UNIVERSITY OF CAPE COAST

EFFECTS OF USING ENGLISH AND LOCAL LANGUAGE ON THE STUDY OF MATHEMATICS AT THE LOWER PRIMARY IN THE SUHUM KRABOA COALTAR DISTRICT OF GHANA

BY

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CANDIDATE'S DECLARATION

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

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SUPERVISORS' DECLARATION

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

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ABSTRACT

The study was conducted to compare the effects of using the local language (L1) and English (L2) on achievement in Mathematics at the lower Primary.

The study, which was conducted in the Suhum Kraboa Coaltar District in the Eastern Region of Ghana adopted a quasi experimental design. Primary 3 pupils were used in the study. Convenient and purposive sampling techniques were used to select four primary schools for the sample. Two of the schools were selected from Suhum (urban town) and the other two were from rural schools. The random sampling technique was also employed to determine the type of language to use for instruction in each of the sampled schools.

Lessons on addition and subtraction of fractions were prepared and presented to the four sampled schools in the respective languages of instruction. A post-test was administered after the treatment. The results were presented and tested by employing the independent samples t-test and the two way ANOVA. The hypotheses were tested to determine if there is a statistically significant difference in Mathematics achievement at the lower primary between using the local language (L1) and the English language (L2) as media of instruction. The level of significance was set at 0.05.

The results revealed that there is no significant difference between the use of the local language (L1) and English (L2) as medium of instruction on Mathematics achievement at the lower primary. It was, however, established

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Mathematics achievement at the lower primary. It was, however, established that the use of the English language favours urban schools more than the use of the local language while in the rural schools the local language is more effective for instruction in Mathematics at the lower primary than English (L2). It was also found that the use of the local language (L2) improves pupils' performance in problem solving more than the use of English (L2).

It was recommended that the choice of using either the local language (L1) or the English (L2) as a medium of instruction in Mathematics at the lower primary should be left with the staff of the schools to decide. The choice should be based on pupils' mastery of the language. It was, however, suggested that in urban schools English should be preferred to the local language while in rural schools the local language should be preferred to the English.

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This work is dedicated to the memory of my late Mother Mrs. Janet Ohene Kwabiwa whose toil and sweat had brought me to this level. It is also dedicated to my dear daughter, Emma Kwapong, who had to endure with my absence during the period of the programme.

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CHAPTER 1

INTRODUCTION

Background to the Study

Language is a system of human vocal behaviour culturally acquired for the purpose of transmitting information. It is a tool which gives order and organisation to human thinking. Lahey (1998) in describing language as a symbolic code used in communication, noted that:

> without an efficient means of communication it would
>
> not be possible to co-ordinate the efforts of many
>
> people to regulate their behaviour for the common
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> good through laws or to amass wisdom learned
>
> through experience by previous generation and pass
>
> it on through education(p. 237).

This idea explains the role language plays as medium of instruction in the teaching learning process. Bruner (1972) emphasised this point quite strongly as follows:

> Man has the capacity to receive and translate knowledge
>
> in a linguistic form. This permits man to convert
>
> knowledge into a form that renders it highly
>
> transformable. Language, not only permits an
>
> enormous condensation of knowledge, but also
>
> permits us to turn the knowledge into hypothetical forms

so that we may consider alternatives without having to

act them in the form of trial and error (p. 44).

In the classroom the teacher uses language to communicate whatever

knowledge the children have to acquire through the language of instruction.

The teacher also issues instructions to the students through the same

language. The students, on the other hand, communicate their responses to

the teacher's questions in the language of instruction. It is through this that the

teacher is able to assess the level of understanding of what he/she has taught

them. Furthermore, it is through the language of instruction that the children

express their needs to the teacher. It is for these reasons that the kind of

language used as medium of instruction in the classroom becomes very

important.

Unfortunately, the issue of medium of instruction has become a bone of

contention in the realm of education not only in Ghana, but Africa and other

parts of the world (Yates, 1995). The contention has been either using the

local language (L1) or a second language (L2) as a medium of instruction.

In Ghana this contention began during the era of the missionary

activities in education. While the Basel and the Bremen missionaries believed

that the use of the local language as a medium of instruction was the best

way of promoting learning, the Wesleyans, with a contrary view, believed in

the adoption of English language (L2) as a medium of instruction in all their

schools (McWilliam and Poh, 1975).

In Ghana (then Gold Coast), government's involvement in the

discourse on the type of language to use as a medium of instruction was

recorded in 1925. This was Governor Gordon Guggisberg's policy on the use

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of local language as a medium of instruction in the first three years of the child's education (McWilliam and Poh, 1975). As already noted, the policy required that in the first three years of primary education, the local Ghanaian Language prevalent in the area should be used as a medium of instruction while English was to be studied as a subject. From primary four, English was to replace the Ghanaian Language as the medium of instruction and the Ghanaian Language was to be studied as a subject. This policy was misconstrued by some indigenous elites to mean a deliberate attempt by the colonial office to provide Africans with "inferior" education. In spite of the criticism the policy was implemented in 1925 (McWilliam & Poh, 1975).

After the implementation of this policy various educational committees appointed by subsequent governments reported varied views on the policy. The Bernard Committee (1956) issued two controversial reports with the result that English was made the medium of instruction from primary class two. The Bannerman Committee (1963) also recommended the continuous use of the mother tongue during the first three years of the child's education but the government did not give it any legal backing. However, the Kwapong Committee's recommendation (1966/67) which was a replica of the Bannerman Committee's recommendation was accepted and legalised by the government. The Ministry of Education in its curricula changes in elementary education, which was issued in 1971 stated that:

> It is now government 's policy that the main Ghanaian
> languages at present provided for in the curricula of primary
> and middle schools should be used as the medium of
> instruction in the first three years of the primary course

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and where the subject makes it possible in the next three years as well (McWilliam & Poh, 1975, p.119).

Similarly, the Dzobo Committee (1974) recommended the use of the local language as a medium of instruction for the first three years in the child's education. The Basic education reforms initiated in Ghana in 1987 endorsed the language policy recommended by the Dzobo committee (Ministry of Education policy Guidelines on Education, 1988). The Basic Education Reforms Review Committee (1994) also recommended "the intensification of training of Ghanaian language teachers and that posting of newly trained teachers should as far as possible consider their ability to use and teach the Ghanaian language where they are posted to" (Education Reform Review Committee Report, 1994, p.17).

In spite of the legal backing provided for the language policy by successive governments, the educational system had not observed it to the letter. While in some schools the local language is used as the medium of instruction in the first three years and in some cases beyond, others, especially, private schools and urban public schools, use English as the medium of instruction from primary one.

In 2001, the Ghana Education Service (GES) in conjunction with the German Technical Co-operation (GTZ) engaged in the production of textbooks for subjects such as Mathematics, Social Studies and Integrated Science written in selected local languages in support of the language policy, that is the use of the local language as a medium of instruction. Consequently, teachers from teacher training colleges were invited for training in the use of the books. Ironically, as the project was in progress, the Minister

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of Education in February, 2002 informed parliament of the Ministry of Education's decision to change the language policy. He submitted that:

> The Ministry of Education's present policy on the study
> and use of Ghanaian Language in primary schools is
> that all pupils should study a Ghanaian Language in
> school and that pupils in P1 to P3 should be taught in
> a Ghanaian Language. However, much as this policy
> is desirable, its operationalisation needs to be carefully
> thought out to ensure effective implementation, and until
> then the following policy will apply: Instructions at all levels
> of primary school will be in English (Parliamentary Debates,
> Feb. 28, 2002).

Ghanaians received the Minister's decision on the language policy with mixed feelings. Some supported the Minister's position that English Language should be used as the medium of instruction at all levels of education (Davidson, 2002; Osei, 2002). They argued among other things that using English as a medium of instruction at all levels would not only improve academic performance but enable pupils to be able to read instructions and answer questions well and help them to develop certain speech habits.

On the other hand, Boakye (2002), the Linguistics Department of the University of Ghana, (2002) Graduate Students Association of Ghana (GRASAG), (2002), and the National Association of Graduate Teachers (NAGRAT) (2002) cautioned the government to reconsider its decision on the language policy because they thought, among other things, that the use of the

mother tongue as a medium of instruction for the first three years helps to bridge the gap between the home and the school. Okyere (1999) reported in a research conducted by the Centre for Research on improving Quality of Primary Education in Ghana (CRIQPEG) of the University of Cape Coast (UCC) that pupils in the primary school found it difficult to cope with instructions in English.

Statement of the Problem

Different governments in Ghana formulated and implemented different language policies with regard to the medium of instruction at the lower primary level. This is with respect to the use of either the local language or English. These policies have not been consistent with the appropriate language to use at the lower primary as the medium of instruction. At one time it had been the local language. At another time English had been emphasised as appropriate. Such inconsistencies go a long way to affect pupils' academic performance because it has been established that the medium of instruction tremendously affect pupils' performance (Andoh- Kumi, 2001, Bamgbose, 2002).

