in 1814 a capital at Kukawa (in present day Nigeria). Sayfawa Mais remained titular monarchs until 1846. In that year, the last Mai, in league with Ouaddai tribesmen precipitated a civil war. It was at that point that Al-Kanemi's son, Umar, became king, thus ending one of the longest dynastic reigns in regional history.

Although the dynasty ended, the kingdom of Kanem-Borno survived. But Umar, who eschewed the title *Mai* for the simpler designation *Shehu* (from the Arabic Shaykh), could not match his father's vitality and gradually allowed the Kingdom to be ruled by advisers (wazirs). Bornu began to decline as a result of administrative disorganization, regional particularism, and attacks by the militant Ouaddai Empire to the east. The decline continued under Umar's sons, and in 1893 Rabihaz-Zubayr, leading an invading army from eastern Sudan, conquered Borno. Rabih was defeated by French soldiers in 1900 (Hallam, 1977).Shortly thereafter, Borno fell to the British Colonial rule becoming a Province in Northern Nigeria and presently, Borno State.



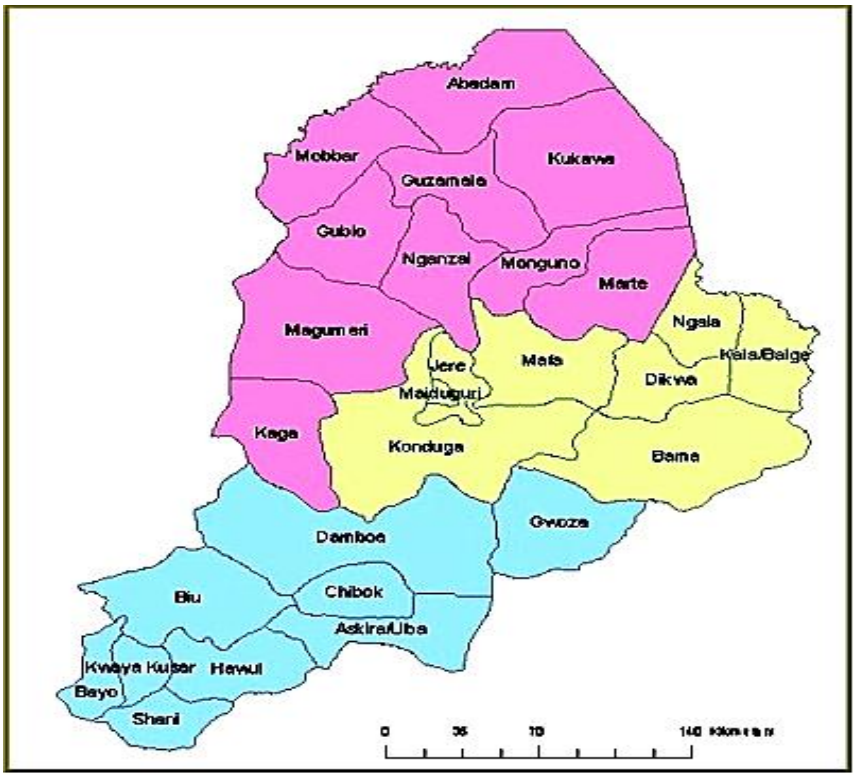
Source: www.ncocisa.com

Figure 2.5: Location of Borno State in NigeriaCoordinates: 11°30′N13°00′E

The Kanuri language is one of the Nigerian languages which were documented rather early in 14th century. The first known source is a short vocabulary of the 17th century discovered in archives in Paris. Another source of comparable age

is the Kanembu annotations of the Koran. It is estimated that the annotations, called 'tafsîr', are dated to the middle of the 17th century. However, no linguistic analysis has been made so far. Klaproth (1827) published a short description of Kanuri grammar. This description is based on data collected by Denham, Clapperton, &Oudney (1831) in the beginning of the 19th century. The most comprehensive work on Kanuri in the 19th century was carried out by Sigismund Wilhelm Koelle. He worked as a missionary among freed and resettled slaves at the famous Fourah Bay College in Freetown, Sierra Leone. The Church Missionary Society (CMS) believed that Kanuri would be, like Hausa, a suitable language for future proselytizing work in the Lake Chad area. The Kanuri nation is an amalgamation of very many ethnic groups which was encouraged by the diversity of its geographical environment as well as by various political influences and changes. The development and expansion of Kanuri language is closely related to the political history of the kingdom of Kanem which is said to have been established as early as the ninth century A. D., as briefly etched out above. As pointed out, during this period the major groups that occupied the region north and north-east of the Lake Chad were the Bulala, Kanembu and Zaghawa. Of these groups the Kanembu appeared to have taken over control of the state under the leadership of the Sayfawa Mais. According to Bulakarima (1987) there have been clear distinctions among the three groups in the languages they originally spoke, and indeed it is difficult to assume that they either understood each other's respective languages or ever communicated with one another through their different languages. He further stated that this state of non-communicability necessitated the emergence of a lingua-franca, a language which was used by all the groups to communicate with one another in the transaction of their business, in administration, and as a medium of instruction. For this reason and many others according to him,

were political reasons; the Kanembu language came to be accepted in Kanem by various other groups as a common language.According to Bulakarima (1987) the Kanuri language became of great importance in the Lake Chad region towards the fifteenth century. It was (and still is) used by the Bade, Ngizim, Karekare, and Bolewa in the West, the Shuwa-Arabs in the east, the Kotoko, Gamargu, Wula, Baghirmi, Marghi, Babur and the Mandara in the south or Buduma (Yedima) of Lake Chad itself and even among the Fulani settlers in Mandara. It was (and still is) without doubt the most important language of the region. Nearly all of the non-Kanuri people/groups are bilingual with Kanuri as one of their languages. This has to some extent made the Gamargu people claim a Kanuri identity though they speak a Chadic language as their mother-tongue. The Kanuri are today concentrated mostly in the present Borno and Yobe States in Nigeria. According to Bulakarima (1987) they form more than two-third of the population of well over five and a half million and constitute a large majority of the people in Borno and Yobe States. According to the national census of 1963, the Kanuri language is spoken by more than three million people as their first language in the present day Borno and Yobe states alone (the former Borno Province). In the other Northern States of Nigeria, Kanuri-speaking groups are evident (e.g. Azare, and Misau in Bauchi State, Hadejia and MallamMaduri in Jigawa State and Lafiyan Baribari in Nasarawa State) the recent census figures put the Kanuri speaking people at over five million. The language is also widely spoken in Southern part of Niger, Chad and Cameroon.



Source: www.ncocisa.com

Figure 2.6: Map of Borno State Showing Major Towns; Coordinates: Lat 10^{o} and14^{o} N and Long $11^{o}30`$ and $14^{o}5`E$

The Kanuri ethnic groups taking their 14^{th} -15^{th} century fief system into consideration, up till now believe that Bade, Ngizim, Buduma, Babur and even Mandara are dialects of the Kanuri language. These ethnic groups are: Bodai, Fada, Kaama, Koyam, Lare, Manga, Mowar, Ngazar, Ngumati, Suwurti, Wuje and Zarara.

Jean Paul Frederick Richter in 1806 argues that all praise that is heaped on the classical languages as educational tool is due in double measure to the mother tongue, which should more justly be called the "mother of all languages" in Desai, (2007).

Learning of Basic science is initiated and sustained if simpler concepts are taught in the child's mother tongue as basic foundation upon which future complex concepts are built. As Desai, (2007), among others argues, using the mother tongue,

(1) we have learnt to think, (2) learnt to communicate,(3) acquired an intuitive knowledge of grammar. The mother tongue is the greatest asset people bring to the task of learning. This is because certain concepts must be mastered before others can be meaningfully taught and understood. A stimulating learningenvironment, availability and use of a wide variety of appropriate teaching methods, aids, games,etc., are desirable for teaching Basic Science and Technology effectively.

2.4 The Importance of Language for Communication in Teaching and Learning

Language is regarded as a tool that enables people to organize and control mental processes such as planning, problem solving, and learning (Schrum&Glisan, 2000). Through questions and answers, demonstrations and discussions, etc. new knowledge can be mediated with the learners. Collaborative activities such as group work facilitate language learning. The students learn new skills by interacting with each other. That is more knowledgeable learners can assist others to reach higher levels of understanding through social interaction. This implies that it is not the teacher only who acts as the mediator, learners who have more capability than others can also mediate learning. Language is an important tool of mediation whether mediation occurs between teachers and learners or between learners themselves. Schrum&Gilsan (2000) mention learner's private speech (that is speech of the self or whispering to the self) as another mediating tool. Private speech is described as the convergence of language and thought. It occurs when a learner speaks aloud, and it helps to clarify certain tasks or seek solution to a problem. Language play occurs within private speech as learners experiment with language features (e.g. grammar, phonology, and lexicon) by imitating other people or repeating their own utterances. Language play creates ZPD because the learner makes efforts to do even more than she is supposed to do at a particular time.

The ZPD and mediation relate to a transactional view of learning which sees the learner as an explorer. The learner is given an opportunity to construct knowledge by posing problems and raising questions to reflect on new experiences Freeman & Freeman,(1994). It is in line with the interactionists and sociocultural theories that Chamot and O'Malley (1994) mention cognitive and social strategies which mediate learning. Cognitive strategies involve relating new knowledge with existing knowledge, making inferences, linguistic transfer, imagery, deductions and inductions, summarizing, etc. these strategies have to do with interacting with materials to be learned. Social strategies, on the other hand, include questioning for clarification, cooperation with teacher or peers or self-talk. Both strategies (cognitive and social) have implications for language competence. For example, the learner may be able to make inferences in a text only if she has comprehended the text. Comprehension has to do with the language used in the text (i.e. whether the learner understands the language or not). Likewise, a learner can be confident enough to ask questions if he is comfortable enough with the language he uses to ask for clarification.

The interaction between the teacher and learner is scaffolding. Instructional scaffolding is a learning process designed to promote deeper learning. We find the concept of instructional scaffolding particularly relevant to our study providing a good fit between the natural learning that takes place in the home and what we intended to study. Whether it is the mother teaching the girl-child the intricacies of home keeping chores or the father teaching the male-child the skills of survival through apprenticeship, on the farm or the in a particular family trade the father plies, the two teachers scaffold the learning and teaching tasks. These natural teachers always know what the child knows and what new knowledge would be added to the

previous knowledge in the most supportive way. The trick is to find the right balance between the strength of the current fulcrum of the child's current knowledge and the weight of the new knowledge to be taught in order that they mesh and grow his knowledge or skill in the most supportive and comfortable way. No matter what subject is taught and whether this subject is taught in the mother tongue or a in a second language, the concept of scaffolding is applicable. Perhaps, it is even more applicable to the mother tongue setting and in particular, in the teaching of science and technology, since it is largely the teaching of palpable and observable phenomena. The concept is particularly useful as it captures the instinctive method parents adopt in teaching their young not only the most critical and most complex of all skills, language, but also all useful life skills in a natural home setting. Given the positive research outcomes of the impact of teaching children in their mother tongue, whose superiority over the second language is widely acknowledged, we find the concept of instructional scaffolding quite germane to our study. One of the strengths of instructional scaffolding is that it provides the learner with all the support they may require to build new knowledge on previous knowledge. The first support that the pupil in our study will receive is that the language challenge posed by the L2 is removed, the ingredients are local ones presented in the child's mother tongue. According to Sawyer (2006), scaffolding is the support given during the learning process which is tailored to the needs of the student with the intention of helping the student achieve his/her learning goals. Instructional scaffolding is the provision of sufficient support to promote learning when concepts and skills are being first introduced to students. These supports may include the following:

- Resources
- A compelling task

- Templates and guides
- Guidance on the development of cognitive and social skills

Instructional scaffolding is used in various contexts:

- Modeling a task
- Giving advice
- Providing coaching

These supports are gradually removed as students develop autonomous learning strategies, thus promoting their own cognitive, affective and psychomotor learning skills and knowledge. Teachers help the students master a task or concept by providing support. The support can take many forms such as outlines, recommended documents, storyboards, or key questions.

The best and most effective use of instructional scaffolding helps the learner figure out the task at hand on his own. It is best to think of the use of instructional scaffolding in an effective learning environment as one would think of as the importance of scaffolding in support of the construction of a new building.

A construct that is critical for scaffolding instruction is Vygotsky's concept of Zone of Proximal Development (ZPD). Ellis, Larkin and Worthington, (2002) explained that the ZPD is that field between what a learner can do by himself (expert stage) and what can be achieved with the support of a knowledgeable peer or instructor (pedagogical stage). Vygotsky was convinced that a child could be taught any subject efficiently using scaffolding practices by implementing the scaffolds at the Zone of Proximal Development. Students are escorted and monitored through learning activities that function as interactive conduits to get them to the next stage. Thus the learner obtains support or raises new understandings by presenting on their previous knowledge through the support delivered by some more capable individuals

(Raymond, 2000). Bransford, Brown, and Cocking, (2000) have shown that when there is deficiency in guided learning experiences and social interaction, learning and development are obstructed.

In writing instruction, typically support is presented in verbal form (discourse). The writing tutor engages the learner's attention, calibrates the task, motivates the student, identifies relevant task features, controls frustration, and demonstrates as needed (Freeman, 1994). Through joint activities, the teacher scaffolds conversation to maximize the development of the child's intrapsychological functioning. In this process, the adult controls the elements of the task that are beyond the child's ability while increasing the expectations of what the child is able to do. Speech, is a critical tool to scaffold thinking and responding, plays a crucial role in the development of higher psychological processes (Luria, 1979) because it enables thinking to be more abstract, flexible, and independent (Bodrova & Leong, 1996). From a Vygotskian perspective, talk and action work together with the sociocultural fabric of writing event to shape child's construction of awareness and performance (Dorn, 1966). Dialogue may range from casual talk to deliberate explanations about features of written language. The talks embedded in the literacy event shapes the child's learning as the tutor regulates her language to confirm to the child's degree of understanding. Clay (2005) shows that what may seem like casual conversational exchange between the tutor and student actually offers many opportunities for fostering cognitive development, language learning, story composition for writing, and reading comprehension. Smagorinsky (2007), posits that conversations facilitate generative, constructive, experimental, and developmental speech and writing in the development of new ideas. Dyson(1983, 1991), pointed out that children use language as a vehicle for discovering and negotiating emergent written language and

understandings for getting meaning on paper. Writing and speech can lead to discovery of new thinking. The teacher offers levels of verbal and non-verbal demonstrations and directions as the child observes, mimics, or shares the writing task. With increased understanding and control, the child needs less assistance. The teacher's level and type of support change over time from direction, to suggestion, to encouragement, to observation.

Optimum scaffolds adapt to the child's tempo, moving from other-regulated to self-regulation. The child eventually provides self-scaffolding through internal thought (Wertsch, 1985). Within scaffolding events, teaching and learning –both inseparable components- emphasize both the child's personal construction of literacy and the adult's contribution to that child's developing of understanding of print. Teale & Sulzby (1986) note that the child contributes what she can and the adult contributes so as to sustain the task.

According to Brock-Utne, (2005), there are two levels of scaffolding: soft and hard. An example of soft scaffolding in the classroom would be when a teacher circulates the room and converses with his or her students. The teacher may question their approach to a difficult problem and provide constructive feedback. According to Alidou, (1996), this type may be referred to "contingent scaffolding". The type and amount of support needed is dependent on the needs of the student during time of instruction.

In contrast with contingent or soft scaffolding, embedded or "hard scaffolding" is planned in advance to help students with a learning task that is known in advance to be difficult (Brock-Utne, 2005a). For example when students are discovering the formula for Pythagorean Theorem in mathematics class, the teacher may identify hints or cues to help the student reach an even higher level of thinking.

In both cases the idea of “expert scaffolding” is being implemented (Holton and Clarke 2006): the teacher in the classroom is considered the expert and is responsible for providing scaffolding for the students.

Reciprocal scaffolding, a method first introduced by Holton and Clarke (2006), is a method that involves a group of two or more collaboratively working together. In this situation, the group can learn from each other’s experiences and knowledge. The scaffolding is shared by each member and changes constantly as the group works on a task (Holton and Clarke, 2006). According to Vygotsky, students develop higher level thinking skills when scaffolding occurs with an adult expert or with a peer of higher capabilities.

Technical scaffolding is a newer approach in which computers replace the teachers as experts or guides, and students can be guided with web links, online tutorials or help pages. Educational software can help students follow clear structure and allows students to plan properly, (Yelland and Masters, 2007).

The pivotal role of language development is obvious because the kind of output produced by the learner depends on the input the learner receives. If the language is incomprehensible, it may not result in effective learning. The determining factor in comprehension is usually the language of communication, i.e. whether it is familiar or unfamiliar language.

2.4.1 Outcomes of National Languages for Teachers, Administrators and Parents

The astounding effectiveness of using national language extends beyond student outcomes, influencing the school experience of all participants. As the program develops and matures, teachers, administrators, and parents in formal and informal interviews all express awareness that they are part of something very special. Most adults connected to the program begin to view it as a school reform, where

school is perceived positively by the whole school community. The respect and nurturing of the multiple cultural heritages and the two main languages present in the school lead to friendship that cross social class and language boundaries. Teachers express excitement, once they have made it through the initial years of planning and implementing enrichment in national language model, that they have lots of support once the staff development and teacher planning time is in place for this innovation. Teachers can see the difference in their students' responsiveness and engagement in lessons.

Administrators of National language schools talk about the enormous amount of planning time needed and the complications of what they are doing. But they add that they absolutely love their jobs and are fully committed to making dual language work for the whole community. Those who serve as principals of whole-school models of national language tend to stay in their positions for many years, stating that it has changed their life and makes work a great joy. Principals agree that the first years of implementation are not easy, but the end results are worth the hard work. A principal's commitment to and vision of this reform requires great sensitivity to culturally and linguistically diverse communities and the willingness to stick with the decision to implement a full enrichment model that enhances the achievement of all students. Parents of both language groups tend to participate much more actively in the school, because they feel welcomed, valued, and respected, and included in school decision-making. Often teachers and administrators of national language schools create after-school activities that welcome family members into lifelong learning partnership for all ages. Examples of flourishing parent-school partnerships in national language schools are provided in the Federal Research Report, especially in the findings from Maine and Oregon (Thomas & Collier, 2004).

2.4.2 Factors Affecting Gap Closure in National Language Programmes

While dual language programs are astoundingly successful, in comparison to other bilingual/English as a second language programs developed for English learners, variations in program design and the tests chosen to measure gap closure can produce different results in program effectiveness. Here are some issues that program designers and researcher/evaluators might consider during the planning stages of implementing a new program. These issues also apply to existing national language programs that want to improve their particular model. All programs, including national language schools in existence for a long time, are a work in progress, as educators respond to the varying needs of their students.

The rich diversity of national language is a powerful linguistic and cultural resource that needs to be maximized as opportunities rather than problemized as barriers to academic achievement and social and cultural integration (Brecht and Gold, 2002). This study highlights the reasons and the need for all educators to better understand the role of national languages in the personal, social and academic trajectories of their students. In their classrooms, it may or may not affirm the value of maintaining and developing national languages among students as a first step in illuminating the potential impact that students can have in the national languages learning process. Research has documented that national language in the form of additive bilingualism leads to academic and personal benefits for linguistic minority students. Proficiency in the national language not only facilitates English acquisition (Cummins and Krashen 1996) but it also leads to higher academic achievement.