In spite of this fact, the extent to which the two languages, as media of instruction, affect pupils' achievement at the lower primary, especially, in mathematics has not been established empirically. It is for these reasons that the researcher conducted a quasi-experimental study to compare the effectiveness of using the local language (L1) and English (L2) as media of instruction in mathematics achievement of pupils at the lower primary in the Suhum Kroboa Coaltar District in the Eastern Region of Ghana.

The Purpose of the Study

The study was to investigate the effectiveness of using local language (L1) and English (L2) as media of instruction in mathematics achievement at the lower primary in the Suhum Kraboa Coaltar District in the Eastern Region of Ghana.

Specifically, the purpose of the study is to find:

1. the difference that exists in mathematics achievement of p3 pupils between those taught using the local language (L1) as a medium of instruction and those receiving instructions in English (L2);

2. the difference in mathematics achievement of p3 pupils between rural and urban schools in relation to the type of language used as a medium of instruction?

3. the difference in P3 pupils' performance in answering questions on problem solving between those who receive instruction in the local language (L1) and those who receive instruction in English (L2).

4. the difference in P3 pupils' Performance on mechanical arithmetic between those who receive instruction in the local language (L1) and those who receive instruction in English.

5. the more effective language (the local or English) to use as medium of instruction in the teaching of mathematics at the lower primary level in urban and rural schools in Ghana?

Hypotheses

Based on available related literature and the problem stated for the study the following null hypotheses have been formulated to guide the study.

1. There is no statistically significant difference between the mean achievement in Mathematics of P3 pupils taught using local language (Twi) (L1) as a medium of instruction and those taught using English (L2).

2. There is no statistically significant interaction between the type of language used for instruction and the location of a school given P3 pupils' achievement in Mathematics.

3. There is no statistically significant difference in performance between P3 pupils who receive instruction in Twi (L1) and those who receive instruction in English (L2) in answering questions on mechanical problems in mathematics.

4. There is no statistically significant difference in achievement between P3 pupils who receive instruction in Twi (L1) and those who receive instruction in English (L2) in answering questions on problem solving in mathematics.

5. There is no statistically significant difference in P3 mathematics achievement between urban schools, where Twi (L1) is used as a medium of instruction at P3, and where English is used as a medium of instruction.

6. There is no statistically significant difference in P3 mathematics achievement between rural schools, where Twi (L1) is used as a

medium of instruction at P3, and where English is used as a

medium of instruction.

Significance of the Study

Although, studies have been conducted in some countries to determine

a suitable language to use as a medium of instruction in schools, there is a

paucity of research in this field in Ghana. Those that were conducted, such as

Collison (1972), Andoh-Kumi (1992), and the Local Language Initial Literacy

(LLIL) project (1992), did not cover the Eastern region. Besides, only a few of

such studies have been conducted in Mathematics in Ghana. According to

Owusu (2002) Professor Kofi Kumado of the Faculty of Law, University of

Ghana, Legon, noted in an article in the August, 8th 2002 edition of the Daily

Graphic that research is very important relative to the search for suitable

language to be used as a medium of instruction for teaching in P1 to P3,

given the Ghanaian peculiar circumstances.

The study would, therefore, contribute to the understanding of the

suitability of using either the L1 or L2 as medium of instruction in teaching

mathematics at the lower primary schools in Ghana. The result would,

consequently, aid educational policy makers to formulate appropriate and

effective language policy for the country. In addition, the outcome of the study

would assist teachers through enhanced interaction with their pupils,

especially, those teaching at the lower primary level, to present effective

lessons to meet the needs of their pupils. This is because once a language

policy is based on empirical evidence, stakeholders would understand and

support its adoption and use it effectively. This would enhance interaction in

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the classroom. Consequently, it would go a long way to improve pupils' academic achievement. The result is also expected to serve as a guide to education officers who have the responsibility of guiding teachers in their work.

Finally, the result of the study has the potential of improving pupils' academic achievement, not only in mathematics but other school subjects as well. This is because using the appropriate language of instruction removes one of the psychological hazards in the way of pupils' learning and establishes a sound foundation for a general academic achievement.

Delimitation

The study was limited to only primary class 3. The choice of class 3 stems from the fact that, that class is the highest of the lower primary classes and the transition stage to upper primary as provided in the policy.

The researcher could not, cover all subject areas of the lower primary. Mathematics was chosen because it is a core subject and partly because it is one subject in which pupils perform most poorly. The study was conducted in schools in the Suhum Kraboa Coaltar in the Eastern Region of Ghana.

Limitation

The researcher identified two factors which could possibly limit the potency of the result. The duration of the intervention was one impediment that might have affected the result. The one-week duration for the intervention in each of the schools was not enough to have had the desired impact. Besides, the study covered addition and subtraction of fractions.

These topics were not sufficient enough. These notwithstanding, the statistical measures adopted would go a long way to reduce such limitations.

Definition of Terms

The terms to be defined are:

Urban: Classification of location based on population, with a population size of 5000 or more being urban.

Rural: A location whose population is less than 5000.

(L1):   The local language spoken in a given location and not necessarily a mother tongue.

(L2) :   A second language that has been adopted as an official or national language. In this particular case, English is the second language.

Organisation of the Study

Chapter one describes the background of the study. Chapter two presents a review of related literature. A detailed description of the methodology employed in the study is provided in chapter three. In chapter four the researcher presents the results of the study and follows it up with a discussion of the findings. Finally, chapter five covers the summary, conclusion and recommendations of the study.

CHAPTER 2

LITERATURE REVIEW

Language is one of man's major means of expression. It plays a major role in the education of the child both formally and informally. Bamgbose (1976) contends that in formal education the degree of mastery in the language of instruction influences school achievement considerably. Bamgbose (1991) further noted that language is, without doubt, the most important factor in the learning process for the transfer of knowledge or skills.

In Ghana, and other countries which are multilingual states, language of instruction has become an issue of controversy. The authorities are caught up in choosing between the local language (L1) and a foreign language (L2) as a medium of instruction. This situation supports the fact that multilingualism may present itself as a problem in many sectors of a nation's life including education (Hymes, 1967).

In this chapter, therefore, literature is reviewed on the relationship between language of instruction and academic achievement. The review included the nature of linguistics in Ghana, development of language policy in education in Ghana, relationship between language and thought, the threshold theory; theoretical framework of medium of instruction, studies on medium of instruction, the concept of achievement, academic achievement, medium of instruction for teaching mathematics at the lower primary, and

studies on medium of instruction in mathematics teaching at the early stages of schooling.

The Nature of Linguistics in Ghana

Ghana is a nation of numerous and divergent ethnic groups and languages. There are, at least, over forty speech forms that are mutually unintelligible. Dakubu (1988) put the figure between forty-five and fifty languages. Recent surveys conducted by SIC/GILLBT and cited in Andoh-Kumi (2001), indicate that Ghana has seventy-two languages. Consequently Ghana can be described as a multi-lingual state.

Multilingualism is a common feature in most African states. Multilingualism can be defined simply as a state of having many speech forms or languages in a given community or nation (Andoh-Kumi, 1997). Subsequently any nation that is multi ethnic tends to be multi lingual.

Every Ghanaian speaks one of the indigenous languages as L1. Besides, English is widespread in its use in Ghana. Andoh-Kumi (2001) noted that:

> English is an essential tool in everyday life of Ghanaians.
> It has become the lingua franca both internally and externally.
> It is the only language of formal education beyond the first
> three years of primary school and the official language at the
> national level. Ghanaians learn English mostly in school as
> L2 or L3. The Ghanaian therefore, acquires at least two
> languages -the Ghanaian uses the L1 at home and
> English mainly in the school (p.15).

Weinreich (1953) and Mackey (1962) described the alternate use of two languages as bilingualism. McNamara (1967) suggested that a bilingual is any one who has a minimal competence in one of the basic skills in a language other than his or her own language. Hammers, cited in Andoh Kumi (2001) defined bilingualism as the psychological state of an individual who has access to more than one linguistic code as a means of social communication. So every Ghanaian school child is expected to be a bilingual and in fact, at some stage and in some sense most of them are bilinguals (Andoh Kumi, 2000).

Bilingualism may present educational problems. Gbedemah (1975) succinctly described these problems when he stated that:

> In a country where many languages co-exist the
> difficulties of communication between and across
> ethnic boundary is compounded. To this must be added
> the nations that have many languages of their own but
> by force of historical and political circumstances have to
> receive modern education through a foreign language
> whose roots and operational system are unrelated
> to any of their local or indigenous languages (p.7).

Awoniyi (1976) reported in a study that the requirement to learn French as the language of instruction usually retarded scholastic progress. Children were frequently forced to drop out of school because their repeated failure largely resulted from the use of a foreign language as medium of instruction. Psychologists, sociologists, applied linguists and educators have become increasingly interested in bilingualism for a number of reasons.