In the light of UNESCO's Project 2000+, Jegede and Aikenhead (2013) pointed out that many nations are currently rethinking their needs and priorities for school science in terms of "science for all". They put forward as an effective strategy

for achieving this ambitious goal what they termed “social constructivism” which characterizes the nature of language to include the following: (1) knowledge is not a passive commodity to be transferred from a teacher to learners, (2) pupils cannot and should not be made to absorb knowledge in a spongy fashion, (3) knowledge cannot exist separate from the knower, (4) learning is a social process mediated by the learner’s environment and, (5) the prior or indigenous knowledge of the learner is of significance in accomplishing the construction of meaning in a new situation. They argued that all learning is mediated by culture and takes place in a social context. The role of the social context is to scaffold the learner, and provide hints and help foster construction of knowledge while interacting with other members of the society (Jegede and Aikenhead 2013).

As Jegede and Aikenhead (2013) surveying the literature on the subject clearly show that pupils experience two types of cultures when they study science in a formal Western type educational setting: the culture of school science and the culture of their life-world. To make meaning out of their experiences in science classrooms, pupils need to negotiate a cultural transition from their world-life into the world of school science. They argued that the ease or difficulty with which pupils make the transition (that is the ease or difficulty with which they cross the cultural borders) will determine their understanding of the subject. The absence of psychological pain leads to a smooth border crossing. At the opposite extreme, the experience of unbearable psychological pain necessitates avoidance and leads to an impossible border crossing.

As Rasheed, (1997), argued, the eco-cultural environment of non-Western learners determines their social and cultural imprints of how knowledge is acquired and how it is used. At school, the science concepts taught as symbolic knowledge can become a source of “cultural violence” and non-empowerment resulting in serious

conflict between what the pupils bring into the science classroom and what they are expected to take away from it. As a result, it is argued, a large majority of pupils in non-Western type of societies cannot cross cultural borders smoothly into school science, and therefore, they do not learn science in the meaningful way expected of them.

Contreras and Lee, (1990); Wolcott, 1991) point out that cultural processes are involved in the acquisition of science culture. When the culture of science generally harmonizes with the pupil's life-world culture, science instruction will tend to support the pupil's view of the world and the process of enculturation tends to occur. This process is characterized by smooth border crossing into school science. But as Maddock, (1981) argued, when the culture of science is generally at odds with the pupils' life-world, science instruction will tend to disrupt the pupil's worldview by trying to force that pupil to abandon or marginalize his or her life-world concepts and reconstruct in their place new (scientific) ways of conceptualizing. This process is assimilation. Assimilation can alienate pupils from their indigenous life-world culture, thereby causing various social disruptions; or alternatively, attempts at assimilation can alienate pupils from science thereby causing them to develop clever ways of (school games) to pass their science courses without learning the content in a meaningful way.

One of such games which has explicit rules is "Fatima's rule" discovered by Larson, in Jegede and Aikenhead, (2013). Fatima's rule can include such a coping or passive resistance mechanisms as "silence, accommodation, ingratiation, evasiveness, and manipulation". What results is not meaningful learning but, merely "communicative competence" or an "accoutrement to specific rituals and practices of the science classroom", in Jegede and Aikenhead, (2013) found the reason for

Fatima's rule that helps explain the avoidance of assimilation for some pupils… "the need to develop a deep understanding of the subject may not have been viewed by the pupils as being particularly important as progression through the schooling system could be achieved without it"

Jegede and Aikenhead (2013) offer the argument that when pupils learn science within a multicultural environment they need to move between their everyday life-world and the world of school science. They pointed out that fore a small proportion of the pupils these cultural borders do not present problems serious enough to affect their learning of science. But many do experience serious problems and must deal with cognitive conflicts between those two worlds. According to Aikenhead and Jegede (1999), this conflict is played out daily in science classrooms around the world where science pupils are expected to construct scientific concepts meaningfully; for example, in Africa where pupils' traditional cosmologies conflict with the norms, values, beliefs, expectations and conventional actions of the Western science community. It is in response to such hazards that pupils invent ways of constructing foreign scientific knowledge or, pupils conveniently store the constructed scientific knowledge in their minds out of harm's way from interfering with their life-world experiences. These clashes, Jegede and Aikenhead (1998) argue that success in teaching science courses depend on (1) the degree of cultural difference that pupils perceive between their life-world and their science classroom, (2) how effectively pupils move between their life-world and their science or school science, and (3) the assistance pupils receive in making those transitions easier. Proposals to ease these transitions have been offered, (Jegede and Aikenhead, 2013):

- Make border crossings explicit enough for pupils
- Facilitate these border crossings

Promote discourse so that pupils are (a) talking in their own cultural interpretative framework as well in the framework of Western science without cultural violence (b) immersed in either the pupils'' indigenous life-world culture or the culture of science, and (c) cognizant about which culture they are talking in any given time.

Jegede and Aikenhead (2013) argued that success in science courses depends on the teachers successfully helping pupils mediate or negotiate cultural borders and engage in some form of collateral learning. Stairs (1995) used the metaphor "teacher as culture broker" to analyze a teacher's role in resolving cultural conflicts that arise in cross-cultural education. A science teacher who is a broker will guide pupils between their life-world culture and the culture of science, and help them resolve any conflict. Atwater (1996, cited in Jegede and Aikenhead, 2013) described this role as a coordinator, facilitator, and resource person in multi-cultural education. It is pointed out that a tour-guide culture broker takes pupils to some of the principal cites in the culture of science (its significant phenomena, knowledge, skills, and values) and coaches pupils on what to look for and how to use it in their everyday lives outside the school. A tour guide helps smooth the otherwise hazardous or impossible border crossing that pupil's face. One of the most powerful border crossing guides in the science teacher arsenal is the rich diversity of national language and cultural resource of the community that needs to be maximized as opportunities as to academic achievement and social and cultural integration (Brecht and Gold, 2002).

As Nomlomo (2007) argues, the more proficient the teacher and learners are in the language of instruction, the more effective the teaching and learning process will if the learners speak the same language. In other words, classroom interaction becomes more effective, with no communication breakdowns or misunderstandings if

both the teacher and the learners are speaking the same language. In such a situation, the terms “instructional dead time”, which refers to pupils’ inability to make progress due to their inability to understand the language of instruction, is avoided, (Nomlomo, 2007). Teachers seem to mediate better in their mother tongue especially, if the learners speak the same language with the teacher. Conversely, the lower the proficiency of both, the teacher and the learners in the language of instruction, the more the difficulties would be experienced in the teaching and learning process. That is teaching and learning through a second language is difficult for both the teachers and the learners if they are not proficient in it.

Pinsloo (2005) mentions stress and uncertainty that usually arise from the mismatch between the language used at home and the language used in schools leads to barriers to learning. He further argues that children who attend schools where the language of learning and teaching (LoLT) is English and their parents can only speak in vernaculars cause anger, shame and low self-esteem in the parents and care-givers. This encourages non-involvement of the parents/caregivers and worsens the fact that they cannot assist their children with school work. On the contrary, Nomlomo (2007) reports that with the introduction of isiXhosa as a medium of instruction (MOI) in science, an improvement was observed in the class where parents started to assist their children with school homework. The involvement of parents in their children’s’ work was more visible with the children who were taught in isiXhosa than those who were taught in English. She argued that this can be linked to the parents’ proficiency in the language of instruction that enabled them to help their children with the school work. On the other hand parents who lacked competence in English could not help their children with their school work. In the same study, Nomlomo (2007) reports that the parents and children of the experimental group showed positive attitudes to isiXhosa

as their home language and as a medium of instruction. They perceived the use of isiXhosa in education as a start towards its development socially and economically. They showed pride and loyalty to their mother tongue not only as the carrier of their culture but of having potential to develop like English and Afrikaans through its use in education.

Further, proficiency in national language has been identified to play a central role in one's ethnic identification. In other words, it instills a stronger sense of ethnic identity and connection to the cultural group, which in turn leads to greater and more positive self-esteem (Lee 2002). By maintaining one's national language, individuals are also able to participate in an enriched environment of experience stemming from two cultures. Conversely, the loss of proficiency in the national language not only diminishes the potential to experience and see the world from different perspective, but also leads to breakdown in communication with family members, alienation from ethnic community networks, and lower self-esteem. Wong, (2002), found that students who do not have the opportunity to fully develop in both languages are significantly more likely to drop out of schools than those fluent in both languages. The loss of a national language for an individual is more than just a loss of a linguistic system; it is a separation from their roots a denial of their ethnic identity, and a dismissal of their potential as a bilingual and bicultural member of society. As the population of linguistically and culturally diverse students continues to grow, it is becoming even more imperative to understand and affirm home cultures and to bring the resources, knowledge, and practices of the home and schools. Thus national language in the learning process is a matter worth serious consideration and investment from educators and the wider society.

Nababan, (2009) points out that the introduction of national languages, in Ethiopia, (Amharic, Tigrinya, Oromo, Sidima and Wolayita), not only significantly raised the pupil enrolment but also significantly reduced pupil dropout rates, especially, in the rural areas.

Nolasco (2013) argued that teaching in the mother tongue is starting from where the learners are, to and from what they already know. This means learning to speak, read, write and think in their first language. She pointed out that their own language enables the young learners to immediately construct and explain their world without fear of making mistakes, articulate their thoughts and add new concepts to what they already know. She further asserts that most world knowledge is accessible in English and so knowledge of English is important, however, it is not true that students will not learn science and mathematics if they do not know English. The ideas of science, she argues, are not bound by one language and one culture.

Buffer and Lauksch, (2004) similarly argued that every language can represent concepts and knowledge in areas of mathematics in its own way. The same opinions were echoed by Gondo, Nyota and Mapara (2005), arguing that any language is capable of manufacturing and developing new words as long as it is in active use. What is needed is what Ball (2000) called "unpacking of mathematical language and the content for pedagogical purposes" arguing that mathematics and science languages can be made simpler and accessible to all pupils in their own mother tongue for effective teaching and learning.

Brock-Utne (2005) also argues that any language can be the language of science and technology if education occurs through the language people know well, pointing out that China, Japan, India and the Russia have achieved world class

technological advancement through their own languages which are the media of instruction throughout the education system (Okebukola, et al, 2012).

Setati's (2005) research in South Africa revealed that using English only in primary mathematics classroom where English is not the mother tongue of the learners has negative effect on the pupils' meaning making and problem-solving. Grappling with English and mathematical content and concepts coupled with mathematical phobia, further complicates and exerts a lot of strain on the pupils. Mother tongue as a medium of instruction, thus has a support effect on the teaching and learning of mathematics, especially at primary school level and may lead to the demystification of mathematics.

However, National language in learning continues to remain the sole responsibility of individuals and families although repeated patterns of language shift have shown that individuals, families and national language communities alone are insufficient in fighting the assimilative forces of English (Fishman, 2001; Veltman, 1983). What educators need to realize is that national language in learning is not an individual process, but also a social process that is influenced by multiple factors at the personal, educational, and societal levels. In the light of the substantial influence that teachers and schools have on students, it is surprising that little attention has been paid to the connection between teachers and schools and students' national language in teaching and learning efforts.

According to Collier (1995) students spend a large portion of their day at school where they have direct contact with the teachers. Teachers can play an influential role in shaping their attitudes towards teaching and learning using national language as a supplement. Previous research has shown that teachers' attitudes significantly affect student attitudes as well as their teaching practices. Ball and

Larder (1997) argued that effective instruction of linguistically diverse students relate directly to teachers' disposition towards their students and their backgrounds. They observed that a lack of respect for the national language of students constituted a language barrier impeding students' educational progress. Moreover, it was found that when teachers communicate that only English is appropriate for school, students infer that their national language and culture are less important. In response to a socio-cultural environment that does not appear to value their national language and culture, linguistic minority students are likely to reject and abandon their national language (Wong, 2000). A common understanding among teachers is that only teachers who are proficient in the students' national language can support students' in teaching and learning in national language. To the contrary, studies have shown that positive effects are also found when teachers express interest in the national language and treat it as a resource (Chamot, 1998). Regardless of whether or not teachers have proficiency in the students' national language, their positive attitudes toward the national language and willingness to value it publicly in the school space can reinforce students' desire to maintain their national language. Thus, teachers must recognize the importance of national language proficiency in the lives of their students and also become aware of their own personal stance and belief towards students national language. Although studies have been conducted on students' attitudes toward primary language use in the classroom to facilitate English language acquisition and access to academic content (Cummins and Krashen, 1996), there has been little, if any, research conducted on students' attitudes toward teachers' national language in teaching and learning for the purpose of promoting additive bilingualism. National language learners and their needs, for the most part, have been invisible in schools. By examining teachers' assumptions and beliefs about national language in

teaching and learning through surveys and interviews, this study hopes to bring to light the students' attitudes toward national language in teaching and learning and the relevance and status of national languages in schools.

Jegede and Aikenhead's (2013) "social constructivism" which is their strategy to achieve UNESCO's Project 2000, clearly underscores the nature of language not only as value and culture-laden, but the role of the child's mother tongue as of great significance in the construction of meaning in a new situation. More importantly, they argue that the pupils experience two types of cultures when they study science in a formal western type educational setting: the culture of the school science and the culture of their life-world.

Our study attempts to bridge the dichotomy by bringing school science through the pupils' most familiar medium- that of their mother tongue.

As Jegede and Aikenhead (2013), Contreras and Lee (1990), Maddock (1981) separately argue, the mother tongue and the repository of cultural knowledge the learners bring to the learning space provide the teacher with the building blocks to provide safe cultural border crossing between the home culture and the school science culture.

Our study is couched both in the mother tongue and subject concepts drawn from the learners' familiar material world and the familiar process of turning these familiar materials into the finished product of soap used in every learner's home every day. This enables us to juxtapose the passing of the same learning through the medium of English, an L2, and Kanuri, the mother tongue.

Our study would be informed by Jegede and Aikenhead's (2013) claim of the presence or absence of "psychological pain" a learner experiences when subjected to a cross-cultural learning process through an L2, and Rasheed's (1997) observation that

there is “cultural violence” leading to the trauma associated with learning science in a language the child is deficient in, which in turn leads to cultural conflict in the pupil. Our study shall note this assertion when the same subject matter is taught in both English and in their mother tongue.

Nomlomo (2007) makes an interesting claim that teaching and learning through a second language is difficult both for the teacher and the learner if they are deficient in it. Our study will tell whether primary five pupils perform better in English, the L2 (which it is quite difficult to claim that the pupils are proficient in) or Kanuri, their mother tongue, in which they are proficient, when taught the same concepts of soap making in the classroom setting.

Lee (2002) argues that instruction in the mother tongue instills both a sense of ethnic identity and self-esteem in the learner. This study will note this claim when the pupils are taught the concept of soap making in Kanuri, their mother tongue.

Our study shall be informed by Nababan’s (2009) claims that the introduction of the national languages in Ethiopia has not only significantly raised the pupil enrolment but has also significantly reduced the pupil dropout rates, especially in rural areas. If the outcomes of our study confirms the same findings it would have far reaching implications for the Borno state educational system, especially should the outcomes of teaching science in Kanuri to the primary pupils prove to be a more effective instructional medium than English.

Nomlomo (2007) argues that teaching in the mother tongue is starting from where the learners are and from what they already know. In our study, both the language and the subject matter to be taught are where the pupils are: teaching them soap making concepts in their mother tongue, from familiar materials and processes in

their cultural milieu. The only difference is the science classroom setting. We shall see whether her claim bears out in our study.

Our study shall also be interested in the claims that scientific ideas are not owned by any one language and one culture (Nolasco, 2013) and that any language is capable of manufacturing and developing new words (Gondo, Nyota and Mapara, 2005), provided that mathematical and science languages can be "unpacked" for pedagogical purposes (Ball, 2000). Even more significant for our study, is Brock-Utne's (2005) strong claim that any language can be the language of science and technology if education occurs through the language the child knows well. Kanuri, the target language, is the pupil's mother tongue and they know it well. Whether they would perform better in learning and retention of science and technology concept as well as or even better than English, their L2, will be of interest to this study.

2.5 Impact on Students' Achievement in Science: English as a Medium of Instruction

In the National Policy on Education, the Federal Government of Nigerian (2004, Section 4; p, 16) provides that the medium of instruction in the lower basic school shall be the language of the immediate environment for the first three years. During this period, English shall be taught as a subject. From the fourth year, English shall progressively be used as a medium of instruction and the language of the immediate environment (cited in Okebukola, et al, 2012:8). The policy specifically provided that English language should be the medium of instruction in higher school levels.

According to Macauley, (1989), Fafunwa, (2004) and Makinde (2005), science and other school subjects should not be totally taught in English language but also in a child's national language at lower levels. This argument was based on the

philosophy that education is culturally biased and evolves from cultural patterns that are shaped by time and place (Atwater, 2012:6). The Educational Project of (1970-1978), reported in Fafunwa, Sokoya (1989) performed an experiment with the use of national language (Yoruba) as a medium of instruction in which he employed new methods of coining, borrowing, changing and translation of words in order to make Yoruba language for instruction from primaries 1-3 as an experimental group while English language was used for the control group primaries 4-7 in which he found out that there was a consistent statistically significant superiority of the experimental group over the control group.

Similarly, a study conducted by Kocakulah, Ustunglough and Kocakulah (2005) in Turkey indicated that students that were taught "Energy" in English had more misconceptions that those taught in the Turkish medium group. Thus, the national language of learner seems to be more effective in comprehension and application of science concepts than non-indigenous language. Fafunwa *et' al*., (1989) noted that instruction in the child's national language encourage pupils or students to acquire knowledge, skills and attitude when national languages are used at early age at the primary school level.

Furthermore, according to Akinbote, et al, (2003), Igbo and Hausa languages are more facilitative to learning than English language among school children in the areas where these indigenous languages are widely spoken. So also, according to Ehindero (1980), students' achievement in Elementary Science when taught in Igbo performed better than those taught in English. Orji and Orji (1989) using a set of Igbo speaking students, found out that the use of Igbo language facilitated higher students' performance and more favourable students' attitudes towards physics than using English Language. On account of the above achievements, it becomes imperative to

study the effects of national language as a supplement in the teaching and learning in the national language.