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Psychologically, for example, Hormby (1977) stated that "there are a number of key issues including such considerations as the effects which speaking or knowing two languages might have on one's intellectual function..." p 9. He further noted that because of the primary role of language as medium of instruction and because of the close relationship between verbal functioning and measured intelligence, bilingualism has also not been neglected by those interested in the field of education, particularly at the primary grade level.

Besides, multilingualism may present itself as a problem in many sectors of a nation's life in education, national development, and in trans-cultural communications (Hymes, 1967). Ghana as a multilingual state has most of its citizens being bilinguals and thus has its fair share of the problems associated with multilingualism and bilingualism especially in the field of education.

Development of Language Policy in Ghana

Language policies in developing countries have always been issue of controversy, especially, where numerous ethnic groups are bounded within an arbitrary geo-political boundary (Yates, 1995). Yates further noted that as well as having to respond to individual and community needs, policy makers have seen language policy as an important tool for promoting national cohesion and integration. This notion has challenged the educational authorities in Ghana in their quest for an effective language policy for education. This is because Ghana is a multilingual state where over forty (40) different languages are spoken (Hall, 1983; Dakubu, 1988) besides the official language, English (Andoh-kumi, 2001). It is, therefore, not surprising that

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there has not been any consistency in developing and implementing a language policy with regard to instruction in the formal educational system.

The inconsistency in the language of instruction in education in Ghana began with the emergence of the missionaries in education. While the Basel and the Bremen missions encouraged the use of the local languages (Twi, Ga and Ewe) as the medium of instruction, the Wesleyans adopted the English language. On the part of the Basel mission, the mission's committee instructed that the vernacular of the people should never be suppressed by the English language. They subsequently commissioned Dr. J. G. Christeller, a philologist, for the scientific study of the local language (McWilliam and Poh, 1975). He was to study the local language and develop it into writing. The Basel missionaries took this initiative because they felt that the Gospel was best spread in the language of the converts and, therefore, made interest in linguistics work in the local language important in selecting the missionaries. The Wesleyans, on the other hand, stuck to the use of English language.

The first move in establishing a public educational system in Ghana was the ordinance for the promotion and assistance of education in the Gold Coast colony, which was enacted in 1882 (McWilliam & Poh, 1975). In the ordinance, one of the conditions for a primary school to receive grant- in- aid was that, the subjects of teaching should be reading and writing of the English Language. The curriculum did not include the teaching and / or the use of the mother tongue in spite of the monumental work that the Christian missions had done in the native language. However, when Gordon Guggisberg promulgated the 1925 Education ordinance the native language was given an official recognition for the first time (McWilliam & Poh, 1975). Consequently

the policy required that the local language of an area be used as a medium of instruction at the lower primary level (primary 1-3) while English is learnt as a subject of study. At the upper primary level (P4-P6) the native language was to be replaced by English as a medium of instruction. As noted earlier, the policy was misconstrued by some indigenous elite class to mean a deliberate attempt by the colonial office to provide Africans with "inferior" education (McWilliam & Poh, 1975).

Although the policy was implemented, education committees and policies of later governments provided varied views on the policy. The 1927 Report of the Advisory Committee on Native Education recommended that English as well as vernacular language should be taught in the primary school (Spencer, 1971). The Report recognized that one of the main reasons parents were sending their children to school was the desire for them to be able to speak English. The era of independence brought another change of language policy.

The Accelerated Development Plan (ADP) of 1951 provided that as soon as possible there should be a change from the mother tongue to English. Then the Bernard committee of 1956 which was appointed to investigate among other things, the feasibility of using English as a medium of instruction throughout the primary school, ended up divided and issuing two different reports. The majority of the committee members, which was made up of scholars of the Basel and Bremen tradition wanted indigenous languages to play a major role in education while those of the Wesleyan tradition, minority group, advocated for the use of English. Unexpectedly, the government adopted the minority report that the local language be used as a medium of

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instruction in the first year only and to be followed by English from the second year.

However, the Bannerman Committee (1963), Kwapong's committee (1967) and Dzobo Committee (1974) in their recommendations advocated for the local language to be used as a medium of instruction for the first three (3) years of primary school while English is taught as a subject. They further recommended that from the fourth year, English should be the medium of instruction and a Ghanaian language taught as a subject. In addition the Education Review Committee (Kwapong's committee) recommended that in 'experimental' schools and the metropolitan areas, English could be used as a medium of instruction from the first year but a Ghanaian language should be taught as a subject of study. Consequently, the Ministry of Education in its curricula changes in elementary education issued in 1971 stated:

> It is now government's Policy that the main Ghanaian
>
> languages at present provided for in the curricula of
>
> primary and middle schools be used as the medium
>
> of instruction in the first three years of the primary course
>
> and where the subject makes it possible in the next three
>
> years as well.

The Ministry of Education Policy Guidelines on Education (1988) and the Education Review Committee (1994) endorsed the policy and further asked for the training of teachers in Ghanaian language to that effect.

In spite of the legal support for the language policy by successive governments, its implementation leaves much to be desired. In the public system, it is mostly schools in the rural areas that use the local language for

the first three years, and in some cases beyond. Most schools in the urban areas and the private schools adopted the total English immersion. Perhaps, this must be in response to the 1964 Education Review committee's recommendation. Andoh-Kumi (2001) summarized the views of parents, educationists, policy makers and other stakeholders and listed the following as some of the arguments that have been raised against the school language policy of using the local language as medium of instruction:

1. The policy seeks to replace English with a Ghanaian language as the official language.

2. Mother tongue education produces low standards of English proficiency among the children.

3. Mother tongue instruction will force teachers to go and work in their home areas.

4. Mother tongue instruction will divide the country along tribal lines.

5. Mother tongue instruction will be difficult to implement because there are no instructional materials already available.

6. Mother tongue instruction will be difficult to implement in urban areas where children have different linguistic backgrounds.

Perhaps some of these reasons must have influenced the Minister of Education in February 2002 to have rejected the use of the local language as a medium of instruction. Ironically, it was at a time that the German Technical Co-operation (GTZ) was assisting the Ghana Education Service to produce books written in some of the Ghanaian languages in Mathematics, Social Studies and Science and was running workshops for Training College teachers on how to use them in a bid to intensify the implementation of the

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language policy. The then Minister of Education, consequently, informed Parliament that instructions at all levels of primary school would be in English (Parliamentary Report, 2002). The Minister of Education catalogued a number of problems that militate against the implementation of the policy of making the local language a medium of instruction. They included lack of resources, difficulty in posting teachers with requisite language background of the ethnic area and the wishes and perception of majority of the people to learn to speak the English fluently as an indicator of being 'educated' among others.

The government's position on the language policy was received with mixed feelings by Ghanaians. While some supported the government's decision (Davidson, 2002; Osei, 2002), others expressed the need to maintain the local language as a medium of instruction in the first three years of the child's education (Graduate Students Association of Ghana, 2002; Boakye, 2002). Kumado, cited by Owusu (2002) opined that to resolve the controversy on the appropriate medium of instruction requires research.

Relationship Between Language and Thought

An important and acceptable aim of education is the necessity to teach children to form concepts, use the mind in order to form opinions and to come to conclusions about things and situations. All these processes could be considered as thinking. Thinking is an internal process and for it to be recognized externally, assessed, judged or categorised, it must be communicated in some symbolic form, in other words, language. This implies that the thinker must have a good command of the language of communication or instruction to express what he/she thinks.

Language is a system of symbolic sequences used to communicate with others (Lahey, 1998). In another sense, language is a purely non instinctive method of communicating ideas, emotions, attitudes and information to other people. In short, language is a symbolic code used in communication (Brown, 2000).

Lahey (1998) explained that without an efficient communication it would not be possible to co-ordinate the efforts of many people in a division of labour, to regulate their behaviour for the common good through laws or to amass the wisdom learned through experience by previous generations and pass it on through education. Lahey noted further that the function of language is to say something to someone. The something is the meaning that is communicated through language. Thus meaningful ideas are sent from person to person through the system of symbols called language.

It is not surprising, therefore, that psychologists and educational researchers have for many years examined the role of language in cognitive development. Different views have been expressed with regard to the relationship between language and thought. Some of the studies have established that language influences thought. Watson (1925) thought that what psychologists call thought is in short nothing but talking to oneself. Watson further explained that the role of language is seen as supplying verbal symbols which can represent concepts and be used as stimuli for the internalized manipulation of these concepts. Whorf & Sapir (1956) also argued that one only thinks about things which words exist in the one's language. The evidence most often cited in support of this position is based on the fact that because the Eskimos have twelve or more different words for

snow they can perceive and think about snow in many ways which are quite foreign to many people. Whorf (1956) stated that "the background linguistic system of each language is not merely a reproducing instrument for voicing ideas but rather it is the shaper of ideas, the programme and guide for the individual's mental activity for his analysis of impressions" (p. 23).