In the Daily Trust March 6th, 2008, according to UNESCO document titled "A step to keep national language alive", a person's national language is not only a vocal form of expressing one's expression, but it is the principal vector that propels and defines one's identity, ideals, values and cultural perspectives of a group in exclusion of others in the community of a nation in the world. With between 450 and 521 languages, Nigeria is the third most linguistically diverse nations in the world, surpassed only by New Guinea and Indonesia (Okebukola, 2012).Some of these languages are at the risk of extinction due to their apparent neglect by their speakers. A national language is one of the vehicles through which the United Nations stimulates the world on the crucial importance of language to humanity. This stemmed from the fact that languages are essential to the identity of groups and individuals as well as to their peaceful co-existence. However, despite their importance, the UNESCO noted that within the space of few generations, more than 50 percent of the 7,000 languages spoken in the world might disappear. The common languages are currently used in schools, and cyber spaces. Therefore, because of the influence of the common language, the Federal Government of Nigeria in collaboration with the Tourism Ministry has embarked on a campaign on best practices to safe-guard endangered Nigerian common languages. Nigeria is purported to have 420 languages now with high percentage of these languages influenced to develop creative writing skills and other proper forms of documentation to prevent them from extinction. After a workshop organized by the tourism ministry in 2006, a plan reinforcing creative writing competition in an indigenous national language was organized. The Director General of UNESCO, Koichiro Matsura, called on political

leaders to recognize the importance of national language and multilingualism everywhere: in education, administrative and legal systems, in cultural expressions and in the media. Koichiro Matsura, who spoke through the country's representative of UNESCO in Nigeria, Mr. Abhimanyu Singba, said national language as a factor influences social integration. Languages effectively play a strategic role in the eradication of extreme poverty and hunger. He therefore, encouraged the use of national language as widely as possible in teaching and learning. Finally, he disclosed that the common goal of national language is its application in education, administrative and legal system, trade, cultural expressions and the media cyberspace. This is widely recognized at the national, regional and international levels. As Okebukola (2012) pointed out, over two thirds of the countries in Africa, Asia and Europe have policies on the use of the mother tongue for teaching science in the lower levels of their education system. Regrettably, as Ademowo, (2010), pointed out, in spite of this policy thrust, the educational systems of many of these countries have not responded fully to the demands of such policy especially to configure the dynamics of science classrooms to match the demands of teachers, facilities, and pupils. He argues that this means that the dynamics of such classrooms, including language of communication (teacher-student; student-student) and geo-spatial dispersion of interactions need to be mapped to permit a thorough understanding of the potential obstacles on the path of implementing such policies.

The difficulties of implementing the Nigerian National Language Policy of 2004, was studied by Okebukola (2012). His findings show that science instruction in L1 was at an average frequency of 93.2% across rural areas this tapered off to 91.1% in primary 2 and 84.6% in primary 3. Fewer adherences was observed in urban schools with science instruction occurring less frequently 63.2% in primary 1, 49.2%

in primary 2 and 26.6% in primary 3. He explained that the relatively low level of violation of the policy in the rural areas is due to the homogeneity of the mother tongue of the pupils and that of the learners. While in the urban areas, there is heterogeneity in the language of the learners and the teachers.

Teaching in English, according to Silvia (2001), is democratic in nature where students are equal, enjoy free self-expression, give and receive respect, participate in activities, cooperate, have free discussions and debates. A democratic classroom, according to Harver (1994), is that in which pupils or students possess the right to be listened to, be respected and be treated fairly and observe the rights of others. These classrooms are characterized by participation and emphasizing values such as tolerance, mutual respect, fairness, freedom of expression and diversity of opinion. For Knight (1999), a classroom is democratic when it welcomes all students as equally valued members of the school community. Pearl (2005) added that in a democratic classroom all students have equal opportunity to learn. Therefore, the term is used here to mean the setting for learning where teachers and students all share ideas, use critical reflection and analysis, promoting the common goal, and participating in decision making.

Silvia (2000) again created the climate of an open democratic class that led 82 Japanese students of Spanish as a foreign language to work so hard. Among the classes, she tried to ensure collaboration, students' participation, free discussion of ideas and motivation.

In Hendershots project (2002) which took place in a tenth grade Language Arts classroom at a high school in Pennsylvania, 45 students from two separate classes participated in the project. It was structured around a unit designed on Shakespeare's Henry IV, a core play in the tenth grade English curriculum. The

objective was to examine how students' choice in the English classroom fosters interest and investment in learning. Rather than assigning the students a formal exam or an essay to write, she decided to leave the medium and topic relating to Henry IV up to them. In this way, the students explored topics she did not consider. The projects motivated them because they were given a choice. They also learned more.

Schechtman (2002) conducted a study to validate a measure of teachers' democratic beliefs on issues related to classroom life. He stated that the principles of democracy can be summarized in three concepts: freedom, equality and justice. Teachers may be friendly, give students freedom and responsibility, be understanding; or they can lead the classroom by giving orders being strict and expressing dissatisfaction. Democratic teachers (i.e. those who value freedom, equality and justice), are said to be self-transcended and open to change rather than self-enhancing and conservative. They tend to be cooperative and effective rather than oppositional; influence is shared with students rather than dominating them. They are more understanding and friendly rather than strict and admonishing in their behaviours. They hold multi-culturing strategies whereas the less democratic teachers clearly use restrictive methods. These results indicate that the better teachers were the more democratic ones in respect of teaching success. Helgesen and Kelly (2004) introduced democracy into children's classes by using questionnaire. They created work-sheets that required students to match English and Japanese Phrases. They then gave the students a questionnaire using the same phrases for the following month each student was asked to select one preferred learning focus (reading, writing, speaking or listening) and one topic from a list of five. From the results the authors created a pie char that indicated the ratio of topic chosen and the preferred learning focus. The authors were biased for making the lesson plans. Fourth to sixth grades chose reading

and writing as their preferred method of learning English, junior high school students placed emphases on speaking and listening. The children were used to make choices and take responsibility for their actions and this was built gradually.

Finally, according to Pryor and Pryor (2005) the students' attitudes in democratic classrooms during all the academic year were one of freely asking questions, free self-expression, active and effective participation in class. They investigated students' intentions to integrate democratic practices into their learning and the influence of their attitudes and beliefs. Participants were 76 graduates from 3 social studies method classes. On the theory of attitudes, there was a change in knowledge of how to integrate democratic practices to levels of course implementation. Here it is the grade level that determines the practice of democracy; such as making a choice and taking responsibility by students participation and finally, freedom to write about what interest them (McBurney and Morell, 2001).

2.6 Retention and its value in Learning Basic Science and Technology

According to (UNESCO, 2000), in every corner of the world, young children are learning languages at home that differ from the dominant language used in their broader social world. These children arrive at school with a precious resource: their mother tongue (L1). Typically, when minority and indigenous language children begin preschool or primary school, they must learn the language of the majority group in their region to fit in socially and succeed academically. Most often, these children are educated exclusively in the second language (L2). Though exceedingly common, these majority languages' educational programmes do nothing to support the minority languages of the children to develop competence in their L1. Moreover, the language policies that inform these programmes devalue the cultural backgrounds and knowledge associated with minority children's L1. Persistent early school leaving

and low academic achievement among minoritised children stem in part from these language-in-education policies (UNESCO, 2000). However, many initiatives around the world provide formal support for children to continue to develop competence in L1 and self-confidence as learners, while also learning an additional language or languages. This literature review focuses on the mother tongue-based bilingual and multilingual education programmes. This study is intended to assist UNESCO, the lead international educational agency, to develop clear guidelines and principles for language policy in early education, particularly within the context of the Dakar Framework for Action, Education for All (2000). Universal access to quality primary education for children and a 50 per cent increase in adult literacy by 2015 were among the goals set in this framework. In addition, UNESCO voiced support for the maintenance of linguistic and cultural diversity and the promotion of children's right to learn in their mother tongue. Many of the world's languages and cultures are endangered by historical incursions, mostly associated with colonialism, and a host of contemporary political, economic, and social processes. One way to counter this linguistic and cultural loss is to encourage and support parents to teach their infants and young children the local language in the home, and to deliver early childhood education programmes and formal education systems in the children's mother tongue. Although not conclusive, current theory and a growing body of empirical research on language acquisition and bi/multilingual learning provide a rationale for basing early education in children's mother tongue before introducing a second language as a medium of instruction. To date, very little research has focused on mother tongue-based care and development programmes for preschool-aged children. The vast majority of formal school systems around the world either require children to acquire a national or international language at school entry or soon after. Typically,

programmes offer two or three years of primary education in L1 before requiring learners to 'transition' to a national and/or international language in primary year two or three. Current research suggests that this trend threatens the preservation of the world's linguistic and cultural diversity. Decisions about which languages will serve as the medium of instruction and the treatment of children's home languages in the education system exemplify the exercise of power, the manufacture of marginalization and minoritization, and the unfulfilled promise of children's rights. Stroud (2002) maintains that "linguistic marginalization of minority language groups and their political and socio-economic marginalization go hand in hand" and that "one is the consequence of the other". Political, social, and technical considerations often collide in policy makers' decisions on language medium, schooling, and curriculum. Considerations include, but go beyond, questions of resources, teacher training, and subjects to be studied. Other crucial factors range from the political will of local, regional, and national governments, the relationships between countries and their former colonizers, the understanding and patience of international donors, and parents' hopes and anxieties about which languages their children will need to secure employment and participate with dignity in their social, legal, and economic worlds. Zubaida (1999), provide excellent analyses of these issues.

Our study will be influenced by the report's findings for effective policy recommendations to enable education planners and policy makers who are committed to language preservation and to ensuring that the children's mother tongue is adopted as the medium of instruction in the early stages of children's schooling.

2.7 Mother Tongue Instructions and Achievement in Science

The use of the mother tongue in teaching and learning of Science and Technology, especially at lower basic levels, has posed quite an interesting challenge to educators in diverse cultures and societies. While the choice of the language of teaching and learning was not an issue for the developed nations such as the United States, Russia, United Kingdom, France, China, Japan, and even among older nations like Iran, Greece, etc., the reality in developing nations is in stark contrast to that of their colonial masters. In the developing nations the language of Education is often the language of a colonizer for whom education was merely a tool for administering conquered peoples and territories; not for development.

Fafunwa and Bliss (1967) observed that no other nation in the world except most of the former colonies and those under colonial rule prepare their children for citizenship in languages foreign to them. They further observed that if the Nigerian child is to be encouraged to develop curiosity , manipulative ability, spontaneous flexibility , initiative, manual industry and dexterity, mechanical comprehension…, he should acquire these skills through the mother tongue as the medium of instruction which after all., is the most natural way of learning. They further argued that, the German, Italian, English children spend their first six years acquiring new skills in their mother tongue while the African child spends these formative years struggling with a foreign language.

The Ife Six Year Primary Project (SYPP), 1970-1976, was undertaken to prove the above point. After six years of instruction in their mother tongue, Yoruba, the Experimental Group who were taught in Yoruba as the medium of instruction while English Language was taught as a subject and the Control Group was taught in English as the medium of instruction, the Experimental Group taught in Yoruba

returned superior academic performance in all the subjects taught: Yoruba, English, Mathematics, Science and Social Science. This superior performance by the Experimental Group held constant whether the schools selected were in the urban areas or in the rural setting.

Perhaps even more impressive was the outcomes of the follow up studies of the SYPP products into their secondary school education where their examination results showed performances well above the average in most of the school subjects. They were also said to be better behaved, had better leadership and social skills.

The project writers argued that the SYPP has proved that primary education conducted in the mother tongue leadsto greater result in permanent literacy and numeracy; it has greater surrender-value and makes the child an integrated and adjusted citizen in his community.

It is, therefore, not surprising that educators, scholars and administrators of nations, where the language of teaching and learning is not the mother tongue but the language of the former colonial master, devoted considerable resources to study the implications of teaching science and technology in the mother tongue both from the pedagogical perspectives and the necessary policies needed to undergird them so as to accelerate the pace of science and technological developments of their nations.

Reyes (2010) conducted a research with the objective to determine which language is more effective in teaching science in Grade 4. The study attempted to find out how two classes one, taught the concept of radiation in Filipino and the other taught in English compared in terms of the following criteria; 1) number of words used/richness/quality of ideas conveyed in these words in the student discourse 2) length of response time before expression of answers 3) Enthusiasm/eagerness of pupils to participate indicated by their actuations and behaviour/words 4) summative

assessment scores. Additionally, the study also sought to obtain the teacher's and pupils' points of view regarding which language they consider more effective for use in the teaching and learning of science. From her findings she concluded that Grade 4 pupils can understand and express themselves better in Filipino than in English. They can respond faster when asked, perform readily when told to do something and get higher scores in a test. They are also more relaxed, were more confident, more enthusiastic and eager to answer and participate when the LOLI in science is Filipino. Both the teacher and her pupils expressed the opinion that Filipino is more effective in teaching and learning science.

Nolacso (2013) explains that many studies indicate that pupils first taught in their L1 and then later in the L2, outperform those taught exclusively in an L2. He cited the Labuagan Kalinga First Experiment in Philippines which showed the L1 experimental classes scoring nearly 80% in Grades 1, 2 and 3 science tests compared to just over 50% scores by the L2 control classes (taught in English).On the basis of these findings he concludes that using Filipino, an L1, would be more effective than using English, an L2, in Philippines.

This only goes to give support to Tapang's (2012) observation that despite the prominence of English as a language of instruction, it is not a requisite for excellence in maths and science pointing out that countries that rank high in maths and science tests in the Transcends International Mathematics and Science Study (TIMSS) carried out by the International Association for the Evaluation of Educational Achievement all have basic instruction in their local tongue.

Mufanechiya and Mufanechiya (2011) conducted a study which focused on language use and challenges teachers and pupils face in the classroom in their attempts to use the mother tongue in the teaching and learning of science in Grades 4-

7 levels. The study comprised 32 teachers from 8 primary schools purposively sampled from Mavingo urban area. Thirty \two of their lessons were observed and learners form the 32 classes participated in the study. Observation protocol and a structured questionnaire were the data collection instruments used. Zimbabwe's two major languages- ChiShona and IsiNdebele were used alongside English in an additive multilingual classroom setting. The researchers reported that teachers and students used extensive code-switching, resorting to the mother tongue when maths concepts became incomprehensible to the pupils. The researchers reported that the pupils found the mother tongue learner friendly and helpful in learning math.

Teachers in the study reported that the mother tongue is a critical player, called upon when the going gets tough for learners in understanding mathematical concepts. "You make use of what they know in their immediate environment and in their language. During one mathematics lesson one pupil use this Shona analogy about improper fraction, Mwana muhombe akatakurwa ne mwana muduk"' (literally translated, A big child being carried by a small child). This was the language the pupils used in mathematics lesson and it seems mathematical communication was achieved even when ChiShona was used. The Zimbabwean classroom situation continues to be dominated by English from primary to tertiary level and ChiShona and IsiNdebele are not officially used as medium of instruction (Chimhundu, 1988). The language of instruction should help create mutual dialogue between the teacher and the pupils as well as among the pupils themselves.

The argument is based on the theory that children who learn to read and write in their mother tongue do better than children obliged to learn to read and write in a second language (Africa News, 2003). According to SIL UK (2003), Studies in Kenya, Botswana, South Africa, Malawi and Mali have shown that mother tongue

instruction is the best policy, arguing that when the language of instruction is not the mother tongue, it places double demand on the pupils: first, the demand on language acquisition and second, concept learning and meaning making. The language experience of the pupils should be harnessed in formal learning situations so that the pupils become active rather than passive participants in the learning process (Gondo, Nyota and Mapara, 2005). The argument rests on creating a friendly language environment in the classroom. Researchers and studies, agree that the use of mother tongue as a medium of instruction makes it possible for numeric achievement and development.

Johnsen (2011), reports that results from pilot projects on mother tongue in education in Mozambique, show that children who are taught in their mother tongue do better in schools than those taught in Portuguese.

Nababan, (2009) in a study conducted by the Ethiopian Ministry of Education in conjunction with the USAID covering 2000-2004 to determine the extent to which the use of mother tongue versus English as a medium of instruction affect students' overall achievement reports that students' performance in Mathematics and sciences was far better for those taught using the Mother tongue as a medium of instruction than those taught using English. From this study Bogale (2009) concludes that in Ethiopia, the use of mother tongue as medium of instruction (MOI) for mathematics and sciences in upper primary education (grades 7&8) has a positive impact on students' achievement scores.

Nomlomo (2007) in a comparative longitudinal study conducted from 2003 to 2005 on science teaching and learning through the medium of English and isiXhosa language in Western Cape in two primary schools in Grades 4-6 concludes, among other findings, that there were more learners with writing difficulties in the control

(English) class than in the experimental group. The research data also showed that those who were learning science through isiXhosa had better understanding of concepts than those who were taught in English. The researcher also argued that her research showed that learners in the experimental group had more confidence than those in the control group. They could express themselves more fluently and clearly in their mother tongue and surprisingly in English as well. Perhaps more importantly was the researcher's claims that the experimental group learners aspired for better jobs such as being the first black astronauts, medical doctors, social worker while the majority of the control group learners were shy and they could not express themselves freely in English. The researcher therefore argues that there is a positive correlation between the use of the learner's mother tongue as a medium of instruction and learner's understanding and academic performance in science.

Nomlomo (2007) also drew attention to her findings that the more proficient the teacher and the learners are in the language of instruction, the more effective the teaching and learning process would be, as classroom interaction is free of breakdown in communication or misunderstandings if both the teacher and the learner are speaking the same language. Besides, teachers seem to mediate learning better in L1, especially if the learners speak the same language with the teacher. The point clearly made by the research findings was that teaching and learning through a second language is difficult for both the teachers and the learners if they are not proficient in it. This point of view was supported by Nomlomo,(2007) pointing out that stress and uncertainty that usually arise from the mismatch between the language used at home and the language used at schools leads to more barriers to learning.

Researchers such as Okoro, et al, (1992) have carried out studies on the relative effects of national languages as a supplement on students' learning outcomes

in different subject areas. Little if any of such studies have been done in the area of Basic Science and Technology in Borno State primary schools in Kanuri or any Nigerian National Language.

In Nigeria Okoro, (1992) compared the relative effects of the use of Igbo and English Language for the teaching of a national language (Ibo) and English. The purpose was primarily to find out which of the two media leads to better understanding among the students in the Eastern part of the country. A total of thirty six students randomly divided into matched classes of eighteen students were used. Class A was taught using Igbo as a supplement and class B was taught same topic using English. The two groups were tested after two weeks of instruction. The null hypothesis tested for this study was, "there was no significant difference in the understanding and performance of students taught using Igbo and those taught using English language as media of instruction." A chi-square X^2 statistics was used to test the hypothesis which was significant at 0.05 level of significance with X^2 value of 5.90 in favour of Igbo language speaking students. Based on the findings, Okoro recommended that students in the junior secondary schools be taught using Ibo language as a medium of instruction. The English language should be introduced later after the students have had a firm grasp using Igbo language.

Amaefule (1998) investigated the effects of three communication media on students' achievement in chemistry. The purpose of the study was to find out the effects of Igbo, Yoruba and English on students' academic achievement in chemistry at the senior secondary school level. The design of the study was the pretest-posttest control group experimental design. Four hypotheses were formulated for the study and tested at 0.05 level of significance. Three schools were used for the study. There were three experimental and one control groups in each school. Analysis of variance

and the t-test were the statistical tests used to test the hypotheses. The researcher used chemistry achievement test as an instrument for collecting data for the study. The results indicated significant differences in the mean scores of Igbo, Yoruba and English groups in chemistry achievement test with Igbo language having the highest mean, followed by Yoruba and lastly English Language. There was no significant difference in the mean scores of Yoruba and English in the chemistry achievement test although the mean score for Yoruba was slightly higher.