Vygotsky (1962) examined the relationship between language and thought and concluded that language plays an essential role in human cognitive development, at least, from the time the child attains a certain level of language competence. According to him, language first develops as a means of social communication, is later internalized and becomes relevant for the elaboration of the abstract symbolic system that enables the child to organise thought. He postulated that an inefficient known language is the cause of inefficient thinking. He concluded that a well known language can generate rich thinking and vice versa.

In acknowledging the role of language in thinking from childhood, Bruner (1975) proposed that as the child develops conceptual linguistic abilities, language comes to play an increasing powerful role as an important implement or test for knowing. Morris and Maisto (1999) summarized this position and concluded that language helps to organize thought into concepts that serve as a kind of shorthand for a whole array of meanings. In fact, language is one of the intellectual processes through which information is obtained and transformed through thinking (Lahey, 1998).

Other studies have also shown that it is thought that influences language. Piaget (1959) noted that the development of certain logical concepts like "bigger", "smaller" etc precede the understanding of words

corresponding to those concepts and therefore, concluded that thought influences language.

Piaget, cited by Hayes (1998), believed that language is only one of several ways in which the children can represent their knowledge. In other words, Piaget saw knowledge as being precursor to language. He explained that the child first has experience, both internally and socially. In this view, language becomes a symbolic system used to express thought. In supporting Piaget's claim that it is thought that influences language, Hayes (1998) cites Vysotsky for having argued that at infancy language and thinking originate separately. At age two, he contended that the separate areas of pre-linguistic thought and pre-intellectual language join together. At this point thought becomes verbal and speech rational. From this time on language has two different functions, which are, monitoring and directing internal thought. Hayes (1998), therefore, concluded that once a child has acquired language, the language acquires another useful function which is that of monitoring thought processes.

In spite of the opposing views on the relationship between language and thought, it has been established that language and thought are inextricably linked (Lahey, 1998). Matsumoto (1995) also observed that language, thought and culture are intertwined. Language is one of the intellectual processes through which information is obtained and transformed through thinking (Lahey, 1998).

In explaining the role of language in the intellectual development of the child, Dewey (1933) summarized the various theories about the relationship between language and thought into three categories. These categories are:

1. language and thought are identical

2. words are garbs or clothing of thought necessary not for thought but only for conveying it.

3. while language is not thought, language is necessary for thinking as well as communication.

It is clear from this summary that whichever way one looks at the issue, there is a kind of close relationship between language and thought. Bever (1975) also summed up three theories about this relationship and stated "our options are clear if we insist on distinguishing language from thought. We can say that thought underlies language, that language is the vehicle for thought or both proceed in parallel" (p.76). Bever thought that the distinction between thought and language is only "Scientific heuristic" and that it would be a mistake to make too much of the distinction between the two.

One cannot easily dismiss the idea that language may make a major contribution to thought, even to the thought of the young child. This kind of conclusion seems to be in tune with the thinking of Caroll (1964) that even though many kinds of thinking are possible without language, language can obviously play a large role in thinking. While it is possible for a child to learn a language response without an underlying concept, Carroll believed that learning to use a word in a meaningful way implies that the child acquired the concept which underlies the linguistic response.

Bruner cited by Hayes (1998 discussed the development of mental representation, looking at the way the child uses enactive, iconic and symbolic

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forms of representation as it develops. He argued that for the child, language provides the means of transforming experience as well as simply representing it in a number of ways. This means that it can directly augment and enhance the child's ability to think. Bruner saw language as taking a very active role in cognition. The flexible qualities of language directly affect what is possible in terms of cognitive organization and so are intimately linked with our thinking.

It seems that progress along the intellectual path is facilitated by the acquisition of enriched language through a dynamic interaction with the linguistic environment. The acquisition and use of adult abstract terms engender new thoughts that subsequently enrich the language. The absence of opportunity to use the language adequately may inhibit the intellectual growth of an individual. That is the possibility exists that under linguistic inhibitory circumstances, intellectual growth may be truncated (Collinson, 1972). So, for normal and progressive intellectual growth the on going language and thought interaction should not be disturbed at least, in the formative years.

For education, according to Andoh Kumi (2001), the crux of the matter is that whatever is learnt or acquired by the pupil will have to be expressed in language for assessment. Therefore every pupil will have to know very well the medium of learning and assessment to be able to perform well.

The Threshold Theory of Language

The Threshold Theory of language (Cummins, 1976; Skutnabb-kangas & Toukomaa, 1977) posited that there are two thresholds of language. There is minimal 'threshold' level that pupils must reach in cognitive development

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in L1 to succeed in full development of proficiency in L2. The theory claims that the child must reach the first threshold level of linguistic competence to avoid negative consequences of bilingualism. In order to experience the possible positive consequences of bilingualism, the child must reach the second threshold level of linguistic competence in both languages. When a bilingual fails to attain the first threshold level in both the L1 and L2 then his/her academic work is likely to be impoverished. However, if he/she crosses the first threshold level in one of his/her languages he/she will not experience any cognitive deficits. The attainment of the second threshold level may lead to positive cognitive or academic growth.

The threshold theory helps to explain why there may be lags in achievement of the bilingual when the curriculum is taught through the L2. The theory postulates that until the L2 has been developed to a level sufficient to cope with conceptual learning, below average performance may be expected. Once the bilingual has acquired proficiency in the L2 enough to comprehend and conceptualize the curriculum content, the bilingual experience is unlikely to have detrimental consequences.

However, the theory also predicts that bilingual children taught through their L2, and who fail to develop sufficient competence in the L2, will not benefit from instruction in the L2. Cummins (1984) asserted that " this condition is cumulative and the children fall progressively further behind in academic and cognitive skills because their low level of L2 proficiency limits the scope of their interaction with the conceptual environment of the school" (p.60).

The threshold theory fails to consider the relationship and interaction between a child's two languages. Cummins (1979, 1980, and 1981) proposed a model that offers a theoretical insight into the influence of L1 and L2 in a bilingual school setting. This model holds that the level of L2 competence a child acquires is partly dependent on the level of competence achieved in the L1.

Theoretical Framework of Medium of Instruction

Language is one of man's major means of expression. It plays a major role in the education of the child both formally and informally. Bruner (1975) emphasized this point as follows:

> Man has the capability to receive and translate knowledge
>
> in a linguistic form. This permits man to convert knowledge
>
> into a form that renders it highly transformable. Language,
>
> not only permits an enormous condensation of knowledge
>
> but also permits us to turn the knowledge into hypothetical
>
> forms so that we may consider alternatives without having
>
> to act them in the form of trial and error (p. 44),

The importance of language in education is expressed by Bamgbose (1991) when he stated that language is without doubt the most important factor in the learning process for the transfer of knowledge or skills.

However, the issue of language has become controversial in respect of a suitable medium of instruction in the classroom in most part of the world. This situation is predominant in multilingual states and more especially, where a foreign language has infiltrated into the linguistic fabric as a national and a

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formal language as a result of historical and political consequences.

Gbedemah (1975) described the problem in this way:

> In a country where many languages co-exist, the
>
> Difficulties of communication between and across
>
> ethnic boundaries are compounded. To this must be
>
> added the nations that have many languages of their
>
> own but by force of historical and political circumstances
>
> have to receive modern education through a foreign
>
> language whose roots and operational system are
>
> unrelated to any of their local or indigenous language (p7).

Indeed, in formal education, the degree of mastery in the language of instruction influences school achievement quite considerably (Bamgbose, 1976). Bamgbose holds the view that a child who comes to school with a language of his own, and is then introduced to learning in another language is bound to have problems that are different from a child who is taught in his own tongue. It is, therefore, imperative for learners to have a high level of proficiency in the language used for the acquisition and transmission of knowledge (Andoh-Kumi, 2002).

Consequently, the issue of medium of instruction has been of great concern to educationists, psychologists, psycholinguists and sociologists.

The United Nations Scientific and Cultural Organization (UNESCO) (1953) acknowledged that the best medium for teaching the child is the mother tongue. It explained that the child learns more quickly through the mother tongue than through any unfamiliar linguistic medium. In support of the

United Nations Organization (UNO), the Organization of African Unity (OAU) at the conference of UNESCO (1975) pledged to pursue the promotion of African language as the medium of instruction and life long education. Okedara (1990) referring to language and literacy efforts in Nigeria, favoured the use of mother tongue as medium of instruction for psychological, sociological and educational reasons.

Fobih (1988) in describing the linguistics nature of the six year old child at the school wrote that:

> There is a big leap in the child's thought process. The
> child easily assimilates and acquires the printed symbols
> of his language. Consequently at P4, the child's cognitive
> maturity plus the teachers conscious efforts to foster transfer
> in learning help the child to use his earlier skills in the mother
> tongue to aid the reading activity in the new second
> language (p.16).

This illustrates that the use of the mother tongue as a medium of instruction helps to bridge the gap between the home and the school. In addition, it shows that it helps the child to develop the necessary skills that will propel him/her for adequate use of the second language. Fobih further observed that at the start of school, the Ghanaian child has mastered the language, has become some what competent in the skills of listening and understanding of the language, has acquired the vocabulary, can use the sentence structure correctly and is able to begin reading the printed symbols of the language and writing it.

In supporting the child's linguistic potentials and corroborating Fobih (1988), Kroch (1994) noted that by the end of Kindergarten, most children have learned the basics of their native language - phonology, syntax, semantics and pragmatics. Kroch concluded that these are all the elements of linguistics that children need to learn to communicate successfully. Fobih (1988), therefore, opined that it is not logically sound practice to leave the child's linguistic development and maturity in the mother tongue and start him/her all over again in a new language. The teacher's task, thus, is to help the child develop these skills further and teach him/her the usual appearance of the language he already understands (Brown, 2000).

In support of the superiority of the mother tongue over a second language as a medium of instruction, Awoniyi (1976) observed from Francophone West African countries that the requirement to learn French as the language of instruction usually retarded scholastic progress. Children were frequently forced to drop out of school because of their repeated failure - largely resulting from the use of a foreign language. Dakubu (1988), clearly expressed the usefulness of the mother tongue by this excerpt;

> The language mastered, no matter which one it is and no
> matter how large or small the community that speaks it, it
> is the common medium of communication in a community
> that has used it successfully for centuries to impart the
> concepts and the knowledge that the people need to live in
> the world. And being a natural language, it is infinitely
> flexible and capable of expansion and adaptation to changes
> in the circumstances of its speaker's lives. So for the

children coming to school there should not be a problem.

They have the equipment they need to be taught (p28).

Studies on Medium of Instruction

A number of studies have shown the advantages of mother-tongue (L1) instruction in the early years of education, leading to higher levels of cognitive development and enhancement in the acquisition of a second language in some parts of the world. One of the most conclusive studies in the mother tongue was carried out in the Ife region of Nigeria. It was a carefully planned and well controlled experiment on the use of L1 as medium of instruction. The Ife six year primary project carried out by the University of Ife between 1970 and 1978 was to test the validity of the claim that primary education received in the mother tongue is richer and more meaningful than that received in the second language (Fafunwa, Macauley & Sokaya, 1989). Sixty-five experimental classes were instructed in Yoruba in all subjects while the controlled classes were instructed in English (L2). Specially designed test was administered to both the experimental and controlled groups. The results revealed that the experimental schools excelled above the controlled schools. The study concluded that the advantages of teaching children in their mother tongue go beyond academic success to include cultural, emotional, cognitive and socio-psychological benefits (Akinoso, 1993; Bamgbose, 1991).

A similar evaluation of cognitive benefits in mother tongue education was carried out in 1985 in Mali. About 150 pupils from experimental schools who were instructed in the mother tongue and 340 from French schools

starting at the same level were observed from primary one through primary six. The results showed that 48% of the experimental pupils finished their studies without repeating a single year as compared to only 7% of pupils from the French speaking schools. The study showed that the use of the mother tongue in education is an important factor for academic success (Hutchinson, 1995).

In 1990 a sublingual transition programme, the threshold project, was studied in South Africa (Luckett, 1994; Klein, 1994) in which the pupils mother tongue was replaced with English in primary 3. The main conclusion was that bilingual programmes in which a language different from the students mother-tongue is used before a certain "cognitive level" is achieved are not likely to be successful.

In Tanzania, research in secondary schools demonstrated that teaching in Swahili (the mother tongue) is superior to teaching in English for the development of the mind (Mlama & Materu, 1978). It was observed that when pupils were asked questions in English, the answers were often incoherent and irrelevant showing lack of understanding of the questions and or inability to reply in English. However, when the same questions were asked in the mother tongue pupils gave relevant and articulate answers.

The issue of which language to use for instruction is not specific to Africa. Both Great Britain and the United States have experienced a large influx of immigrants from all over the world. With immigration comes the issue of how best to achieve cultural and linguistic integration of the various ethnic groups into the social fabric. Initially, both Britain and the United States chose total English immersion as a means of facilitating the integration of immigrant

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children. However, by the 1980's the flaws in the immersion theory became evident and the academic performance of immigrant children became a real concern (Klein, 1994).

From 1978 to 1981 the University of Bradford in Great Britain observed the effects of a yearly bilingual programme of five-year old native Punjabi (an Indian language) speakers. A control group using only English scored much lower, than children who were taught partly in Punjabi and partly in English. Similar results were obtained with Italian-speaking children (Klein, 1994).

In the United States, the Center for Minority Education and Research of the University of California carried out one of the most comprehensive longitudinal studies of bilingual education programmes from 1998 to 1991. The object of the study was to determine whether teaching Spanish-speaking students (who have limited English proficiency) mostly in English or in combination with Spanish, enables them to "catch up" with their native English speaking peers in basic skills in Mathematics and English. The study came to the following conclusions:

1. The students' mother tongue is the most effective language of instruction

2. Rapid transition to classes taught only in the students' second language does not allow the satisfactory development of the students' linguistic and cognitive abilities.

3. The second language can be taught effectively if half of the students' classes are taught in that language.

4. A bilingual/multilingual programme, integrated into the regular curriculum, gives the best results.

Orata (1953) gave an account of a study undertaken by the Department of Education in Manila, Philippines. The purpose of this carefully controlled study was to investigate the effects of using Hiligayon, an indigenous language, as medium of instruction in the first two classes in primary schools. The experimental schools were taught using the local language as medium of instruction for the first two years after which English replaced the local language. For the controlled group, English was used exclusively as medium of instruction. It was reported that the performance of the experimental group in the first two years was better than that of the controlled group. Moreover, in a Peruvian study, Hormberger (1987) showed how the use of Quechua as a medium of instruction in all subjects for six years of instruction also led to increased comprehension of reading, greater ease of writing and increased transmission of educational content.

However, there is no universal consensus about the educational advantages of mother tongue instruction. Wagner and Spratt (1988) found that with Berber monolingual children in Morocco, instruction in their second language did not automatically place them at a disadvantage compared with their Arabic speaking peers by the fifth year of primary school. There does, however, appear to be a growing consensus, especially among educationists and sociolinguists, of the need to preserve local languages through bilingual educational policies which aim to maintain vernacular languages while also equipping learners with a language of wider communication.

Hormberger's (1987) Peruvian study showed that despite being a success in pedagogic terms, the community rejected instruction in Quechua. This was because the school was perceived as being traditionally a Spanish

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language domain, a non- Quechua, island within the community and that

Spanish literacy acquired through the schools was perceived as being

necessary in supporting the community against the abuse of wider society.

Similarly, in Ghana when Guggisberg introduced the language policy making

the local language a medium of instruction for the first three years at the

primary level, some indigenous elite objected to it as a deliberate attempt by

the colonial government to provide Africans with inferior education (Mcwilliam

& Poh, 1975).

Other studies have also shown that the medium of instruction does not

influence significantly on the achievement of pupils in some subject areas.

Andoh-Kumi (2001) reported of a bilingual study which resulted in significant

difference in all subjects except achievements in mechanical arithmetic.

Similarly, MacNamara (cited in Morris, 1974), found out that although in

problem solving arithmetic, monolinguals performed better than bilinguals, but

in mechanical arithmetic there was no statistically significant difference

between the two groups. Henderson & Shama cited in Association for

Developing Education in Africa (ADEA) (1992) in another study in Zambia,

found similar results. It was observed that there was no significant difference

in achievement in mechanical arithmetic between monolinguals and

bilinguals, at grade 3.

Furthermore, a study that explored how different media of instruction

affect the learning of chemistry in a Malawian school showed that the

performance of students instructed in their vernacular language did not

improve as much as expected (Reinhard, 1996). In another study, Goldstein

& Liu, (1994) noted that an editor of a bridge programme had insisted that all

materials in the subject texts be related to students own experiences. He, however, found out that this is possible in some subjects such as social studies but not in others such as mathematics.

Studies on medium of instruction in Ghana

Most of the studies conducted in Ghana on an effective medium of instruction at the basic level, have shown that the use of the mother tongue is superior to the use of the English Language (L2). Collison (1972) undertook a study on language and concept development in Ghanaian elementary schools. Using class six, the purpose of the study was to investigate the effects of learning Science in English (L2) compared with learning science in the mother tongue (L1). The design made it possible for each child to use both English and a Ghanaian language in class discussions in two independent series of lessons. The results showed that learning science in the Ghanaian language results in higher conceptual thinking than when the learning is done in English. It also observed that there were instances when some of the pupils voluntarily switched from English to the Ghanaian language during English sessions.

Andoh-Kumi (1992) also studied the relationship between language of instruction and scholastic attainment in a correlation and experimental studies.