The implications of the study were as follows: firstly, the significant difference in chemistry achievement score of students taught using Igbo, Yoruba and English language indicated that students' achievement in chemistry is a function of national language as a supplement used by the teacher in the teaching process. This calls for a greater attention on the part of science teachers in general and chemistry teachers in particular to be careful in selecting the medium to be used in teaching any topic in science. Secondly, Igbo language is the most favoured of these media in students' achievement in chemistry test which implies that Igbo language should be used in preference to both Yoruba and English languages. Thirdly, that Yoruba and English languages of instruction have some influence on students' achievement in chemistry indicates the non-superiority of these media over each other. It implies that effective use of any of the two national languages i.e. Igbo and Yoruba will produce some learning experience in science and chemistry in particular. Based on the above findings, Amaefule, (1998) gave the following recommendations that:

i) Igbo language as a medium of instruction in science be used by Science and English teachers

ii) Teachers teaching science in general and chemistry in particular adopt the use of national language at the primary and junior secondary schools levels.

iii) Science teachers in general and chemistry teachers in particular should not limit their use of language to Yoruba and English languages alone. These media should be supplemented by the Igbo language too.

iv) Government should organize workshops and in-service training programmes for science teachers to acquaint them with innovations in the use of Igbo language for teaching science.

Banu, (1992) conducted an investigation on the effects of Hausa language on students' achievement in Biology. The purpose of the study was to compare the performance of students who were taught biology using Hausa language as a medium of instruction and those taught using English language. The researcher used a total of forty students. Three schools were selected for the study. Thus there were two groups in each school. The experimental groups were exposed to Hausa Language as a supplement while the control groups were exposed to English language only. For both groups, continuous assessment and the final achievement test were given at the usual interval as practiced in these schools. Marks for the experimental groups were assigned on group basis. Grades of members were averaged and assigned to each member to ensure the group's efforts. The marks of the control group were assigned to each student as normally practiced on individual basis. One teacher was used to teach both experimental and control groups in each school to ensure coverage of the same content. At the end of term, a post-test was conducted. The results obtained showed that the pre-test scores of the experimental and control groups of each set of school were compared and the entry behaviour seems to be the same. Using t-test the experimental group posttest score and the control group posttest scores were compared separately for each of the schools. The results indicated that there were significant differences between the control groups and the experimental groups. The

results however showed no significant difference between the experimental groups at the 0.05 level of significance. The results obtained from this investigation confirm the effectiveness of Hausa as a supplement in learning of science in schools, thus students taught using the Hausa language as a medium of instruction in teaching and learning did better than the students that were taught using English language only.

Similarly, Obioma, (1984) conducted a study to investigate the effects of English and Yoruba in presenting school physics tasks. Hypothesis on teaching media and sex as significant factors on the physics performance were tested beyond the 5% level of significance. Two initially equivalent groups of a random sample of 120 class three secondary students were randomly assigned to two treatments in English and Yoruba respectively taught a unit on optics. The two groups were post-tested after four weeks for any significant differences in their physics scores. Data were analyzed using the 2x2 (teaching x sex) Analysis of Variance test and the Scheffe's multiple group comparison tests. Major findings indicated that the Yoruba language group performed significantly better (at P = 0.05) than the students taught in English language. Obioma then recommended that secondary schools physics teachers should explore the use of Yoruba language as a supplement for presenting various physics tasks. In this study the effect of Kanuri language as a medium of instruction will be used to teach lower basic the concepts of making soap in order to determine the effect of the media used on pupils' academic achievement.

Osungbemiro et al (2013) conducted a study into the use of indigenous languages as media of instruction in teaching Biology case-studied some selected secondary schools in Ondo West local Government in Ondo State. The research was conducted in four schools in Ondo West local Government Area.

The research tested the following null hypotheses:

Ho1:There is no difference in the post test achievement scores of the experimental groups and the control group

Ho2: There is no significant difference in the posttest achievement scores of students taught in Yoruba and those taught with English Language as medium of instruction

Three groups of students from different schools were used. There were two experimental groups and one control group designated A, B, and C respectively. The three groups were randomly selected from school in Ondo Local Government Area of Ondo State. Group A was exposed to a topic called Nervous System in Yoruba Language while Group B was taught only in English Language. Group C was not taught in order to cater for the lack of relevant reference material. Reading texts in both Yoruba and English languages were prepared in three sub-topics. (1) The meaning and structure of the skeletal system (2) the functions of skeleton, the tissue and its components (3) anatomy of the skeleton of a mammal. The reading material was validated by three biology teachers and suggested for amendments and which were corrected. The Yoruba version of the text was produced and validated by three experts in Yoruba language for Yoruba English Group (YEG) and in English language for the English English Group (EEG). It was ensured that none of the topics to be treated in the study had been dealt with in any of the schools. After the administration of the pretest the experimental groups were taught the lesson while the control group was not taught at all. The posttest was administered to the students after the lessons had been taught. The test which was administered to the students for the pretest was also administered again for the posttest after teaching the experimental groups using English language as the medium of instruction for the EEG and Yoruba Language as the medium of instruction for the Yoruba Experimental Group.

The results show that the Yoruba Experimental Group has the highest mean (13.32) followed by the English Experimental Group and the Control Group with the mean of 8.47 and 5.75 respectively. Hypothesis one which stated there was no significant difference in the post test achievement scores of the experimental groups and the control group was rejected because the data showed there was a significant difference between experimental and control group because they performed better than the control group. This seems s to signify that both English and Yoruba languages are effective media for instruction.

The second hypothesis which states that there is no significant difference between the Yoruba Experimental Group and the English Experimental Group was tested and rejected because those who were taught in Yoruba performed significantly better that those who were taught in English Language.

The researchers claimed that the use of Yoruba as a medium of instruction placed the Yoruba Experimental students at an advantage over the English Experimental and Control Group. They further claimed that the use of Yoruba as a medium of instruction contributed to the higher achievement of the experimental group. They further pointed out that skeletal system known to be difficult to teach and learn due to its being too wide in nature was taught and learnt with relative ease using Yoruba Language as a medium of instruction.

An earlier study was conducted by Alabi (2002), in which she evaluated the implementation of using Yoruba as a medium of instruction in the teaching of primary science. 25 primary science teachers in 20 randomly selected schools in Ilorin Township formed the sample for the study. The relevant data for the study were collected using a questionnaire tagged Yoruba Language and Primary Science Teaching Questionnaire (YLSTQ). The instrument was face and content validated and

its reliability coefficient of 0.091 was determined through a test-retest technique using five primary science teachers in the schools outside the study sample. Simple percentage and rank ordering statistics were used to analyze the data collected. Two research questions were asked:

Research question: which of the language-Yoruba and English- do the science teachers find more convenient to teach science lessons?

The results show that English language is found to be more convenient and hence, more frequently used (76%) in the teaching of Primary Science. The researcher explained that the reason for this strong preference for the use of English in teaching lower basic Science could be due to the relative ease of getting appropriate words for science concepts in English Language (92%) than in Yoruba language (8%)

Research question 2 sought to find out how effective is Yoruba Language in teaching of science in terms of pupils' understanding and interest? The findings revealed that Yoruba Language is more effective in imparting knowledge of lower basic science to pupils-heightening pupils' interest (80%), participation (72%) and understanding (76%), and ability to relate learnt concepts to the environment. As the researcher pointed out relating concepts to the environment is a requisite for meaningful learning in science. And that is possible only when instruction is given in a language that the pupils understand fluently. The researcher further reports that majority (72%) of the respondents suggested the use of Yoruba Language to teach lower basic science.

This study attempts to examine whether the teaching of Science and Technology concepts in Kanuri in middle basic levels would be more effective in academic achievement and retention than teaching same concepts in English Language or not. It also attempts to examine whether gender would be an important

influence in academic achievement and retention when Science and Technology concepts are taught in Kanuri Language.

Mbabah, (1991) conducted an experimental study of the effects of three national languages on students' performance in beginning shorthand. The purpose of the study was to compare the performance in shorthand speed writing and transcription of three groups of students who were treated to different practice distribution, which were:

i) Thirty minutes twice a day for four days in a week

ii) One hour, once a day for four days in a week

iii) Two hours a day, twice a week

Hypothesis for any significant difference in the mean performance in shorthand speed test among groups of students who were taught with short periods and those who were taught using long periods was tested at 0.05 level of significance. A pre-test was administered to know the initial entry behaviours of the students. The findings indicated that the three experimental groups were homogenous. The first two posttests never showed significant F-test values at 0.05 level of confidence using ANOVA and Duncan Multiple Range Analysis. Significant difference was obtained following the different treatments from posttest three to posttest eight. Mbabah therefore, concluded that using national language as a supplement in teaching with practice periods as short as thirty minutes twice a day, properly spaced produced higher mean scores in short hand speed performance and the teaching practice periods of one hour a day produces a higher mean score than two hours a day followed by two-day break.

The implication of this study was that short repetition practice sessions using national language as a supplement are more effective in skill performance than those

long and widely spaced sessions. Regular repetition is a necessary ingredient and process of acquiring skills. Skill performance is therefore, directly related to the amount of rehearsal and the amount of materials to be learned and practiced at a time. Another implication of this work was that repetition practice is a performance variable rather than a learning variable, which means that constant practice, not enough to allow boredom and fatigue changes the underlying abilities while rest helps performance. This study is very significant to the present study in that it has to do with national language in knowledge, skill and attitude development as it will help the researcher to prepare the treatment time-table for both laboratory and class work effectively. It can also introduce and encourage the need for repetitive performance of certain tasks in the laboratory for the students to become perfect in their knowledge, skills and attitudes in shorter time.

Ugwainyi, (1998) investigated the effects of Igala and English languages on students' achievement in physics in selected secondary schools in Nsukka. The purpose was to find out the extent to which Igala and English languages actually affect performance in physics with a view to recommending a better option.

Three Hypotheses as follows were tested at $P<0.05$

i) There was no significant difference in performance of secondary school physics students taught in Igala and those taught in English language.

ii) There was no significant difference between the performance of male and female secondary physics students taught in Igala language.

iii) There were no interaction effects between sex and teaching media on the achievement of the physics students.

Two secondary schools, one male and one female, were randomly selected for the study. The subjects (120) were exposed to the treatment for four weeks. The task

presenters were interchanged within the two groups after two weeks of experiment to minimize errors due to teacher variable. The one way analysis of variance (ANOVA) test was used to verify the initial abilities of the students in physics before they were treated with either English language or Igala. The 2 x 2 analysis of variance was used to test the effects of the two languages on the performance of the students in physics. From the analysis, the results indicated that students had equal entry behaviours in physics before the experiment. The 2 x 2 analysis of variance was used to test the hypothesis instead of analysis of covariance since the initial ability levels of the students were equivalent.

The results indicated that the calculated F due to the teaching media is 130.8, while from the F distribution, the value of F beyond 0.05 probability level (at 1 and 116 df) was 3.65. The difference was highly significant, thus leading to the rejection of hypothesis one. Hence students' performance was related to the teaching media used. It was tested that sex had a significant effect on performance of students. Female students performed significantly better than their male counterparts. Finally the calculated F due to interaction effects was less than the expected 3.92 value leading to the acceptance of hypothesis three.

The findings of this study were that using Igala language of instruction in physics was more effective than the commonly used English language. In other words, Igala language increased the degree of students' interest, and consequently students developed principles based on their observation and in addition, encouraged enquiry and group work. The study therefore, recommended that Physics teachers in Nsukka should encourage the language for effective teaching and learning.

The present study intends to use Kanuri and English Languages as media of instruction to teach the concept of soap making to middle basiclevel in selected

schools in Maiduguri. The objectives are to determine the influence of the use of these languages for teaching on the performance and retention of the concept taught and the influence of gender on the performance and retention of the pupils when taught in these two languages.

2.8 Implications of Literature Reviewed on the Present Study

As mentioned, one of Vygotsky's main contributions to education is his concept of Zone of Proximal Development: the gap that exists for a learner between what s/he is able to do on their own and what s/he can achieve with help from more knowledgeable person. Individual's potentialities are different. "Some children have larger zone of proximal development than others, even when their existing levels of performance are similar" (Wood, 1998). Bruner's theoretical arguments about the nature of cognitive development, nevertheless, have direct implications in education. Developmentally appropriate education in which materials and instruction are suitable for pupils in terms of their cognitive abilities is very important. That is, attempts to ask questions or explain things to children before they are mentally ready cannot help their development. Indeed, premature questioning or explaining frustrate the child who cannot understand what s/he is being taught. In pre-school and elementary school, for example, children need to see physical representations of ideas or concrete examples of concepts.

Moreover, teachers should allow children to act upon the world with objects and tasks that serve to foster their understanding of invariance. While observing this point, teachers should not enforce correct answers. Instead, children must be free to construct their own understanding.

According to Berk (cited in Slavin, 1994), the main educational implications drawn from Brunner's are "*A focus on the process of children's thinking, not just its*

product. And recognition of the crucial role of children's active involvement in learning activities…"

The literature so far reviewed indicated that the use of the child's first language is far more effective in teaching and learning than teaching him in a second language. Studies in Philippines by Reyes (2010), on Grade 4 Science class reports that pupils' participation and sharing of ideas were found to be more enthusiastic, spontaneous and articulate in Philippino than in English Language, evaluation scores were also better in the classes conducted in Philippino Language than in that conducted in English Language. Nomlomo (2007) in a study in Western Cape(South Africa) asserts the more proficient the teacher and learners are in the language of instruction, the more effective the teaching and learning process will be, because there will be no communication breakdown or misunderstanding if both the teacher and the learner are speaking the same language. Zimbabwean Mufanechiya and Mufanechiya (2011) drawing from studies conducted on the use of the Zimbabwe's two major Languages, Chishona and IsiNdebele, concluded that students taught Mathematics concepts in their mother tongue had higher achievement scores than those taught in the second language: English. Various scholars like Nababan in Ethiopia, Johnson in Mozambique and Okoro in Nigeria all unambiguously showed the superiority of teaching using mother tongue at the lower and middle primary levels in the child's first language over the second language. This study seeks to do a comparative study of pupil's academic achievement and retention level in Science when taught Basic Science and Technology in their mother tongue, Kanuri, and English Languages (L2), their second language.

The literature reviewed so far strongly points to a superior achievement in the various subjects taught in the learners' mother tongue than in English Language, the

learner's second language. One of the main objectives of this study is to test/determine whether pupils taught Basic Science and Technology concept in Kanuri Language will have a higher achievement and retention rates than when taught the same concept in English Language.

It can be summed up that the literature on use of mother tongue as the language of learning and teaching indicates a near unanimous acceptance of its greater impact on the learners' achievement than those using an L2 as the language of learning and teaching across a broad range of surveys carried out cutting across diverse communities and cultures.

On the other hand, the literature on gender differences on academic achievement so far has mixed results. While some studies show male's advantage over females in academic success, the mainstream of these studies that cut across diverse communities and fields reveal the opposite. Some studies, on the one hand, show that gender has no effect at all on academic achievement, although other variables such as natural endowments, superior study skills, commitment, motivation, parental involvement and responsiveness, financial standing, etc., do have some effects.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter describes the methodology used in conducting the study, under the following sub-headings:

- Research Design
- Population of the Study
- Samples and Sampling Techniques
- Instrumentation
- Pilot Study
- Administration of Treatment
- Data Collection Procedure
- Data Analysis

3.2 Research Design

The design adapted for this study is quasi-experimental research design (pre-test post-posttest control group) with random assignment of students to experimental and control groups (Kerlinger, 1973, Fraenkle and Wallen, 2000).

A pretest (BSTAT) was administered in order to determine the equivalence of the two groups in their ability level. An achievement test in Kanuri was also administered to the experimental group as pretest. At the end of the treatment, posttest (BSTAT) was administered to the two groups to determine the significant difference if any in their mean academic performance in Basic Science and Technology. BSTAT was also administered as posttest after the treatment in order to determine the effect of the treatment i.e. the use of Kanuri Language as medium of instruction on the experimental group.

The design is represent as follows:

EG - 01 → X_1 → 02 → 03

CG - 01 → X_0 → 02 → 03

Where;

EG	=	Experimental Group (Taught in Kanuri)
CG	=	Control Group (Taught in English)
X_1	=	Teaching Science in Kanuri (Treatment)
X_0	=	Teaching Science in English
0_1	=	Pre-test administration
0_2	=	Post-test administration
0_3	=	post post-test administration

Figure 3.1: Schematic Representation of the Research Design

This design is recommended by Kerlinger (1973), Fraenkle and Wallen, (2000) for experimental study of this nature. This design has the advantage that the scores obtained from the pretest can be used to statistically find out if there is any difference between the groups at the start of the experiment. Also it would show difference(s), if any, in the post-test scores at the end of the experiment.

3.3 Population of the Study

The populations from which the sample of this study was drawn are lower basic five pupils (mixed) of the seven Model Primary Schools in Maiduguri Metropolis.

They are as listed in Table 3.1.

Table 3.1: Population of the Study

S/N	School Name	No Pupils	Boys	Girls
1	El-kanemi Model Primary School, Maiduguri	548	300	248
2	Ruby Model School, Maiduguri	460	281	179
3	International Model School, Maiduguri	904	514	390
4	Capital Model School, Maiduguri	108	070	038
5	Namu Model School, Maiduguri	032	028	004
6	Innovative Model School, Maiduguri	110	073	037
7	Abande Model School, Maiduguri	209	107	102
.	Total	2371	1373	998

Source: (Borno State Ministry of Education, Maiduguri, 2012)

3.4 Sample and Sampling Procedure

For the purpose of sampling, two model primary schools were selected from the population using random sampling technique. The sample size used for the study is ninety five (95) primary five pupils in the selected schools, i.e. one class from each school with 48 and 47 pupils from each of the schools respectively. The names of the seven science model primary schools were written on pieces of paper, two papers were picked from the box, and the name of schools on the papers was used as the sampled schools. The schools selected were assigned experimental and control group using balloting. Since all the school in the population are at different locations, it is assumed that interaction did not occurred between the groups during the period of treatment, which could affect the result of the study. The sample schools finally selected are as in Table 3.2

Table 3.2: Sample of the Study

S/No	Group	Names of Schools	Number of Pupils	Girls	Boys
1.	Experimental	Innovative Model Primary School	48	23	25
2.	Control	Ruby Model Primary School	47	17	30

3.5.1 Instrumentation

The instrument that was used for data collection in this study was BSTAT test item constructed by the researcher. The items in the test covered the concept that was taught by the researcher in Kanuri and English. The BSTAT test items are made up of thirty four (34) test items consisting fifteen (15) multiple choice questions with four options (A-D), fifteen (15) subjective or fill in the gaps questions carrying one mark each. Four short (4) short essays, each carrying ten (10) marks, was converted to hundred percent (100%). The same test items were also used for both groups as posttest and post posttest after treatments for four (4) weeks, (in one double period of 60 minutes) per week.

The questions were designed both in essay and multiple choice forms to see whether the pupils have comprehended what was taught to them and whether they have retained anything from what they were taught. The essay questions require them to express their understanding of the subject taught in their own language. The multiple choice questions are susceptible to luck and guess work. The pupils' efforts in the essay questions would confirm their understanding and retention of the lesson learnt when they had to express them in their own words.

3.5.1 Description of Instructional Research Instruments (Lesson Plans)

Two sets of instructional research instruments were constructed:

A) *Instructional Research Materials in English*: four lesson plans were constructed covering the delineated subject topic to be covered by the study. **Lesson One** is a double period of 60 minutes duration which introduced the basic concepts of soap making, types of soaps, and thetypes of materials used in making soap and the processes of soap making. At the end of the lesson the teacher summarized the lesson and allowed learners to ask questions. **Lesson 2** built on the previous knowledge acquired in Lesson One. The teacher brought to the classroom all the materials required for local soap making such as water, palm oil, caustic soda, dry plantain husks and source of heat.The teacher ***demonstrated***soap making while the learners watched keenly.The learners' activity was mainly helping the teacher crush some of the materials for soap making, adding water to the ashes, tending to the fire, etc...**Lesson 3**built on the previous knowledge gained in lesson 2. The teacher brought to the class: sodium hydroxide (caustic soda), PKO, common salt, caustic potash, red litmus paper, source of heat, etc., *all materials required for making soap from alkali.*The teacher demonstrated soap making. The learners'main activities included crushing some of the materials, stirring the mixtures and generally assisting the teacher in practically making the soap from alkali. At the end of the lesson, the learners were asked to describe the processes of soap making. **Lesson 4***discussed*and *listed* the uses of soap at homes, in the industries, at schools. Learners' main activities, in addition to actively participating by assisting the teacher in practically making the soap, was in listing the uses of soap in everyday life for cleaning purposes.

B) *Instructional Research Materials in Kanuri*: the four lesson plans in English were translated into Kanuri and presented exactly as they were, except that the medium of instruction was in Kanuri.

3.5.2 Validity of the Instrument

The test items with the marking scheme were validated by three senior lecturers, two of whom are of Doctorate Degree Status and one Master Degree holder, from the Department of Kanuri Language, University of Maiduguri and two lower Basic Science teachers from Innovative Model School, Maiduguri.

A table of specification built by the researcher based on Obeka's model (2009) was used in generating the BSTAT items to guide the construction of the instrument. Table 3.3 is the detailed table of specification which ensured the representation of each content area in the unit of study.

Table 3.3: Table of Specifications

Topics/Ability	**%**	**Cognitive Knowledge**	**Cognitive Comprehension**	**Cognitive Application**	**Total Items**
Definition of Soap	25	3	5	2	10
Listing of materials for Soap making	25	3	5	2	10
Process of Soap Making	25	3	5	2	10
Uses of Soap	25	3	5	2	10
Total		12	20	08	40
Total Percentage	100	30	50	20	

The experts were requested to examine and assess the entire test items with reference to the following:

i. Whether BSTAT instrument is valid, that is whether it conforms to the

objective of the content and specifications it was to test.

ii. Are the items clear, precise and free from ambiguity?

Among the 40 questions that were corrected and approved 22 were selected. That is 10 multiple choice and 10 fill in the gap questions and 2 short essay questions.

3.5.3 Pilot Testing

The Instrument Basic Science and Technology Achievement Test (BSTAT) was pilot-tested on primary five pupils of Namu Model Primary School, Maiduguri. This school is part of the population but not part of the sample used for the study. The aim of this pilot study was to determine the characteristics of the test items, which include their difficulty and discrimination indices and the reliability coefficient. Thirty pupils' comprising twenty one (21) boys and nine (9) girls participated in the pilot testing. The subjects were administered the achievement test (BSTAT) both in English and in Kanuri Language which covered the topics; definition of soap, listing of materials for soap making, processing of soap and uses of soap after BSTAT was administered, the data generated were analysed to determine the characteristics of the test items of BSTAT and the reliability coefficient of BSTAT. The results of the pilot test were then used to:

i. Assess the clarity of the items of BSTAT.

ii. Calculate the reliability coefficient of BSTAT.

The discrimination index and difficulty index were also determined using the scores of the pupils. The following adjustment was hence made based on the findings of the pilot study:

i. The length of time required to answer the BSTAT was increased from thirty (30) minutes to fourty (40) minutes because the pupils needed time to write the processing of soap step by step.

ii. The diagrams involved in preparation of soap are many, especially, question two in the essays section, which has to be drawn and labelled correctly.

3.5.4 Reliability of the Instruments

The Researcher used Kuder-Richardson Formula (KR20) method to establish reliability of the instruments. This method was used because of its numerous advantages, for it provides an estimate of the average reliability found by taking all possible splits without actually having to do so. The formula provides a meaningful way of estimating the reliability from a single administration of a test (Gilbert 1980). A pilot study was administered to one of the science model primary schools i.e. Namu Model Primary School, Maiduguri, using BSTAT items constructed in both Kanuri and English Languages. In the school thirty (30) pupils were used to determine the reliability of the test, its difficulty level and the ability of the pupils was established. The reliability was calculated to be0.89 which is high therefore, show the suitability of the test items for the study.

3.5.5 Difficulty Index of the Test Items

Test difficulty index is the level of a test that affects the spread of scores. In normed-referenced tests items, score variation is restricted if items are too easy or too difficult. According to Okpala, Onacha and Oyedeji (1993) that there is the tendency for students' or Pupils' scores to cluster towards the maximum score when items are easy whereas scores from difficult items cluster towards the minimum score. Restricted variability of test scores will reduce the reliability coefficient of test result. Thus, a moderate level of difficulty of tests items (0.45 to 0.65) is necessary to allow discrimination among students or pupils. Based on this, this study was able to determine and established the items difficulty index.

In computing the index of item difficulty (difficulty index), the test papers were scored and ordered from highest score to the lowest. A high and low group of the test papers were selected with an equal number of cases being included in each group. The groups were constituted to be the upper and lower 27 % or the upper and lower 33%. To determine this, the formula of difficulty index was used, given by:

$$D = \frac{CR_u + CR_1}{N_u + N_1}$$

Where:

D = difficulty Index

CRu = number of correct responses from upper group

CR_1 = number of correct responses from lower group

Nu = number of respondents in the upper group

N_1 = number of respondents in the lower group

From the data on the item, CRu, CR_1 Nu and N_1 are 20, 20, 33 and 33 respectively, substituting these values in the formula:

$$D = \frac{20+20}{33+33}$$

$$D = \frac{40}{66}$$

$$D = 0.606$$

This is an indication that the test items were moderate, not too difficult or too easy for the pupils to attempt during and after the experiment using Kanuri and English language as medium of instruction in teaching the concept of soap making at the lower basic science and technology among primary five pupils and as well retention ability after two weeks of the treatment.

3.5.6 Discriminating Index

According to Sim and Rasiah (2006) and Schreyer Institute for Teaching Excellence (2014) (http:/www.schreyerinstitute.psu./Tool/ItemAnalysis/) Discrimination Index (D) refers to how well an assessment item, especially in Multiple Choice Questions (MCQ) differentiates between high and low scorers. In other words, one should expect that high-performing students to select the correct answer for each question more often than the low-performing students. If this is true, then the assessment is said to have a *positive discrimination index* (0 and 1.0, indicating that students who received a high total score chose the correct answer for the specific item more often than the students who had a lower score. If however, it is found that more of the low-performing students got a specific item correct, then the item has a *discrimination index* (between -1 and 0).

The discrimination index (D) is determined by subtracting the number of students in the lower group who got the item correct from the number of the students in the upper group who got the item correct. Divide the number in each group. The resulting value is the difficulty index of the item. MCQ items that demonstrate good discriminating potential attend to be moderately difficult items and the moderately to very difficult items tend to show negative discrimination. For this study, questions having low or negative values of discrimination were reviewed very carefully for confusing language or incorrect key. The study finally had items that have equal distribution of 20, 20 for each group at upper and lower group. Therefore, the discriminating index of this test items tend to be zero, which means it discriminates moderately.

3.6 Administration of Treatment

The pupils were first exposed pre-test to check their knowledge base line. The pupils were then randomly assigned to experimental and control groups where they were exposed to different treatment as follows:

i. The experimental group was exposed to the treatment with Kanuri Language as medium of using the demonstration method to teach

ii. The control group was exposed to the same treatment but in their normal English medium of instruction, using the demonstration method of instruction.

Lesson notes were prepared to teach the selected science subjects in both Kanuri and English Languages (appendixes F and G).

3.7 Data Collection

At the end of the treatment, study subjects i.e. pupils were post-tested and data collected through the following;

i. Basic Science Technology and Achievement Test (BSTAT); A posttest (BSTAT) was given to both groups i.e. experimental and control groups and marked using marking schemes (Appendix C&D). Data was collected after marking the pupil's scripts with maximum score of 40. The scores were collated into experimental and control groups. The scores was further collated based on gender i.e. boys and girls. After sorting out the scores, the data was subjected to analysis. This is to determine significant differences if any in their academic achievement and the impact of gender on academic achievement and retention.

ii. Basic Science and Technology Achievement Test (BSTAT): BSTAT was also administered as pretest and posttest on the experimental group after two weeks to determine their retention level. Data collected was subjected to statistical analysis to determine the level of achievement, if any, in the experimental group.

The response of the subjects on the Basic Science and Technology Achievement Test (BSTAT) was scored by the researcher and research assistants using the marking scheme. Each correct response in the objective section was scored one point and the short answer question was scored ten points each with maximum score of forty (40) marks, which was later be converted to hundred percent for each respondent. After two weeks, a post posttest was administered and the scores recorded.

The scores obtained from the post – test and post posttest scores will thus be used to determine the achievement as well as the retention of the concept taught.

3.8 Data Analysis

The pupils' scores from the posttests of both Basic Science and Technology Achievement Test and that conducted after two weeks to determine the retention level of the pupils were collected for analysis. The hypotheses were restated with corresponding statistical tools for analysis at $P \leq 0.05$ as follows;

HO_1: There is no significant difference in the academic performance of pupils taught concepts of soap making in basic science using Kanuri Language and those taught using English Language.

Comparative t-test was used to test the hypotheses.

HO_2: There is no significant difference in the academic performance of boys and girls in subjects taught the concepts of soap making in Basic Science in Kanuri Language. Independent- t-test was used.

HO_3: There is no significant difference in the retention levels of pupils taught soap making using Kanuri language and those taught soap making using English Language as medium of instruction. t-test statistical tool at $P \geq 0.05$ was used for the analysis.

HO_4: There is no significant difference between the mean score of retention level of boys and girls taught in Kanuri Language and those taught using English Language as medium of instruction. Comparative t-test was used to test the hypotheses.

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

This study investigated the impact of Kanuri language as instructional medium on Academic Achievement and Retention among pupils in Lower Basic Science and Technology in Maiduguri Metropolis, Borno State, Nigeria. In this chapter the results of the statistical analysis of data from the study are presented under the following subheadings:-

- Data Analysis
- Results
- Summary of the findings
- Discussion of the findings

4.2 Data Analysis and Results

Basic Science and Technology Achievement Test (BSTAT) instrument was used for the collection of data in the study. Two groups of pupils were involved in the study. One group was taught in English language, control group, while the other group was taught using Kanuri language as medium of instruction which was designated as the experimental group. Two major variables were therefore, investigated, these were achievements from the instructional medium and the retention or recall after the experiment with the two media of instruction, English language and Kanuri language.

Data collected during the research were:

i. Mean scores of experimental and control groups using kanuri language

ii. Mean scores of boys and girls taught concept of soap making

iii. Mean scores on retention for experimental and control groups

4.2.1 Impact of Kanuri Language on Academic Achievement of Basic Science Pupils Taught Soap Making

Research Question 1: what is the difference in the academic achievement of pupils taught concepts of soap making in Basic Science and Technology in Kanuri language and those taught using English language in the selected primary schools?

To provide the solution to this question, descriptive statistics in the form of mean scores and standard deviation were used. The mean scores and standard deviation of the two groups are shown in Table 4.1

Table 4.1: Means and Standard Deviations of Experimental and Control GroupsAfter Treatment With BSTAT

Medium of Instructions	N	Mean	Standard Deviation	Standard Error
Kanuri Language	48	22.15	5.92	0.66
English Language	47	17.15	4.64	0.52

Table 4.1 reveals that students who were taught the concept of soap making using Kanuri language as medium of instruction performed better (mean 22.5) than their counterpart taught the same concept of soap making using English language (mean 17.15). The difference in performance was accounted for by the medium of instruction used (Kanuri language) for the teaching of the concept of soap, is a clear indication that Kanuri language which was used as medium of instruction has better impact on students' academic achievement among pupils of lower Basic Science and Technology than their counterpart taught using English language as medium of instruction. The statistical validity of this statement is left for the test of the related hypothesis of the study to verify as to whether significant difference existed or not.

Research Question 2: what is the difference between the academic achievement of boys and girls taught concept of soap making in basic science and technology using

Kanuri language as medium of instruction.to answer this research the scores of boys and girls were used to find out their means and standard deviations.

Table 4.2: Meansand Standard Deviationsof Boys and Girls taught concept of soap making using Kanuri Language as medium of instruction (Experimental Group)

Variable (Sex)	N	Mean	S D	S E
Boys	25	3.68	0.26	0.03
Girls	23	3.66	0.29	0.03

The mean scores in Table 4.2 revealed that boys had the higher mean score of 3.68 while girls counterpart had the means score of 3.66. When compared, they had slight difference of 0.02 mean score. However, going by the aggregate mean score, gender did not appear to make any significant difference. Their academic achievement is equated to be the same with only a slight difference.

Research Question 3: Does any difference exist in the retention ability of pupils taught concept of soap making in Basic Science and Technology using Kanuri language and those taught using English language in the selected primary schools?

To provide solution to the question, therefore, the retention mean scores of pupils in the experimental and control groups were compared. Table 4.3 shows the mean scores of the two groups (experimental and control groups).

Table 4.3: Meansand Standard Deviationsof Retention for Experimental and Control Groups

Groups	N	Mean	S D	S E
Kanuri Language (Experimental)	48	17.85	5.83	0.65
English language (Control)	47	16.70	5.12	0.57

Table 4.3 reveals that pupils taught concept of soap making using Kanuri language as medium of instruction had higher retention ability than those taught same concept using English language after two weeks of treatment. On the basis of this, therefore, it could be concluded that the use of Kanuri language as medium of instruction significantly enhanced the retention ability of pupils taught concepts of soap making in Basic Science and Technology.

Research Question 4: Does the use of Kanuri language as the medium of instruction in teaching the concept of soap making account for the difference in retention level of boys and girls?

Table 4.4: Means and Standard Deviations of Retention for Boys and Girls Taught Concept of Soap Making in Kanuri

Variable (Sex)	N	Mean	S D	S E
Boys	25	3.68	0.26	0.03
Girls	23	3.66	0.29	0.03

The mean scores in Table 4.4 revealed that boys had the higher mean score of 3.68 in terms of retention ability while their girls counterparts had the means score of retention ability 3.66. When compared, they had slight difference of 0.02 mean score. However, going by the aggregate mean score, gender difference makes no much difference. Their academic achievement is equated to be the same with only a slight difference in term of retention ability after two weeks of treatment.

4.3 Null Hypothesis

The hypotheses formulated to test the impact of Kanuri language as instructional medium on academic achievement among pupils in lower basic science and technology on concept of soap making were tested as follows:

HO_1: There is no significant difference in the academic achievement of pupils taught concepts of soap making in basic science and technology using Kanuri language and those taught using English language.

To test this hypothesis data collected from academic achievement of pupils on the BSTAT test was subjected to analysis using t-test statistics at a P value of 0.05. Summary of the result is presented in Table 4.4

Table 4.5: Results of t-test Analysis of Mean Scores of Experimental and Control Groups on Academic Achievement in Concept of Soap Making in Basic Science and Technology

Group		N	Mean	SD	S E	t-value	df	p Remark
Experimental	48	22.15	4.64	0.51				
					5.94	93	0.00	sig
Control	47	17.15	5.92	0.66				

Significant at the $\leq$ 0.05 level

Table 4.5 shows that pupils taught concept of soap making using Kanuri language as medium of instruction had the higher mean score of 22.15 compared with 17.15 of those taught same concept using English language. From the observed t-value of 5.94 at level of significant of 0.05, it could be concluded that pupils taught concept of soap making using Kanuri language achieved significantly higher than their counterparts taught same concept of soap making using English language.

The null hypothesis formulated is thus an indication that significant difference exists in the academic achievement of the pupils; hence the null hypothesis is therefore rejected. The result revealed that Kanuri language as medium of instruction significantly improved the pupils' academic achievement in Basic Sciences and Technology.

HO_2: there is no significant difference in the academic achievement of boys and girls taught the concepts of soap making in Basic Science and Technology using Kanuri language.

The hypothesis was tested using independent t-test by their mean scores and standard deviation sorted out. This is shown in Table 4.6

Table 4.6: t-test Analysis of Mean Scores of Experimental Groups of Boys and Girls Taught the Concept of Soap Making in Kanuri

Varibale (Sex)	N	Mean	SD	S E	t-value	df	p	Remark
Boys	25	3.68	0.26	0.03				
					0.04	93	0.05	not sig
Girls	23	3.66	0.29	0.03				

NB: Not significant at the $P \leq 0.05$ level

Table 4.6 shows that the mean scores of boys and girls taught the concepts of soap making in Kanuri language had slight difference in their scores of 3.68 and level of significance at 0.050. This is an indication that the null hypothesis was accepted that there is no significant difference existed between boys and girls taught concept of soap making using Kanuri language. Which means both sexes achieved significantly, therefore, gender difference was not a problem when using Kanuri language as instructional medium in Basic Science and Technology.

HO_3: there is no significant difference between the retention ability of pupils taught concept of soap making using Kanuri language and those taught using English language as medium of instruction after two weeks of treatment was used for this hypothesis. A two way or sample t-test was used because of the two independent groups (experimental and control groups). Summary of the test is presented in table 4.7.

Table 4.7: t-test analysis of pupils' retention ability in lower basic science and technology

Groups	N	Mean	SD	S E	t-value	df	p	Remark
Experimental	48	17.85	5.84	0.65	4.32	93	0.01	sig
Control	47	16.70	5.12	0.57				

Significant P < 0.05

The result from Table 4.7 indicates that pupils in the experimental group had higher retention ability on Basic Science and Technology in concepts of soap making than those in the control group. However, the observed difference was found to be statistically significant because the observed t-value 4.324 is higher than the critical value of 1.96 and the observed level of significance 0.01 less than the chosen level of $x \leq 0.05$. This means that the null hypothesis that stated that there is no significant difference in the scores of pupils taught soap making using Kanuri language and those taught same concepts in English language as medium of instruction in Basic Science and Technology at lower Basic Science and Technology level. Therefore, the hypothesis is rejected.

HO_4: there is no significant difference between the retention ability of boys and girls taught concept of soap making in Kanuri language as medium of instruction. The data collected to test the hypothesis raised was collected two weeks after the treatment of both sexes. The summary of the test is presented in table 4.8.

Table 4.8: t-test Analysis of Boys' and Girls' Retention Ability in Lower Basic Science and Technology Using Kanuri language as Medium of Instruction

Variable	N	Mean	SD	df	t-cal	t-crit	Remark
Boys	25	3.68	0.26	46	0.20	2.02	Accepted
Girls	23	3.66	0.29				

The result from Table 4.8 indicates that Boys and Girls had the mean of 3.68 and 3.66 respectively in the retention ability on basic science and technology in concepts of soap making using Kanuri language as medium of instruction. However, the observed difference was found to be statistically significant because the observed t-value 0.02 is lesser than the critical value of 2.02 and the observed level of significance $\leq$ 0.05. This means that the null hypothesis that stated that there is no significant difference between the retention ability of boys and girls taught concept of soap making in Kanuri language as medium of instruction was accepted since the critical value was greater than the calculated value of 2.02 as against 0.02, therefore, the null hypothesis was accepted, that there is no difference in their retention ability. The data collected to test the hypothesis raised was collected two weeks after the treatment of both sexes.