The correlation study examined the scores in language of instruction (English and the local language) of pupils in selected Ghanaian junior secondary schools. The scores were compared with their scores in other subject areas such as mathematics and Social Studies. The analysis of the data revealed a significant high positive correlation /relationship between the

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language of instruction and overall achievement. He, therefore, concluded that the language of instruction could be a factor in a child's school achievement.

As a result of the conclusion, Andoh- Kumi (1992) followed up the study with an experimental study. The study examined empirically the scholastic achievement of selected school children as they functioned successively in two 'school' languages in order to arrive at conclusions about which of their two languages (Akan or English) facilitates the learning of school subjects. The result of the study favoured instruction in Akan (L1). It supported the view that language is an important factor in the educational achievement of children and that the use of the L1 might enhance the achievement of children. It also observed that the mastery of the language of instruction can lead to substantial beneficial effects in the achievement of school children.

In 1996 the Local Language Initial Literacy (LLIL) project in Northern Ghana conducted a study in nine schools to compare the effect of initial reading and writing in the local language (L1) with English language (L2) on performance in English comprehension. The results not only showed that the English reading comprehension scores for the children who had first learned to read in their mother tongue were markedly higher than those children learning to read only in English but it was as well observed that those who started L1 literacy were doing well in the basic GES curriculum than the children who had been taught in English. The study was replicated in 1998 and the same result was reported as in the 1996 study. In the replicated study

a comparison was made between urban and rural pupils. The following observations were made:

1. The English only readers in urban town schools had higher scores than those in rural schools.

2. Urban school scores for Ghanaian language readers were higher than their English language reader counterparts.

3. The local language readers in the rural school performed remarkably better than those English only readers.

4. There was no difference between rural and urban schools who were engaged in initial local language literacy.

Furthermore, a research conducted in 1999 by the Centre for Research on Improving Quality of Primary Education in Ghana (CRIQPEG) of the UCC to find out the English language proficiency levels of primary school pupils, found among other things that, the pupils found it difficult to cope with instructions in English. Okyere (1999), reported in the study about rural schools that:

> the pupils could comprehend only simple instructions
> such as sit down, 'stand up' etc. However, they were
> generally unable to respond correctly to oral directions
> that required the use of vocabulary. Generally they were
> unable to express themselves in the English language.
> They often responded in the local language to questions
> asked in English (p. 74).

The Concept of Achievement

In every human endeavour the ultimate desire is achievement. Achievement has been used in different ways by different authorities. According to Sundberg (cited in Phares, 1979), achievement is associated with ability and aptitude, which constitute intelligence of an individual. Ability, to him, is the currently available power to perform something or a certain task and aptitude is the potential for performance after training. Achievement is, therefore, a successful performance of a task. Consequently, achievement involves skills that a person has mastered as a result of direct instruction (Hammil, 1987). Hammil further stressed that such skills exist in those individuals who have had specific training from parent, a teacher or oneself. He concluded that in the school, achievement tests are mostly conducted to discover how much a student knows about a particular content or subject taught and can be attained as a result of instruction. Nicholas, (cited in Clarizio and Graig, (1974)), noted that a higher achiever refers to a person who scores higher on tests of abilities. The definitions of achievement given by Sundberg and Spodek, Hammil and Nicholas indicate that achievement depends on one's abilities and capabilities to perform certain tasks after a given instruction and that one's achievement is determined through assessment.

Academic Achievement

Assessment in schools is basically based on academic achievement of students. Academic achievement is what a student is able to achieve when he is tested on what he has been taught (Sprinthal & Sprinthall, 1990). The

International Dictionary of Education (1977) also defined academic achievement as ones performance in school or college in a standardized series of educational tests. This makes academic achievement a crucial variable in the academic field.

It is in response to the crucial nature of academic achievement that a number of studies have been conducted to determine the factors that affect achievement (Anastasi, 1984; Neisworth & Bagnato, 1987). The identified factors are viewed from two perspectives. While some see academic achievement as the content of the intellect and therefore project intelligence as its basis, others see it as the product of the psychomotor abilities of a person and thus emphasize skills.

Anastasi (1984) saw academic achievement as being determined by intelligence. But linguists have also established a close link between intelligence and language by acknowledging that language and thought are inextricably linked (Lahey, 1998). This shows that language has influence on academic achievement. Therefore, if children are made to use a poorly developed language in school, the quality and quantity of what they take in from the teacher's curriculum materials and produce by oral and written means will relatively be impoverished (Baker, 1988). Cummins (1979) in his theory which sought to conceptualise the relationship between bilingual education and school attainment established that bilingual education could be said to be successful when pupils have enough L2 proficiency to work in the context.

Neisworth & Bagnato (1987) also believed that academic achievement depends on gifts and talent and asserted that if one has the talent or not, that

giftedness is not something that can be taught. Opposed to the stand that intelligent quotient (IQ) is an index to academic achievement are those who advocate for environmental factors as being responsible for academic achievement. Whimbley, (cited in Hammil (1987)) noted that academic achievement is not dependent on genetic endowment such as intelligence, but it is acquired. This suggests that people could through instruction acquire the skill of achievement. This means that people acquire achievement through instruction.

Flanagan,(quoted by Morris and Blatt (1986)), asserted that academic achievement is measured in terms of how well above the norm or average an individual performs. This means that the factors or variables in which high performance is recognized are relative and culturally determined. Flanagan and his associate implied that exhibition of high skills indicate potential for success.

Kirk and Galagher (1986) thought that the direction in which gifts and talents move depends on several factors such as experience, motivation, interest and self concept. Perhaps this assertion supports Whimbley's supposition because these factors directly or indirectly affect achievement (Micclelland, 1971; Atkinson 1984; Lahey, 1998). For example, McClelland (1971) in his theory of achievement motivation postulated that the primary factor for any level of achievement is the existing environmental cue, which impels the individual into action. Thus, he was of the view that if the school's environment is not stimulating enough the level of achievement and motivation will be low in an individual who lives in the milieu.

In addition Atkinson (1964) also propounded a theory of achievement motivation and asserted that the tendency to approach achievement goal is a product of three factors, the need for achievement or the motive for success, the probability of success; and the incentive value of success. He maintained that if the goal is perceived as easy to attain then the individual will have a high expectancy of succeeding. The opposite holds for a difficult task. The discussions above show that achievement is influenced by both hereditary and environmental factors.

Medium of Instruction for Teaching Mathematics at the Lower Primary

Available studies show that mathematics teaching at the early stages of schooling should be activity oriented and related to the child's previous experiences including language. Palling (1988) in describing mathematics teaching at the early stages maintained that as far as possible the teaching of mathematics should involve some practical activity with each child handling objects, drawing, sorting and measuring with a simple clear question to answer. This suggests that in mathematics teaching at the early stages, besides making it practically oriented, it should involve interactions. Palling, consequently, described such activity as discussion and suggested that such activities will help children to understand general results.

Discussion method helps children to think. If children are expected to think, they must be given the opportunity to ask questions (Palling, 1988). Palling further explained that questions help to know all the facts and the relationships between them. He, therefore, went on to show the importance of discussion in this way:

> Discussion not only helps the children but can also be
> of great help to the teacher. For the questions the children
> ask help often to indicate, very clearly, to the teacher
> the way in which the children think. They also indicate
> whether the child really understands a new idea or not (p. 4).

In emphasizing the need to make use of the child's previous experience, Dienes (1967) noted that before a child goes to school he learns much from all that is happening in and about his/her home, in the street and in shops. He learns to understand and to speak his/her own language. He has many experiences that are linked with basic ideas of mathematics. Dienes therefore, advised that the teacher should remember that most children have had these experiences and should extend and develop them during a child's few weeks at school. Dienes further observed that this will help very much to build a bridge between everyday life and school. This suggests that the language of instruction in mathematics for the beginner should be the one in which the child is already conversant with as opined by Andoh-Kumi (2002) that It "is imperative for learners to have a high level of proficiency in the language used for the acquisition and transmission of knowledge" (p. 2). This idea is buttressed by'(Garafalo, 1989) that the mathematics classroom must be vibrant and interactive and have an atmosphere of inquisitiveness, exploration and discovery. Stephens (1977) has expressed this view advisedly that the medium of instruction in mathematics needs to be evaluated at least in part, by its ability to develop relationships within which mathematical dialogue can be fostered. This goes to support the fact that the

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best learning situations exist where language can be used freely as the interactive medium (Hanley, 1978).

In order to foster dialogue in mathematics class, it is important that the child has absolute control over the language of instructions. Morris (1974) opined that many more students, no doubt, enjoy and succeed in learning mathematics if their attention was directed to situations that would provoke thought and invite debate. He contended that since situations have to be described and questions formulated the use of language is not only involved but also paramount. Linguistic fluency, he averse, is vital in mathematics teaching.