4.4 Summary of Findings

The following findings were obtained from data analysis and test of hypothesis.

1. Students taught Basic Science and Technology using Kanuri language as medium of instruction achieved significantly higher scores than their counterparts taught same subject using English language.
2. No significant difference existed between boys and girls taught Basic Science and Technology using Kanuri language as medium of instruction; the

difference is negligible and it is statistically insignificant. This means that although both sexes performed well their difference is insignificant.

3. There is a difference in the retention ability of pupils taught the concept of soap making in Basic Science and Technology using Kanuri language and those taught same concept using English language. Students taught using Kanuri language retained the concept of soap making significantly better than their counterpart taught using English language.

4. Teaching the concept of soap making in Kanuri failed to reveal a statistically significant difference in the retention level of boys and girls; the difference in retention was negligible between the two sexes.

4.5 Discussion of Results

Data collected and analyzed were based on the academic achievement of pupils in Basic Science and Technology Achievement Test (BSTAT) instrument. The data were analysed based on questions raised, hypothesis stated and the study design. The discussion of the results is as follows:

Null hypothesis one (HO_1); the impact of using Kanuri language as medium of instruction in teaching the concept of soap making in Basic Science and Technology and that of using English language to teach the same concept was tested by comparing academic achievement of pupils in the experimental and control groups respectively. Results from Table 4.5 shows that there is a significant difference in the mean scores of pupils in the experimental group and the control group. The results indicate that pupils taught concept of soap making in Basic Science and Technology using Kanuri language achieved significantly better scores than their counterparts in the control group who were taught same concept of soap making using English language as the medium of instruction. The higher achievement in favour of the

experimental group suggests that the use of Kanuri language is more effective than the English language when used as medium of instruction. The null-hypothesis was, therefore, rejected since differences existed between the two groups. From the corpus of data generated from this study, not only have the experimental group (N=48) performed better than the control group (N=47) as the mean scores of 22.15 and 17. 15 in Table 4.5 indicate, the details show that the pass rate for the experimental group stands at 75% while the pass rate of the control group stands at 52%.

The findings of this study is similar to that of Osungbemiro et al (2013) who conducted a study on the use of indigenous languages as media of instruction for teaching Biology.The researchers claimed that the use of Yoruba as a medium of instruction placed the Yoruba Experimental students at an advantage over the English Control Group. They further claimed that the use of Yoruba as a medium of instruction contributed to the higher achievement of the experimental group. They further pointed out that skeletal system known to be difficult to teach and learn due to its being too wide in nature was taught and learnt with relative ease using Yoruba Language as a medium of instruction.

The findings of this study is also supported by a similar earlier study conducted by Alabi (2002), who evaluated the implementation of using Yoruba as a medium of instruction in the teaching of primary science. One of the Research questions sought to find out how effective is Yoruba Language in teaching of science in terms of pupils' understanding and interest? The findings revealed that Yoruba Language is more effective in imparting knowledge of lower basic science to pupils: heightening pupils' interest (80%), participation (72%) and understanding and ability to relate learnt concepts to the environment (76%). As the researcher pointed out, relating concepts to the environment is a requisite for meaningful learning in science. And that

is possible only when instruction is given in a language that the pupils understand fluently.

The findings of this study also resonate with the findings of Ugwainyi (1998) who investigated the effects of Igala and English languages on students' achievement in physics in selected secondary schools in Kogi. The purpose was to find out the extent to which Igala and English languages actually affect performance in physics with a view to recommending a better option.

The results indicated that differences in the performance of the two groups was highly significant, indicating that students' performance is related to the teaching media used. In other words, Igala language (an L1) increases the degree of students' interest, and consequently students develop principles based on their observation and in addition, encouraged enquiry and group work.

Johnsen (2011), reports that results from pilot projects on mother tongue in education in Mozambique, show that children who are taught in their mother tongue do better in schools than those taught in Portuguese.

Nababan, (2009) in a study conducted by the Ethiopian Ministry of Education in conjunction with the USAID covering 2000-2004 to determine the extent to which the use of mother tongue versus English as a medium of instruction affect students' overall achievement reports that students' performance in Mathematics and sciences was far better for those taught using the Mother tongue as a medium of instruction than those taught using English.

From the above study one of the authors, Bogale (2009) concludes that in Ethiopia, the use of mother tongue as medium of instruction (MOI) for mathematics and sciences in upper primary education (grades 7&8) has a positive impact on students' achievement scores.

Nomlomo (2007:) reports similar findings to this study when she reported in a comparative longitudinal study conducted from 2003 to 2005 on science teaching and learning through the medium of English and isiXhosa language in Western Cape in two primary schools in Grades 4-6 reports a higher pass rate for the experimental group over the control group taught in English.During this research it was also found that pupils were more expressive, more creative and enthusiastically participative in the classroom, freely consult each, and speech is laden with humour, idiomatic expressions that adorn mother tongue use in a lesson that is activity-driven. The more capable ones acted as facilitators to the less capable ones thus, in Vygotskian parlance, "enlarging their Zones of Proximal Development"As a matter of fact, during the analysis of the pupils' works, we found the test results strongly correlating with the analysis of the pupils' work which shows that pupils expressed themselves better and logically in their mother tongue, both verbally and in writing than the pupils taught through the medium of English language.

Khosa (2012) who conducted a research on speakers of Xitsonga reports similar findings to this study, pointing out that when learning is conducted through the learners' first language it becomes easy for them to learn.

The findings of this study were also similar to that of Reyes (2010) who conducted a research with the objective to determine which language is more effective in teaching science in Grade 4. The study attempted to find out how two classes one, taught the concept of radiation in Filipino and the other taught in English compared. Her findings indicated that Grade 4 pupils can understand and express themselves better in Filipino than in English. They can respond faster when asked, perform readily when told to do something and get higher scores in a test. Both the teacher and

her pupils expressed the opinion that Filipino is more effective in teaching and learning science.

Studies similar to this one conducted by Nolacso (2013) and Tapang (2012) in the Philippines, indicate that pupils first taught in their L1 and then later in the L2, outperform those taught exclusively in an L2.

In the course of this study we found that the experimental group taught in Kanuri, their L1, appears less anxious when we were teaching them the concept of soap making. This finding fits in with Krashen's (1982) affective filter hypothesis in which he argues that the use of L1 helps learners to reduce their affective barriers in the classroom and assist learners with subject comprehension. Thus, the use of the mother tongue helps create a less threatening atmosphere. Similar findings were argued by Harbord (1992), Cole (2001), Schweers (cited in Khosa, 2012:77), Lightbrown and Spada (cited in Khosa, 2012:77)

Null hypothesis two (HO_2); was tested in order to find out whether significant differences exist between boys and girls when taught the concept of soap making in Basic Science and Technology using Kanuri language as medium of instruction. The results showed little difference in terms of their mean scores but the null hypothesis was accepted, which means that no significant difference existed between boys and girls when taught concept of soap making using Kanuri language as medium of instruction in Basic Science and Technology.

This means that both sexes achieved significantly but gender was not a significant factor affecting performance when using Kanuri language as instructional medium in Basic Science and Technology.

For this aspect of the study, only the control group participants were considered in keeping with the research question and the hypothesis framed. The

detail from the corpus of data generated is masked by the slight difference in the mean scores indicating that boys had a slight but statistically insignificant edge over the girls in the tests given. For instance, the composite scores from the three test elements: fill in the blanks, multiple choice and short essays, indicate boys (N=25) have not only a slightly higher means score of 3.68 to the girls' (N=23) 3.66, the boys have a higher pass rate at 78% to the girls' pass rate at 72%.

The findings of this study resonate with the findings of Udousoro (2011) who tested the effects of gender on mathematics ability on academic performance in chemistry on 100 SS1 Chemistry students in two secondary schools in Uyo Metropolis and found no significant difference in the achievement of males and females, concluding that gender is not a significant factor in science achievement. Similar findings were reported by Kano (2004) and Okon (2003) who assert from their studies that gender does not affect student's performance in science and mathematics.in a similar study, Ebunuwa-Okoh's (2010) argued that gender, age and financial status are not significant predictors of academic performance.

Abdu-Raheem (2012) findings are also similar to findings of this study: he conducted a study on gender differences and students' academic achievement and retention in Social Studies among Junior Secondary Schools in Ekiti State in a sample involving 240 students equally split between males and females. His findings indicate no significant differences between the retention mean score of male and female students in experimental and control groups. He concluded in the study that gender does not play any significant role on students' achievement and retention in social studies.

As pointed out earlier in the literature consulted in section 2.8 above, the impact of gender on academic performance has been the subject of a very lively

debate for long and it is far from being settled. As Kwaileh and Zaza (2011), Dayioglu and Asik (2004), Davies-Kean and Eccles(2002), among others, argue, the literature on gender differences in academic achievement, especially in higher education, where most of these studies have been carried out, reveals mixed results; with study results fairly evenly distributed among those showing males' advantage over females (OECD 2001, Young and Fisler (2000), etc.; those that show girls are better (Fergusson and Horwood, 1997; Younger, Harrington and Williams, 1999; among others; and those that, show that gender has no effect on academic success (Abdu-Raheem, 2012; Kang'ahi et al, 2012; Afuwape and Oludipe,etc

While as cited above, the findings of this research with regard to the effect of gender on academic performance resonate with most of the studies conducted locally; elsewhere in the world, scholars and studies are far less agreed. Based on the findings of this study, it is argued that gender has insignificant impact on pupils' academic achievement in Basic Science and Technology taught at the Primary school level. And, based on the lack of consensus among researchers on the subject, this study is in agreement with the opinion expressed by Buadi (cited in Ebenuwa-Okoh, 2010) who posits that the difference in gender as it affects student's performance is inconclusive at best.

Null hypothesis three (HO_3): there is no significant difference in the retention level of pupils taught soap making using Kanuri Language and those taught soap making using English language as medium of instruction. After two weeks of treatment this was investigated by comparing the retention ability levels of pupils in the experimental group and that of the control group. This hypothesis was tested at 0.05 level of significance using t-test and it was found that significant difference exists; hence the null hypothesis was rejected. The results indicate that the group

taught concept of soap making using Kanuri language as medium of instruction has better retention ability than their counterparts taught same concept using English language as medium of instruction. This is an indication that the use of indigenous language has better retention capability.

The finding of this study agrees with that of Reyes (2010) who reported that the use of indigenous language enhanced pupil's achievement and retention ability. The findings of this study is also in consonance with findings of The Educational Project (1970-1978), reported in Fafunwa and Sokoya (1989) where the use of Yoruba Language as a medium of instruction from primaries 1-3 as an experimental group while the English language was used for the control group in primaries 4-7 revealed outcomes that show that there was a consistent statistically significant superiority of the experimental group over the control group. Osungbemiro (2013) reported that the use of mother tongue for basic instruction aids better retention ability in students.

Hypothesis four (HO_4): there is no significant difference between the mean scores of retention level of boys and girls taught Basic Science and Technology soap making concepts in Kanuri language and those taught using English language medium of instruction. The result from Table 4.8 indicates that Boys and Girls had the mean of 3.68 and 3.66 respectively in the retention ability on Basic Science and Technology in concepts of soap making using Kanuri language as medium of instruction. However, the observed difference was found to be statistically not significant because the observed t-value 0.02 is less than the critical value of 2.02 and the observed level of significance $\leq$ 0.05. This means that the null hypothesis that stated that there is no significant difference between the retention ability of boys and girls taught concept of soap making in Kanuri language as medium of instruction was accepted since the

critical value was greater than the calculated value of 2.02 as against 0.02, therefore, the null hypothesis was accepted, that there is no difference in their retention ability. The data collected to test the hypothesis raised was collected two weeks after the treatment of both sexes.

The findings of this study are in consonance with the findings of Udousoro (2011) who tested the effects of gender on mathematics ability on academic performance in chemistry on 100 SS1 Chemistry students in two secondary schools in Uyo Metropolis and found no significant difference in the achievement of males and females, concluding that gender is not a significant factor in science achievement. Similar findings were reported by Kano (2004) and Okon (2003) who assert from their studies that gender does not affect student's performance in science and mathematics. Ebenuwa-Okoh (2010) who studied the influence of age, gender and financial status on the academic performance among undergraduates in the Department of Counselling Psychology in Delta State University, Abraka,claims that gender, age and financial status are not significant predictors of academic performance.

The findings of this study are also supported by the research findings of Liu and Wang (2005); Smith (2005); Ismail and Othman (2006), which showed gender has no statistically significant impact on learners' academic achievement. Similar studies by Abdu-Raheem (2012); Kang'ahi et al (2012); Afuwape and Oludipe (2008); Downing et al (2008); Berkant (2009); Mackintosh (1998), also indicate that gender had no significant impact on the academic achievement of the learners.

The findings of this study, on the other hand, contradict the findings of studies of Khwaileh and Zaza (2011) Dayioglu and Asik (2004) Fergusson and Horwood, (1997); Younger, Harrington and Williams, (1999); Davies-Kean and Eccles (2002),

Smith, (2005); Ismail and Othman (2006), which indicate that female students performed better than their male counterparts.

The findings of thisstudy also contradict the findings of OECD (2001; Young and Fisler, 2000; Mattox, 1997), whose findings indicate that males return superior academic achievement relative to females.

The findings and conclusions of this study, as indicated elsewhere above, is in agreement with the views expressed by Buadi (cited in Ebunuwa-Okoh, 2010) who posits that the difference in gender as it affects student's academic performance is inconclusive at best; perhaps other variables operating alone or in concert with others, affect and give colour to the various outcomes of research into the role gender plays in the academic achievement of learners across time, cultures and climes; each being the unique product of its defining circumstances.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The present study was carried out to investigate the impact of Kanuri language as instructional medium on academic achievement and retention among Primary Five pupils in lower Basic Science and Technology in Maiduguri Metropolis over a period of six weeks. The study aimed at investigating the comparative academic achievements and retention levels of Primary Five pupils when taught through the medium of Kanuri relative to when taught similar concepts using English language as the medium of instruction. The study also aimed to find out the impact of gender in academic achievement when pupils are the taught concepts of soap making in Kanuri language. The data collected was analysed using mean, standard deviation and t-test of significance at $P \geq 0.05$. The following discussion highlights the major findings of our study. It is specifically presented under the following sub-headings:

- Summary of the Study
- Summary of Major Findings
- Conclusion
- Contributions to Knowledge
- Recommendations
- Limitations of the Study
- Suggestions for Further Studies

5.2 Summary of the Study

This study investigated the impact of Kanuri language as an instructional medium on academic achievement and retention ability among pupils in lower Basic

Science and Technology when taught the concept of soap making. The study was carried out to:

i. Determine the impact of Kanuri language as medium of instruction on achievement of primary five pupils taught soap making.

ii. Establish the differences between the academic achievement of male and female subjects when Kanuri language is used as a medium of instruction to teach the concepts of soap making in Basic Science and Technology.

iii. Determine the retention ability among pupils in lower Basic Science and Technology using Kanuri language and English language as media of instruction.

iv. Determine the retention ability of boys and girls pupils in lower Basic Science and Technology using Kanuri language as medium of instruction in concepts of soap making.

Chapter two featured pertinent related literature that was relevant in areas such as teaching and learning Basic Science and Technology academic achievement at lower level, the History of the Kanuri People of Kanem-Borno, the importance of language for communication, teaching and learning, the future of national language for teachers, administrators and parents. Further discussed as relevant to the present study, in the literature reviewed, were factors affecting gap closure in national language programmes, impact of the use of English language in the teaching and learning of science and technology, students' achievement when English language is used as language of instruction, retention and its value in teaching. Overview of similar studies on the use of mother tongue for teaching and learning science and their implication for the present study were reviewed.

In chapter three, the methodology employed by the study was outlined. The quasi experimental research design was adopted (posttest control groups) and the pupils were randomly assigned to experimental and control groups. A simple random sampling technique was used to select two model primary schools, Innovative Model Primary school as the experimental school and Ruby Primary School in Maiduguri metropolis was selected as the control school. Ninety five pupils were selected from the population of the two schools: Innovative Model Primary School with 48 and Ruby with 47 pupils. The pretest was used to determine the similarities of the subjects before treatment. Treatment was administered to both groups. The treatment for experimental group was the use of Kanuri language and for the control group it wasthe use of English language as media of instructions. The primary five pupils were taught for six weeks. The difference in treatment administration was to determine the efficiency of the Kanuri language over the English language used throughout the pupils' academic achievement. A posttest was administered after the treatment to determine if there was any significant difference in pupils' academic achievement. Both male and female were post-post tested using Kanuri language to find any significant difference in their retention ability after two weeks of treatment.

The research instrument used was;

Basic Science and Technology Achievement Test (BSTAT) items which were used as pretest, posttest and post posttest. The data collected were analyzed using mean and standard deviation to answer the research questions and t-test statistics to test the hypotheses that guided the study at the chosen level of alpha at 0.05 level of significance.

5.3 Summary of Major Findings

At the end of the study, the following findings were made:

i. There was significant difference in the mean scores of Basic Science and Technology pupils in the experimental group taught concept of soap making in Kanuri language and those in the control group taught using English language. The experimental group significantly performed better with the mean score of 22.15 and observed t-value 5.94 and at level of significance at 0.05 compared to their counterparts in the control group taught concept of soap making using English language as medium of instruction with the mean score of 17.15.

ii. There was significant difference in the retention scores of pupils in the experimental group taught concept of soap making using Kanuri language with 20.85 and the control group with 16.70 using English language as medium of instruction taught the same concept in Basic Science and Technology. Pupils in the experimental group had higher retention ability than those in the control group.

iii. There was no significant difference in the retention scores of boys and girls taught in Kanuri language and those taught in English; this is an indication that both boys and girls had higher retention ability when asked to recall after two weeks from the day of treatment.

iv. The use of Kanuri language as the medium of instruction for the teaching of the concept of soap making accounted for the higher retention ability level because all pupils that were involved were able to recall the procedure or the step by step procedure of making soap after two weeks of treatment for both boys and girls.

5.4 Conclusion

On the basis of the findings emanating from this study, the following conclusions are drawn:

i. Pupils' academic achievement in Basic Science and Technology in concepts of soap making can be significantly improved using Kanuri language as medium of instruction.

ii. The use of Kanuri language as medium of instruction on academic achievement can significantly enhance pupils' retention ability in concepts of soap making.

iii. The use of Kanuri language as medium of instruction on academic achievement has accounted for the difference in performance and for higher retention ability of boys and girls in Basic Science and Technology in concepts of soap making.

iv. On a general note, the use of Kanuri language as medium of instruction on academic achievement and retention ability among pupils in lower Basic Science and Technology was found to have positive impact.

5.5 Contribution to Knowledge

This study investigated ways to curtailing poor academic achievement in Basic Science and Technology at lower basic science and technology in primary schools.