Palling's (1988) idea that mathematics teaching at the early stages of the primary school be based on the child's previous experiences including language suggests superiority of the use of the L1 as a medium of instruction for teaching mathematics over the use of a second language. However, in the language employed in mathematics teaching the terms and symbols used must be carefully chosen. An attempt should usually be made to render precise written communication which is devoid of any unnecessary embellishment (Dienes, 1967).

Goldstein and Lui (1994) noted that an editor of a bridge programme had insisted that all materials in the subject text be related to students' own experiences. He, however, found out that this is only possible in some subjects but not in all subjects especially, mathematics. He noted, for example that no practical or everyday experience can be used to explain that $a^0=1$. This required that the mathematical terms and symbols be introduced to the children with the technical names in order not to adulterate their meanings.

This is more effective with children who are culturally deprived (Bereit, 1966). Kennedy and Tipps (1988) and Palling (1988) have also suggested the discussion method to be suitable for teaching mathematics at the early stages at the primary school and creating opportunities for children to ask and answer questions.

Studies on Mathematics Teaching at the Early Stages of Education

A number of studies have been conducted on the effects of language of instruction on achievement in mathematics in the early stages of education. Some of the results revealed that the use of the mother tongue (L1) as a medium of instruction in teaching mathematics at the lower primary is superior to the use of foreign language (L2).

Morris (1974) cited an example of a study by MacNamara (1967) who found that bilinguals were inferior to monolinguals in problem solving in mathematics but not in mechanical arithmetic. This certainly is a reflection of the difference in their dependence on language. While mechanical arithmetic demanded only computing skills, problem solving depends primarily upon perceiving the problem, which means being able to read and understand. Handerson and Shama cited in ADEA (1992) found similar results. Students who learnt through the medium of English were compared to learners to whom vernacular was employed in schooling. The results of the study showed that while in mechanical arithmetic there was no significant difference in academic performance the vernacular users were more successful in problem solving arithmetic than the bilinguals.

Furthermore, in an action research on the potential for science learning in primary six, Eshun (1996) observed that on many occasions the pupils resorted to their first language (Fante) and showed that they were quite capable of discussing concepts and reasoning in that language. Consequently, Eshun suggested the exploration of the use of heritage language in the teaching of science.

In another study, Fafunwa, Macauley & Sokaya (1989) gave a report of a carefully planned and well-controlled experiment on the use of L1 as medium of instruction. The study, the Ife six year primary project, was carried out by the Institute of Education of the University of Ife between 1970 and 1978. An experimental group was taught by using Yoruba (L1) as a medium of instruction while the controlled group was taught in English. In both urban and rural settings it was found out that the experimental schools excelled over the controlled in all subjects including mathematics. The report further noted, however, that in a first School Leaving Certificate Examination, there was no statistically significant difference between the experimental and controlled schools in arithmetic among other subjects.

The results indicated that if children are made to use a poorly developed language in school, the quality and quantity of what they take in from the teacher's curriculum materials and produce by oral and written means will be relatively impoverished (Baker 1988). This implies that if pupils are not well grounded in the language of instruction, their achievement in school subjects will be impeded.

Summary

Since language and thought are intellectual processes, which have implication for education, the language used as a medium of instruction in the classroom interaction is very crucial. While some studies favour the use of the mother tongue (L1) as medium of instruction (Ak inoso, 1993, Bamgbose, 1991; Cummins, 1979) others have established that the use of a second language (L2) is more effective (Wagner & Spratt, 1988).

The controversy surrounding the issue of medium of instruction is not different in Ghana. Until recently, in Ghana, the language policy made it mandatory for the native language (L1) of an area to be used as a medium of instruction from primary 1 – 3 while English (L2) is taught as a subject. From class 4, English (L2) is used as a medium of instruction while the local language (L1) is taught as a subject. Unfortunately, not all schools comply with the policy.

In February 2002, government changed the policy and that English is to be used as a medium of instruction at all levels of education. While some support the government's position others wish that the local language were maintained as a medium of instruction from P1 to P3.

From the literature, the language suitable for mathematics instruction at the lower primary requires a language in which the pupils have proficiency. Besides this the mathematical symbols and terms should be presented in a language that would make them meaningful to the pupils.

CHAPTER 3

METHODOLOGY

This chapter describes the methodology that was employed in carrying out the study. This includes the design, sample and sampling technique, research instrument, data collection and data analysis.

The Research Design

The quasi-experimental design was used for the study. Wiersma (1980) defined an experiment as a research situation in which, at least, one independent variable called the experimental variable is deliberately manipulated or varied by the researcher. It is the research in which the investigator has control over one or more factors in the study that may influence the behaviour of the subjects. That is he/she can manipulate a factor and then, as a result, see what will happen to the responses of subject (Mcmillan, 1996). According to Wiersma (1980) quasi-experimental design is where intact groups rather than randomly formed groups are used. It involves procedures that resemble those which have characteristics of true experiments (Shaugnessy & Zechmeister, 1997). Consequently, the following design was adopted.

Group	Treatment	PostTest
A	X_1	O_1
B	X_2	O_2

The X represents treatment which in the study was the teaching. (X_1-schools where the local language (L1) was used as a medium of instruction and X_2 - school where English (L2) was used as a medium of instruction). The observation "0" represents the performance of the subjects. O_1 represented the performance of the L1 group and O_2 was the performance of the L2 group.

This design was suitable for the study because intact groups (full classes) rather than random groups were used for the study. One factor that could affect the internal validity of the design is differential mortality. This is because not all subjects who receive the treatment would be available to take the posttest. In this case, the outcome might not be a true reflection of the group's performance. Another limitation anticipated for the use of the design was that the subjects in each group must have been different in ways that would have differentially affected the dependent variable (achievement). Such situation makes it difficult to determine the true effect of the treatment on the subjects. This is because if there was any difference in achievement, it could not be attributed solely to the effect of the treatment but it could as well be attributed to the group differences. In this way, selection was the most serious threat to internal validity. To minimise this threat an entry behaviour test was conducted to select groups which were comparable in performance. This in a way controlled the selection differences. The shortcoming of the design not withstanding, the design helped to avert the inconveniences associated with dividing a class into groups by way of randomisation.

Population

The population for the study was primary 3 pupils. However, the accessible population was P3 pupils in the Suhum Kraboa Coalter District in the Eastern Region of Ghana. The researcher felt that pupils of that class are comparatively more proficient in the English Language than the other classes in the lower primary. The level of understanding of the English language of the class was therefore expected to provide even playgrounds for the intervention– as compared to the children's understanding of the local language. The researcher, as a result of this, felt that, the P3 would be a fair representation of the lower primary stage. In all there were 120 primary schools in the District.

Sample and Sampling Techniques

Four schools (4) were selected for the study. Two schools were selected from Suhum, an urban town, and the other two were selected from the rural areas.

The purposive and convenience sampling techniques were used to select the schools for the study. Considering the nature of the study, the convenient sampling technique was employed to select an initial eight (8) schools. Various schools were contacted and the first eight (four from Suhum and four from the rural areas) that accepted the request to participate were selected. In order to reduce the incidence of the pupils of one school to influence the learning of pupils from another school, the schools that were quite distant apart were selected. Consequently the following schools were selected; Suhum Presby Primary 'C', Suhum Roman Catholic Primary 'B', Suhum New Town Presby Primary, and Suhum Methodist Primary 'A'. For

the rural areas the schools selected were Okanta Presby Primary, Aboabo Sonkor Presby Primary, Budu L/A Primary and Oberetema Presby Primary. To select the final four schools for the study, the purposive sampling technique was used. An entry behaviour-test based on the P2 Mathematics syllabus was conducted for the P3 classes of the eight schools. The means and the standard deviations for the various schools were computed (see Tables 1 and 2). Two of the schools from Suhum, Suhum Presby Primary "C" and Suhum Methodist Primary "A" that were comparable in terms of the means and the standard deviations were selected for the sample. The same procedure was followed to select Okanta Presby Primary and Budu L/A Primary schools to represent the rural schools.

Table 1

Performance of Suhum (urban) schools in the entry behaviour test

Schools	Mean	Standard Deviation
Suhum Presby Primary "C"	9.7	3.5
Suhum R/C Primary "B"	7.8	3.5
Suhum Newtown Presby Primary	7.5	3.6
Suhum Methodist Primary "A"	9.4	3.8

As shown in Table 1 the mean scores of Suhum Presby Primary "C" and Suhum Methodist Primary "A" were closer while that of Suhum R/C Primary "B" and Suhum Newtown Presby Primary were also closer. However, the researcher selected Suhum Presby Primary "C" and Suhum Methodist Primary "A" because their scores were higher than the other two and reflect

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more the characteristics of urban schools as compared to the scores of the rural schools.

Table 2

Performance of rural schools in the entry behaviour test

Schools	Mean	Standard Deviation
Aboabo Sonkor Presby Primary	4.8	2.4
Okanta Presby Primary	8.3	2.7
Oberetema Presby Primary	10.9	3.7
Budu L/A Primary	9.1	3.3

As seen from Table 2 the mean scores of Okanta Presby and Budu L/A Primary are more comparable than the other schools. In view of this the two schools were chosen to represent rural schools.