This study empirically established that:

i) Academic achievement in Basic Science and Technology can be improved with the use of Kanuri language as medium of instruction in teaching the concepts of soap making.

ii) The use of Kanuri language could also lead to positive performance in terms of practical teaching in Basic Science and Technology among pupils of lower basic science school level.

iii) As a result of Kanuri language used as medium of instruction, the retention ability level of pupils was very high after sixweeks of treatment.

iv) The use of Kanuri language also enhanced better retention of learnt concepts in Basic Science and Technology of boys and girls pupils. The use of Kanuri language could be a better alternative to the use of only English language alone.

v) This study points to the need to connect the home/community resources to the benefit of the learners in school; this is feasible only if the language of learning and teaching is one that is available to the parents of the learners in order to be able to fully and meaningfully participate in the school activities. Parents can help with their wards' home work only if the subjects are presented to them in a language that is available to them.

5.6 Recommendations

On the basis of the findings emanating from this study, the following recommendations are made:

- The use of Kanuri language should be encouraged for the teaching and learning of Basic Science and Technology at Lower Basic Science and Technology inMaiduguri Metropolis, Borno State at the Primary School level as it is found to improve pupils' academic achievement due to the fact that it is the first language of the learner.

- Curriculum planners should examine the efficacy of mother tongue (Kanuri language) and recommend it for use in translating the curriculum at the classroom level
- There is need for a more robust implementation of the National Policy on Education (2004, Section 4; pp. 16) which provides that the medium of instruction in the lower basic level should be in the language of the immediate environment at both the state and local government council levels.
- Teacher development: to truly enhance the teaching of Basic Science and Technology through the mother tongue, Kanuri in this case, at any level of our educational level, there is a crucial need for teacher development at two levels:
- Pre-service teacher training and development: should from the outset set out to develop purpose-trained teachers to teach in the first language selected for the area. The implication of this recommendation for the curriculum planners, policy makers and administrators is obvious. In this way, it is possible to empower teachers with the skills that will enable them to fulfill their roles as mediators of learning in this exciting area. Part of their teachers' training should focus on innovative teaching strategies so that teaching and learning can be effective.
- In-service training: should aim at continuously improving the teachers by bringing them up to date in latest knowledge in their chosen fields by bringing them in regular contact with knowledge holders and purveyors as a matter of deliberate policy to enhance their teaching capabilities in the mother tongue. Teacher development, especially post qualification, can occur in the form of seminars, workshops, self-development programmes where teachers can share experiences about the teaching of science in general and in particular, the

teaching of science and technology through the use of the mother tongue medium. State and Local Governments should sponsor primary school teachers to take upgrading courses in science in Colleges and Universities.

- Development and supply of teaching and learning materials: as evidenced by the Ife Project, if there are no resources in school, teaching and learning using mother tongue may not be effective regardless of which language is employed as a medium of instruction. Materials development and scientific terminologies in the mother tongue are the most acute challenges the teachers, who teach science in general and basic science and technology in particular, face. It would be very pragmatic for schools, Ministries of Education and other stakeholders to form partnerships that will aid with research strategies and resources to investigate problems relating to the teaching and learning of science so that the teaching of science can be domesticated and made available to the learners through their mother tongues.Perhaps more importantly, requiring teachers to undergo training for materials development such translation of existing texts into Kanuri would greatly facilitate the teaching of Basic Science and Technology in Kanuri. Of course, it would be most helpful if texts books in the sciences are written in Kanuri with appropriate training of editors would help accelerate the growth of the Kanuri language as the language of learning and teaching.
- Collaboration with institutions of higher learning and research: the resources and capabilities of higher institutions should beexplored to meet the need for materials development, teacher training and curriculum development forcollective benefits of teachers and the teaching of lower basic science in the mother tongue in general and, Kanuri in particular. It would be profitable for

the schools to form partnerships with these institutions that will aid them with research strategies and resources to investigate problems relating to teaching.

5.7 Limitations of the Study

The study has the following limitations:

i. Sample size: the sample size is relatively small, limited both in the geographical spread (only two schools in Maiduguri Metropolis) involving a relatively small sample size in terms of both number of schools selected and the number of pupils participating in the study (only 95 pupils from two private primary schools in Maiduguri Metropolis were selected) there are thousands of public and private schools both in the Maiduguri Metropolis and rural areas throughout the state; it is possible that if a similar study is conducted in a government primary school in a rural setting,it may have dramatically different outcome from the findings of this study; this would have limited the generalizability of the findings of this study in regards to schools in such settings.

ii. The time frame is short: only a six weeks period was employed in this study. A larger sample over a longer period of time may have given more generalizable results. A longitudinal study covering a longer time frame, larger in geo-spatial scope may have allowed for stronger generalization of this study's findings. The conclusions reached on the effectiveness of Kanuri language as medium of instruction are only applicable to the concepts taught, selected from primary five text book of Basic Science and Technology taught over a six-week period. The above noted limitations therefore limit the generalizations that can bemade on the basis of this study's findings.

iii. The two schools used were selected to control the peculiar problems of large class and absence of well-equipped science laboratories in schools in the area of study. From experience, in the area of study, it is known that as one moves away from the Maiduguri Metropolis, the challenges schools and teachers face in teaching not just lower basic and technology but also other subjects, that are even far less demanding in terms of classroom infrastructure, such as well-equipped science laboratories, tools and equipment, and libraries, become even more challenged. Studying the teaching of Basic Science and Technology under such circumstances may offer a different outcome. To that extent, therefore, the generalizability of the findings are also limited.

5.8 Suggestions for Further Studies

i. The limitations of the study observed above offer rich opportunities for further studies: A similar study could be replicated in the public schools especially in the rural areas that have far more challenged infrastructure than private schools which are the relatively better equipped in Maiduguri Metropolis.

ii. A multi-year longitudinal study, similar to those conducted by Fafunwa and Sokoya (the Ife Project 1970-1978), Nomlomo (2007) and Khosa (2012) in South Africa designed along the lines of this study would offer a rich academic and pedagogical vein for scholars of mother tongue as the language of teaching and learning of science and technology providing the take-off point for scientific, cultural and technological development of the country.

iii. A similar study may also be conducted at the secondary schools level to find out the impact of mother tongue (Kanuri language) on academic achievement and retention ability of students in other subjects, such as Biology, Chemistry, Woodwork, Metalwork, etc.

iv. A more ambitious multi-nation study covering both private and public schools in the Kanuri speaking communities in neighboring Tchad, Niger and Cameroon which also host very large (often dominant) Kanuri speaking populations, may offer a rich source of information so that a broader and more generalizable claims could be made with great opportunities for collaboration through policy and scholarship to promote the language for the benefits of these societies.

v. Other areas of Nigeria may also attempt teaching Basic Science and Technology at the Lower Basic level and evaluate its impact for a broader application of their mother tongue in the teaching and learning of the sciences.

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APPENDIX A: Basic Science and Technology Achievement Test (BSTAT) in English

1. Soap is a cleansing agent which produces……. Or…… when mixed with water.
2. The chemical reaction of caustic potash or caustic soda with vegetable oil or animal fat is called……..
3. Basically there are two types of soap namely……and……..
4. The mixture of caustic potash and oil result in……..
5. Caustic potash is the chemical substance called ……
6. The mixture of caustic soda and oil results in……
7. Caustic soda is a base known as…….
8. An example of hard soap is the…… we use in washing our cloths
9. Alkalis are soluble bases which turn red litmus paper to……
10. Soap is used in cleaning our ……..in our home in the bathroom.

Multiple choices

1 What is Saponification in soap making?

(a) Saponification is simply the reaction between caustic potash or caustic soda and oil to produce soap.

(b) Saponification is simply the reaction between caustic soda and water to produce soap.

(c) Saponification is simply the reaction between caustic potash and kerosene to produce soap.

(d) Saponification is the reaction between caustic soda and petrol to produce soap.

2. What is soap?

(a) Soap is a cleansing agent which produces water when mixed with water.

(b) Soap is a cleansing agent which produces foam or lather when mixed with water.

(c) Soap is used in preparation of soap.

(d) Soap is made up of sugar, red litmus paper and water.

3. There are two types of soap.

(a) Liquid and solid soap.

(b) Hard and liquid soap.

(c) Soft soap and hard soap.

(d) Soft soap and bar soap.

4. Why must we add disinfectants, perfumes, colour and preservatives?

(a) Substances such as disinfectants, perfume, colour and preservatives cannot be added to both soft soap and hard soap.

(b) Disinfectants, perfume, colour and preservation can either be added to soft or hard soap.

(c) Disinfectants, perfume, colour and preservatives are not good for soft or hard soap.

(d) Disinfectants, perfume, colour and preservations are too harsh for hard soap.

5. The local materials used in making soaps are:

(a) Ashes, charcoal, palm oil and sugar.

(b) Palm bunch, plantain husks, sugar and salt.

(c) Ashes, palm bunch, oil and salt.

(d) Water, palm oil, caustic soda and source of heat.

6. The reaction between caustic potash or caustic soda and oil is called:

(a) Alkali

(b) Evaluation

(c) Sodium solution

(d) Saponification

7. An example of hard soap is the……. We use in washing cloths

(a) Bar soap

(b) Hotel soap

(c) Restaurant soap

(d) School soap

8. The mixture of caustic soda and oil produce

(a) Black soap

(b) Hard soap

(c) White soap

(d) Blue soap

9. Soft soap is often called:

(a) Sodium soap

(b) Potassium soap

(c) Hard soap

(d) Liquid soap

10. Soap is used in

(a) Washing cloths

(b) Cleaning offices

(c) Washing machines

(d) Cooking indomie

Short Essay

List the materials used in preparation of local soap?

Write the steps used in the preparation of local soap?

APPENDIX B : Marking Scheme for Basic Science and Technology Achievement Test (BSTAT) English

Filling in the gaps or blank spaces

1) Foam or lather

2) Saponification

3) Soft soap and hard soap

4) Soft soap

5) Potassium hydroxide

6) Hard soap

7) Sodium hydroxide

8) Bar soap

9) Blue

10) Body

Multiple Choices

1) A

2) B

3) C

4) B

5) D

6) D

7) A

8) B

9) B

10) A

Short Essay

i. Water, palm oil, caustic soda or an alkali source like dry plantain, husks waste of palm bunch and source of heat.

ii. Burn some dry plantain husks using a large, clean container.

iii. Crush the ash to powder in a clan basin.

iv. Heat the power in an open pot until the ashes are white.

v. Add water to the ashes, Boil the water and ash mixture.

vi. Filter the mixture and kept the filtrate

vii. Evaporate most of the water from the filtrate mix some of the filtrate with palm oil and heat.

viii. Continue heating but keep adding the filtrate until you have used it all. Allow the mixture to cool and set.

APPENDIX C : Basic Science and Technology Achievement Test (BSTAT)

(TEST IN KANURI:ND3PNO C)

JARAPT3 K3LA NOT3 KİMIYA BADIYARAMBE-A NZUNDU ZAMANBE-ABEN (BST AT) KANURIN

1. Shawuld3 awo shilan karewa tulzain duwo ..... au .....sutuluyin sa njia tuskatia.

2.Sa k3lwu kostikbe-a k3ndawu kalisegebe-au kais3 dabbabe-a k3ltaiya awo waljind3 Sunz3..... .

3.Asaliman shawuld3 jili indi sandima .....-a .....-a.

4.K3lwu kostikbe-a k3ndawu-a koltia awo laaro waljin, abi. .....

5. K3lwu kostikbe sunz3 kemikalbede abi .....

6. Soda kostikbe-a k3ndawu-a k3ltia awo laaro waljin, abi .....

7. Soda kostikd3 awo duwo njlan yijin sunz3 .....

8.Misal shawul cibbuyed3 ..... shilan kaz3muwande tulnyen.

9. Alkalaisod3 awowa njilan yizain duwo warak litmusbe kimea ..... kalakcin.

10.Fandelan shawullankasalaramlan ..... tulnyen

Raamma karta

1. Shawul tandolan abi *saponificationd3?*

*e. Saponificaiiond3*biya k3lwu kostibe-au soda kostikbe-a k3ndanu-a k3ltaiya awo waajind3.

*b.Saponifacationd3*biya shawul tandolan soda kostikbe-a nji-a k3ltaiya awo waajind3.

*e.Saponificationd3*biya shawul tandolan k3lwu kostikbe-a kananzir-a k3ltaiya awo waajind3.

d.Saponificationd3 shawul tandolan soda kostikbe-a fetur-a koltaiya awo waajindo.

2. Abi Shawuld3?

a. Awo kare tultaye njia tuskatiya nji sutuluyind3.

b. Awo kare tultaye njia tuskatiya bilwu sutuluyinde.

c. Shawul tandoro shawul faidatain.

d. Shawuld3 shuwur-a warak litmusbe kime-a nji-alan t3wandin.

3. Shawuld3 jili indi

a. Shawul nji-a cibbu-a.
b. Shawul cibbu-a nji-a.
c. Shawul telala-a shawul cibbu-a.
d. Shawul telala-a shawul ka-a.

4. Abirokurwunwa kuli kwasabe njezoma-a kabudi-alaunu -a nz3liwoma-a k3lnyen?

a. Kurwunwa kuli kwasabe njezoma-a kabudi-alaunu-a nz3liwema-ad3 shawul t3lala-a shawul cibbu-asoro k3lteyinba.
b. Kurwunwa kuli kwasabe njezoma-a kabudi-alaunu -a nz3liwoma-ad3 shawul t3lala au cibbu yayero k3lteyin.
c. Kurwunwa kuli kwasabe njezoma-a kabudi-a launu-a nz3liwoma-ad3 shawul t3lala au shawul cibburo ngelagenyi.
d. Kurwunwa kuli kwasabe njezoma-a kabudi-a launu -a nz3liwoma-a ad3 shawul cibburo aziya.

5. Karewa fatobe sandilan shawul satandind3 sandima:

a. Buwu-a k3limi-a manjaye-a shuwur-a.
b. K3la manjabe-a kare f3lantenbe-a shuwur-a manda-a.
c. Buwu-a k3la manjabe-a k3ndawu-a kannu-a.

6. K3lwu kostikbe-a soda kostikbe-a k3ndawu-a k3ltayae awo waajind3:

a. Alkalai.
b. Rizapt3.
c. Nji sodiumbe.
d. Saponification.

7. Misal shawul cibbuyed3 ..... Shilan kaz3muwande tulnyen.

a. Shawul ka.
b. Shawul hotel be.

c. Shawul masanarambe.

d. Shawul maarantibe.

8. Soda kostikbe-a k3ndawu-a tuskatiya awo ad3 t3wandin:

a. Shawul s3l3m.
b. Shawul cibbu.
c. Shawul bul,

d. Shawulliwula.

9. Shawul t3lalad3 ng3wusoro shiro ..... gulzain.

a. Shawul sodiumbe.
b. Shawul potassiumbe.
c. shawul cibbu.
d. shawul njia.

10. Shawuldo shilan faidaten:

a. Kazemuwa tultan.
b. Ofiswa cintan.
c. Inji kaz3mu tultayen.
d. Indomie detan.

Ruwo kori

Karewa sandilan shawul fatobe t3dandinde ruwone?

Katabwa got3 shawul fatobe t3tandind3 ruwone?

APPENDIX D

APPENDIX F (ND3PNO F)

BASIC SCIENCE AND TECHNOLOGY ACHIEVEMENT TEST (BSTAT) KANURI MARKING SCHEME

JARAPT3 K3LA NOT3 KIMIYA BADIYARAMBE-A NZUNDU ZAMANBE-ABEN (BSTAT) KASHIMO JAJAT3BE

Na bad3 au land3roro yikko

1. Bilwu
2. Saponification
3. Shawul t3lala-a shawul cibbu-a
4. Shawul t3lala.
5. Potassium hydroxide
6. Shawul cibbu
7. Sodium hydroxide
8. Shawul kabe
9. Liwula
10. Tig3

Raamma karta

1. A
2. B
3. C
4. B
5. D
6. D
7. A

8. B

9. B

10. A

i. Nji au manja au soda kostikbe au fandoram alkalaibe alamamma f3lanten ngamd3-a budu k3la manjabe-a kannu-a.

ii. Kalwo kura kadawu balan kare f3lantenbe ngamd3 warne.

iii. Kalwo kadawu balan buwudo t3lalaro g3wurne.

iv. Kolo cibalan rungod3 kwadane hatta buwud3 b3llo walz3.

v. Buwud3ro nji fig3ne, tuskano nji-a buwu-abed3 kwadane.

vi. Tuskanod3 sakn3miya g3nane.

vii. Saknod3n njid3 tullumiya manja-a tuskaane kuru kwadane.

viii. Kwadan3minnaro saknod3 k3ll3gamin duwo daz3. Tuskanod3 kolle hamz3 kuru s3diyan naps3.

APPENDIX E : Basic Science and Technology (BSTAT) English Language

LESSON PLAN 1

Subject: Basic Science

Class: Primary (5) Five

Topic: Soap making

Duration: Double period (60 Minutes)

Age: 10-11 Years

Sex: Boys and Girls

Entry behaviour: pupils are familiar with soap.

Behavioural objectives: By the end of the lesson, pupils should be able to;

i. Define soap

ii. Name local materials used in making soap.

iii. State clearly the types of soap presented.

Presentation

Step I: Who among you has ever seen soap? What is it used for, etc.?

Step II: Soap is cleansing agent which produces foam or lather when mixed with water. It is a substance produced by the chemical reaction of caustic potash or caustic soda with vegetable oil or animal fat, this chemical reaction is called saponification.

Step III: Ashes, Animal fat, vegetable oil such as palm oil are the local materials used in making soap.

Step IV: There are two types of soap; these are soft soap and hard soap. The mixture of caustic potash and oil results in soft soap. Caustic potash is the chemical substenance called potassium hydroxide that is why soft soap is called potassium soap. Examples of soft soaps are liquid soap, toilet soap and some

antiseptic soap. Substances such as disinfectants, perfume, colour and preservatives can be added to soft soap.

Step V: The mixture of caustic soda and oil results in hard soap. Caustic soda is a base known as sodium hydroxide; the soap made of this is referred to as sodium soap.

Pupils' Activities: Pupils are allowed to ask questions on the lesson taught. The teacher or the pupils answer the questions.

Summary of the lesson: the teacher summarizes the lesson by briefly explaining what hard and soft soaps are.

Evaluation: What is soap?

Answer: Soap is a cleansing agent which produces foam or lather when mixed with water. How many types of soap do we have? Two types: soft and hard soap.

Lesson 2

Subject: Basic Science

Class: Primary (5) Five

Topic: Soap from Local Materials

Duration: Double period (60 Minutes)

Age: 10-11 Years

Sex: Boys and Girls

Entry behaviour: pupils have little knowledge about soap making.

Behavioural objective: By the end of the lesson pupils should be able to identify the active ingredients in the local materials used in making soap.

Presentation:

Step I: The teacher introduces the lesson by asking question from the last lesson, e.g. what is soap? How many types of soaps do we have, etc.

Step 2: Local soaps made from palm oil and alkali which can be obtained from the waste of burnt palm bunches or dried plantain husks. Black soap (Sabulun solo) is a well-known local soap in Nigeria.

Step 3: The teacher improvise local materials for the soap making e.g. water, palm oil, caustic soda or an alkali source like dry plantain husks on the waste of palm bunch, and a source of heat.

Step 4: *The teacher demonstrate soap making while the pupils watch keenly.* (1) The teacher burn some dry plantain husks using a large, clean container (2) Crushes the ash to a powder in a clean basin (3) heats the powder in an open pot until the ashes are white (4) adds water to the ashes. Boil the water and ash mixture (5) filter the mixtures and keep the filtrate (6) evaporate most of the

water from the filtrate mix some of the filtrate with palm oil and heat (7) continue heating but keep adding the filtrate until you have used it all. Allow the mixture to cool and set. Local soap has been prepared.

Pupil's activities: pupil helped in crushing of ash to powder in a clean basin. Adding water it cashes at intervals etc.

Evaluation: palm oil and alkali (alkali is obtained from the waste of burnt bunches or dried plantain husks) are the basic ingredient of black soap i.e. sabulun solo.

Lesson 3

Subject: Basic Science

Class: Primary (5) Five

Topic: Soap from Alkali

Duration: Double period (60 Minutes)

Age: 10-11 Years

Sex: Boys and Girls

Entry behaviour: Pupils have knowledge of how to make black soap.

Behavioural objective: Describe the process of making different types of soap, using local ingredients and alkali.

Introduction: Who have ever seen how soaps are made?

Presentation: Alkalis are soluble bases in water e.g. sodium hydroxide (caustic soda), potassium hydroxide (caustic potash) and ammonium hydroxide: Alkalis are soluble bases which turn red litmus paper to blue.

Step 1: Common alkaline used for producing soaps is sodium hydroxide (caustic soda) and potassium hydroxide (caustic potash). Oil, like palm oil, palm kernel oil, groundnut oil or coconut oil is mixed with any of these bases. The common table salt is then added to separate the soap from the resulted mixture.

Step 2: *The teacher demonstrates soap making by using Alkali or base.* Materials needed include; water, common salt, palm oil, caustic soda, caustic potash, red litmus paper, source of heat.

Step 3: The teacher put sodium hydroxide caustic soda in a container. Dip a piece of red litmus paper in the container, the colour of the red litmus paper will change to blue.

Add palm oil to the sodium hydroxide solution stir to mix. Heat it in a water bath and stir again.

Allow product to cool. Now the soap is made.

Form lather with a small piece of the soap made. Compare it with anyone in the market.

Pupils' Activities: They participated at different stages in stirring the mixture.

Evaluation: Alkalis are soluble bases which turn red litmus paper to blue. The teacher asks the pupils to explain briefly the making of soap by using Alkali.

Lesson 4

Subject: Basic Science

Class: Primary (5) Five

Topic: Uses of Soap

Duration: Double period (60 Minutes)

Age: 10-11 Years

Sex: Boys and Girls

Entry Behaviour: Pupils have idea about soap making (both soap from local materials and soap from Alkali).

Behavioral Objective: at the end of the lesson pupils should be able to identify both local active ingredients and alkali used in making soaps.

Presentation:

Step 1: Uses of soap at home:

Use soap in washing cloths

Use soap in cleaning bodies (bath)

Use soap in cleaning toilets and bathrooms

Use soap in washing cooking utensils

Use soap in washing fruits before eating

Step 2: Soap is used in industries:

To wash clothes

To wash industrial vans

To wash containers

To clean offices e.g. curtains

To wash machines

Step 3: Soap is used at school

For scrubbing classroom floors

Washing our hands after games

Washing school bus

Washing laboratory equipment and toilets

Use soap as a teaching aid

Pupils' Activities: participated in listing out the uses of water.

Evaluation: Local soap can be made by mixing palm oil and solution of ash or alkali from burnt plantain or banana husks; soap can also be prepared by mixing palm oil and a solution of sodium hydroxide; the reaction between the oil and ash (alkali) solution is called saponification, the result of saponification is soap; potassium soap are softer than sodium soaps. Soaps are used mainly for cleaning purposes.

APPENDIX F : Basic Science and Technology Achievement Test (BSTAT)

KANURI LANGUAGE LESSON PLAN

FASAL DARASA GULTAGAYE

Lesson 1

Daras3:	Kimiya Badiyarambe
Aji:	Aji Uwu (5)
K3la Manabe:	Shawul Tando
Zaman:	Minti 30 (double)
Saa:	10-11
Jinsi:	Tadawa-A Ferowa-A

Hal badiyarammin: Fuwurawado shawul nozana.

Halwa marad3t3na: Datag3ram daras3yen, fuwurawaye raksa;

i. Shawul bayenzain

ii. A wowa duwo faton faidata shawul satandin gulzain.

iii.Kalkallo jiliwa shawulbe gulzain.

Yitagatt3g3:

Katab I:	Abiro faidatain?
Katab II:	Shawuld3 shilan awowa tultaye duwosa shi-a nji-a tuskazaiya bilwu gojin. Shid3 k3lwu kostikbe au soda kotsikbe-a k3ndawu kolis3g3be au kais3 dabbabe-an kelzain, k3lk3llo kemikalbe ade shiro *saponification* gulzain.
Katab III:	Buwu-a kais3 dabbabe-a k3ndawu kolis3g3be alama manja-a faidata shawul satandin

Ketab IV: shawul t3lala-a shawul cibbu-a. Shawul t3lalade tuskano k3lwu kostikbe-a k3ndawu-abe.K3lwu kostikbed3 shima *potassium hydroxide;* ad3maro shawul t3lalad3 shawul *potassiumbewo.*Misalwa shawulwa t3lalabed3 sandima

shawul njia-a shawul kasalabe-a shawul kulikasuwabe njezoma-a. Awowa alama kurwunwa kulikasuwabe njezoma-a kabudi-a launu-a nz3liwoma-ado shawul t3lalaro k3lteyin.

Ketab V: Tuskano manda kostikbe-a k3ndawu-ad3 shawul cibburo waljin. Soda kostikbedo

shima*sodium hydroxidebewo,* shawul shilan satand3nado *shawulsodiumbewo*

Cidawa Fuwurawabe: Fuwurawa k3la daras3 sandiro gulzaanaben korowa soworin. Mal3md3 au fuwurawad3 jaawuwasadin

Kasarno darsabe: Mal3mye bayen k3la shawul cibbu-a t3lala-ad3ben kasarjin

Rizapta: Abi shawuld3?

Jaawu: Shawulde shilan awowa tulzain, shi-a nji-a tuskatiya bilwu gojin. Shawul jili ndawu nonye? Jili indi: shawul t3lala-a cibbu-a.

FASAL DARASE GULTEGEYE

Lesson 2

Daras3:	Kimiya Badiyarambe
Aji:	Maaranta Badiyarambe Aji Uwu (5)
Kela:	Karewa Fatoben Shawul Tando
Zaman:	Minti 40
Saa:	10-11
Jinsi:	Tadawa-A Ferowa-A

Hal Badiyarammin: Fuwurawaye ilmu shawul tandoye gana laa sawand3na.

Halwa merad3t3na: Dat3g3ram daraseben fuwurawaye awowa fatobe faidata shawul satandind3 asuzain.

Yitagatt3g3:

Katab I: Malamye daras3 daryebekoromben darase badijin. Misallo: abi shawuld3? Jiliwa shawulbe ndawu?

Katab II: Shawuld3 manja-a buwu alkalaibe duwo dalamiwa ya manjabe warrata au kare felantenbe ngamd3n t3wandin-andon sadin. Shawul s3l3md3(shawul solo) Nigerialan shawul fatola nowata soda kostikbe au buwu alkalaibe alama kare f3lantenbe ngamd3-a budu ya manjabe-a kannu-a

Katab III: Mal3mye futu shawul tandoye felejin fuwurawa ye fetero lawarzain. (1) Mal3mye suro kalwo kuraben kare f3lantenbe ngamd3 warjin (2) Suro daro kadawu bayen buwu ad3 rungoro g3wurjin. (3) Rungod3 suro kolo ci kaataben dez3 hata buwud3 b3ljin. (4) Buwudero nji fiz3g3 tuskano nji-a buwu-a ad3 kwadaz3. (5) Tuskanod3 saks3 genaz3. (6) Buwu sakkatad3nnji ng3wuso sutuluwuyiya laad3 manja tuskaz3yiya kuru kwadaz3. (7) Kwadaz3 arnrna buwud3 k3ll3gamiya duwo fig3m daz3.Tuskaned3 k3lle hamza klakalze.Shawul fatola t3tand3na.

Cidawa **fururawabe:** Fuwurawaye banazaa buwud3 sura daroben rungoro G3wurzain. Nji ganaganan fizain.

Rizapta: Manja-a alkalai (alkalaid3 k3ska ward3be warratan au lalla ya rnanjabe ngamd3n t3wandin) -anyi sandilan shawul s3l3m sadin, wato, shawul solo

FASAL DARAS3 GULT3G3YE

Lesson 3

Daras3: Kimiya Badiyarambe

Am: Maaranta Badiyarambe (5) Aji Uwu.

K3la: Alkalailan Shawul Tando

Zaman: Minti 30 (double)

Saa: 10-11

Jinsi:' Tadawa-ferowa-a

Hal Badiyarammin: Fuwurawaye ilmunza shawul s3l3m tandoye mbeji.

Halwa m3rad3t3na: Futu shawul jili gadegade karewa fatobe-a alkalai-alan satandind3 bayenne.

Badiyaram: Ndu ngalte yaye futu shawul sadin suruna?

Yitagattaga: Alkalaid3 awo suro njiben yijinma, alamanna *sodium hydroxide* (soda kostikbe)-a *potassium hydroxide* (bilwu kostikbe)-a *ammonium hydroxide-*
a. Alkalaid3 awowa launu kimero fig3miya liwularo faltin.

Ketab 1: Alkalai nowata sandi lan shawul satandind3; sandima *sodium hydroxide-a* (soda kostikbe) *potassium hydroxide-a* (k3lwu kostikbe) k3ndawu, Alamannamanjabegai au koljibegai aukokabegaia awowa njin yizain anyiga tuskatin.Daji manda fit3ge shawuldo tuskano d3n firtin.

Katab 2: Mal3mye futu alkalain faidat3m shawul tandoyede f3lejin.Karewa m3radet3nad3 sandima; nji, manja, soda

kostikbe, k3lwu kostikbe, warak litmusbe kime, kannu.

Katab 3: Mal3mye suro k3lweberosodium *hydroxide-a* soda kostikbe-a fiz3yin. Suro k3lwud3bero warak litmusbe kime sakk3 launuwarak litmusbe kimeda liwularo waljin. K3lk3llo sodiumhydroxide bero manja k3lzaga tuskaza.Kalwo kasalarammin kwadaza, walta tuskazakolzahamz3.

K3rmashawul t3t3ndana.Shawul t3t3nd3nad3n bilwu tuleye.Shawulbi yaye kasuwubea karene.

Cida fuwurawabe: Katabwa tuskat3ye gadegadedero r3ptaa.

Rizapta: Alkalaisod3 awowa njilan yizain duwo warak litmusbega liwularo kalaccin.

Mal3mye fuwurawa futu alkalai faidata shawul satandind3 suworo kasarrataro bayen sadin.

FASAL DARASE GULT3G3YE

Lesson 4

Darase: Kimiya Badiyarambe

Aji: Maaranta Badiyarambe (5) Aji Uwu.

Kela: Faidawa Shawulbe

Zaman: Minti 30

Saa: 10-11

Jinsi:Tadawa-Ferowa-A

Hal Badiyarammin: Fuwurawaso ilmunza shawul tandoye mbeji (karewa fatobe-a alkalai-ason)

Halwa m3rad3t3na: Dat3g3ram daras3ben fuwurawaye raksa karewa fatobe-a alkalai-a faidata shawul satandind3 asuzain.

Yitagatt3g3

Katab I:

Faton faidawa shawulbe:

- Kaz3muwa tulta
- Kasala.
- Ngawudi-a kasalaram-a tulta.
- Kalowa k3mbu detabe tulta.
- K3ska k3li kawu tuwinno tulta.

Katab II:

Shawuld3 sanyaramwan faidatain:

- Kaz3muwa tulta
- Matowa karebe tulta
- Kontenawa tulta

- Ofiswa tulta-alama lawuleso
- Mashinwa tulta

Katab III:

Shawuld3 maarantiwan faidatain:

- Suro ajiwabe tulta
- Ngawo biskeben rnusko tulta
- Bos Maarantibe tulta
- Karewa kimiyabe-a ngawudiwa-a tulta
- K3ra gult3g3n faidat3

Cidawa fuwurawabe: Faidawa njibe sonozana

Rizapta: Shawul fatolad3 tuskano manja-a buwu diyata au alkalai koska wardebe-abe. Shawul kare f3lantenbe au awayabed3, rakt3 manja-a nji *sodium hydroxide* be-a k3ltiya t3din; kaltabndawu-a buwu nji *(alkalai)be-ad3saponification* gultin, daryeramdo shawul; shawulpotassiumbed3 shawul *sodiumbega* n3mt3lelan koz3na.Shawulsod3 taganasmaro awowa tultalaro faidatain.

APPENDIX G: Glossary of Terms and Terminologies Used in this Study and their English Language Translations.

**Glossary of terms and terminologies used in this study and their English language translations. A semantic translation was attempted as there are many words without English equivalents in meaning*

***3: stands for the Kanuri mid-high central vowel found in words like "k3n3m" (sleep) and "k3na" (hunger). This special font was not readily available to us hence the use of a" stand-in"but Kanuri readers readily accept and use it in lieu of the inverted 'e' often used to represent it.*

Kanuri	***English equivalent***
A	
abi?	what?
aji	class
alkalai	alkali
alamanna	such as
asuzain	they will identify
awowa alamanna	things such as
awowa njiye yizain	things that dissolve in water
awowa launi falt3ma	things that change colour
B	
badejin	it/she/he will start
banazaa	they will help to
bayenne	describe/explain
bilwu	foam/lather

biske	game/play
bos	bus
buljin	it will turn white
buwu	ash
buwu duro nji fit3g3	water be added to the ash

C

cida	work/activity
cidawa fuwurabe	pupils' activity

D

daras3	subject
dat3g3ram daras3yen	at the end of the lesson
k3la darasu salinaben korowa soworin	pupils will ask questions on the lesson taught
daz3	finish
diyata	mixed

F

faida	use/uses
faidaten	is used (for)
faltin	(it) changes (into)
fasal darasu gult3be	lesson plan
fato	home/house
f3lejin	showing/demonstrating
fero	girl
ferowa	girls
fetero lawarzain	clearly/keenly looking/watching
fig3m	(you) pour (liquid)…

firtin	(it) separates
fuwura	pupil
fuwuraad3 shawul nozana	the pupils know what soap is
fuwuraa raksa gulzain	the pupils (should) would be able to tell

G

gade	different/another
gana	small/little
gana-ganan fizaan	adding small quantities at intervals
g3wurzaa/g3w3rt3/g3wurtin	they/it will(be)pound(ed)
gultin	(it) is called

H

hal badiyarambe	entry behavior
halwa m3rad3t3na	behavioural objective

I

ilmu shawul tandoye gana sawand3na	(pupils) had some knowledge of local soap making
ilmunzaa mbeji	they have knowledge of

J

jaawu	explanation
jili gade-gade	different types/kinds of
jili indi	two types/kinds
jinsi	sex/gender

K

kabudi	perfume
kadawu	dirt, stain

kakkad3 litmusbe kime	red litmus paper
kalakcin	(it will) turn(into)
kannu	fire/heat
kare	material(s)
kare kilikembuye	(edible) fresh fruits and vegetables
kare ngandu f3latenbe	dried plantain husk
kare fatobe	local materials
karewa kimiyabe	(scientific) laboratory equipment
karewa k3ra gultube	teaching aids/teaching materials
kasala	bathing
kasalabe	for bathing
kasalami	bath tub
kasalaram	bathroom
kasarrataro bayen sadin	(they will) briefly explain
katap	step
kawu	before
kazomo	clothes
k3la	(on) topic
k3ndawu kime	red oil
k3ndawukoljibe	groundnut oil
k3ndawu kwakwabe	coco-nut oil
k3ndawu manjabe	palm oil
k3ll3gamiya	filtrate
k3lk3llo	compound (substance)

k3lwu kostikbe	caustic potash
k3ska kili	fresh fruits
koka	coco-nut
kolle hamz3 kalkaz3	allow to cool and set
kolo	(earthen) pot
kontenawa	containers
koro	question
kuraben	(in) large
kurunwa kuli kosabe njezoma	antiseptic
kwadaz3	(let it) boil

L

launi d3 faltin	the colour changes
launi riwularo faltin	(it) will turn into blue colour
lawole	curtains
liwura kimero kalakcin	turns blue to red

M

maaranta badiyarambe	lower/middle basic (primary school)
mal3mbe	(of the) teacher
manda	salt
manja	red oil (another term for palm oil)
mashinwa	machines (motor bikes)
m3rad3wa halbe	(another term for) behavioural objectives
m3rad3t3na	desired/needed
misallo	for example
mota	motor(vehicle)

musko	hand
N	
ndawu ?	how many?
nd3pno	appendix
ndu	who
ngalte	ever (never)
ngawo	after
ngawudi	toilet
nijeriyalan shawol fatola nowata	local soaps are well known in Nigeria
nji negwaso sutuluyiya	after evaporation
nji sodium chloride be	solution of sodium chloride
njiwa tuskatiya bilwu gojin	when mixed with water it foams
nonye	(we should) know
R	
rakt3 k3ltin	can be mixed
S	
sa'a	age
saks3 genaz3	keep the filtrate
samza	(they) list
sandima	they are
sanyarumuwan	(in) industries
shawul cibbu	hard soap
shawuld3 shi lan kare tulzain	soap is a cleansing agent
shawul kasalabe	bathing soap
shawul kuli kwasabe	antiseptic soap

shawul nji-a	liquid soap
shawul s3l3m	black soap
shawul t3lala	soft soap
shawul t3tand3nad3n bilwu tuluyen	from the soap made (we) derivefoam
soda kostikbe	caustic soda
suro daroben	(in)side a bowl
suruna	(has) seen

T

tadawa	boys
tando	make
tandoye	(of) making
t3lala	soft
tuskano	admixture

W

warjin	(it) will burn
warrata	burnt

Y

yitagatt3g3	presentation (of a lesson)

Z

zaman	duration

APPENDIX H : Covering Letter Attached to Achievement Test Instrument

Ahmadu Bello University, Zaria
School of Education
Science Education Section.
5th June, 2012.

Dear Sir,

I am a post graduate student of Ahmadu Bello University, Zaria, conducting a research study titled, 'Impact of Kanuri Language on Academic Achievement and Retention Among Primary Five Pupils in Basic Science and Technology in Maiduguri Metropolis".

Your school has been identified as one of the selected schools for conducting the pre-test after teaching for 4 weeks. This will be done in order to collect data for the analysis of the effects of Kanuri Language on academic performance in Basic Science and Technology in Primary Five.

Therefore, your help or assistance will be of paramount importance for the success of this study. All issues and responses will be treated confidentially and used for the purpose of the study only.

Thank you.

Yours faithfully,

Fati Ali Maina
M. Ed/EDUC/5205/2009-2010