By using the lottery method the sampled schools were designated as either English group or Twi group. The names of the four sampled schools were written on pieces of paper and placed in a container. A four- year- old boy was made to pick the pieces of paper at random with replacement. This was to ensure that the probability for the selection was maintained throughout the exercise. The first schools that were picked from the Suhum schools and the rural schools were labelled as Twi group while the rest were labelled as English group. The English group were taught using the English language as a medium of instruction while the Twi group were taught using the Twi language. Consequently, Suhum Methodist Primary "A" and Okanta Presby

primary constituted the Twi group while Suhum Presby Primary "C" and Budu Primary were labelled as the English group. This is presented in Table 3.

Table 3

<u>Schools selected for the study</u>

Location	Twi Group	English Group
Urban	Suhum Methodist Primary	Suhum Presby Primary
Rural	Okanta Presby Primary	Budu L/A Primary

Instrument

An achievement test instrument was designed by the researcher and used for the study. The items for the instrument (see Appendix A) were based on addition and subtraction of fractions with the same and related denominators, which were presented for the intervention. In all twenty items were presented, ten of which were non-story problems and the other ten were story problems. The questions were supplied type of objective items where pupils had to supply their own responses. This was to minimise the incidence of guessing in the response. Initially, twenty six (26) items were constructed. After review and editing twenty (20) of the items were finally selected.

<u>Validity</u>

In order to ensure content validity of the instrument, a table of specification was constructed (see Appendix B). The sub- topics were matched against two of Bloom's cognitive taxonomy of objectives namely, knowledge and comprehension.

After the initial write-up the researcher reviewed the items and examined grammar, clarity and suitability of the content of the items to the level and ability of the sample group. Ambiguity of the stems was also examined. It was then given to an expert in Mathematics who was an M.Phil Mathematics Education student, for editing. These steps were to establish evidence for content validity of the instrument.

Trial Testing of the Instrument

After the editing, the test instrument was administered on a pilot basis to a representative group of the sample – a P4 class of the University Primary School at Cape Coast. The primary four class was chosen because it was anticipated that during the time of the intervention most of the primary 3 classes must not have treated the topics selected but since the p4 class had gone through primary 3 already it was more likely that they must have been taught. This was confirmed by the class teacher. The scores were used for item analysis. This is presented in Appendix C. Indices of item difficulty, item discrimination and point biserial were computed. Item difficulty describes the difficulty level of the item and the item discrimination shows the extent to which an item discriminates between high scorers and low scorers. The point bi-serial, on the other hand, describes how performance on an item correlates with performance on the entire test. In other words, the point bi-serial indicates the likelihood of a high scoring testee to score the given item correctly and the low scorer getting it wrong. The following were formulae used for the computation of the various indices:

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Item Difficulty

The item difficulty, Pi, is the proportion of candidates who had item (i) correct and it is given by the number of candidates who obtained item (i) correct divided by the total number of candidates to whom the test was administered. Generally, item difficulty index of about 0.3 to 0.7 is desirable.

Item Discrimination

The item discrimination index for item i, Di, was calculated by the formula $D_i = U_i - L_i$, where Ui is the proportion of upper range scorers (30% of the testees who had high scores) who scored item i and L_i is the proportion of lower range scorers (30% of the testees who had low scores) who scored item i. Ebel (1965) offered the following guidelines for interpretation of item discrimination (D) values.

1. If D is greater than 0.40 the item is functioning satisfactorily.

2. If D is between 0.30 and 0.39 little or no revision is required.

3. If D is between 0.20 and 0.29 the item is marginal and needs revision.

4. If D is 0.19 or less the item should be eliminated or completely revised.

Point bi-serial

The formula used to compute the point bi-serial

$$\text{Pbis} = \frac{\overline{Xi} - \overline{X}}{Sx} \sqrt{\frac{Pi}{1 - Pi}} \quad \text{where}$$

$\overline{Xi}$ is the mean of the scores of examinees who scored item i.

$\overline{X}$ is the mean of the scores of all the examinees. Sx is the standard deviation of all examinees. Pi is the item difficulty for item i. For an item to be functioning well the point bi-serial index should be positive and for an item whose point bi-serial index is negative, it should either be revised or eliminated.

Based on the criteria for determining acceptable indices of the item characteristics, the suitability or otherwise of the items were determined. Those that were not appropriate were either reviewed or discarded. Consequently items 2, 6,7,8,11,12,13,20,23, & 26 were retained. Items 1,5,9,10,14,15,16,19, & 21 were revised and items 3, 4,17,18,24, & 25 were discarded. However, those discarded were substituted appropriately.

This stage was followed by assembling of the items. The less difficult ones were placed first and the more difficult were placed later. This was done to serve as a motivation for the pupils to respond to the items since encountering the most difficult ones first would have been put them off.

Reliability

After assembling, the instrument was tried out once again with a different P4 class of 55 pupils. This time the result was used to compute the reliability of the instrument. The Kuder Richardson 20 (KR 20) formula was used to compute the internal consistency of the instrument (Mehrens & Lehman, 1973). The KR 20 was appropriate for estimating the reliability because the items were homogenous and dichotomously scored. Besides, splitting the test would not have been easy, let alone determine

whether it is parallel or not. A reliability of 0.65 was reported (see Appendix E).

Data Collection Procedure

An entry behaviour test was administered to P3 pupils of the eight (8) selected schools by the researcher. The means and standard deviations of each school were computed (Tables 1 and 2) to determine two schools from each of Suhum and the rural areas with comparable standards. Following this, Suhum Presby Primary "C" and Suhum Methodist Primary "A" representing urban Schools and Okanta Presby Primary and Budu L/A Primary, representing the rural area, were selected for the treatments.

A lesson plan was prepared on addition and subtraction of fractions with same and related denominators. The choice of these topics became necessary because they are among the last topics in the Mathematics syllabus for the class and it was anticipated that by the time of the study none of the classes would have been taught. When the researcher inquired from the schools involved none of them had treated them.

Four days of one hour each was used for the treatment in each of the schools. The schedule below was followed.

Day 1...... Revision of fraction as a concept and equivalent fractions.

Day 2 ..... Addition of fractions with the same denominator.

Day 3...... Addition of fractions with related denominators.

Day 4 .... Subtraction of the same fractions with the same and related denominators.

The lessons were presented by the researcher. He presented the lessons on different days in the various schools. The lessons were presented at Suhum Presby Primary from 26th to 29th May 2003. At Suhum Methodist the presentation of the lessons started on 2nd June and ended on 5th June 2003 while that of Okanta Presby took place between 9th and 12th June 2003 and Budu L/A Primary had their turn between 16[th and] 19th June 2003. It was ensured that the lessons were presented about the same time in all the schools to allow for uniformity. An assistant was engaged and trained for the recording of observations.

Description of the Treatment

Day 1: On the first day after the researcher had introduced himself to the class he assured the children that the exercise was a continuation of their teachers work and that the outcome would not affect anyone of them. He therefore asked for their co-operation and asked them to feel free to participate in the lesson.

With the aid of fraction cards, strips of paper and counters the researcher revised fractions with them. The pupils were asked to mention, write, fold and demonstrate different fractions such as $\frac{1}{2}, \frac{2}{3}, \frac{3}{5}$ etc. They were also made to differentiate between numerator and denominator. This was followed by revision of equivalent fractions. The pupils participated actively. They were able to answer most of the questions correctly and performed the related activities satisfactorily.

In all the schools, the pupils demonstrated that they had fair knowledge of the concept of fraction. However, they did not know anything about

numerator and denominator as well as equivalent fractions which the researcher took time to explain with varied activities. In both the English and local language classes the pupils were able to answer questions that required simple answers. However, when it came to questions that required explanation those in the English classes could not explain but few of those in the local language classes made frantic efforts to do so.

Day 2:

The second day's activities began with revision of fractions. With the use of strips of paper and fraction cards the pupils were introduced to addition of fractions with the same denominator eg. $\frac{1}{3}+\frac{1}{3}$, $\frac{2}{5}+\frac{1}{5}$. The pupils were involved actively in the lesson. They were made, among other things, to demonstrate, answer questions and solve problems on the chalkboard.

The participation of the pupils was encouraging. They could answer most of the questions. Their difficulty was using the number line to do the addition. The second day's lesson did not show much difference between the English classes and the Twi classes in terms of responses and activities.

Day 3:

On the third day the researcher started by revising the addition of fractions with the same denominator and equivalent fractions eg.

$\frac{1}{4}+\frac{2}{4,}$ $\frac{2}{5}+\frac{1}{5}$, $\frac{1}{3}$ =... The pupils were asked to solve some problems and explain the processes involved.

This was followed by the addition of fractions with related denominators such as $\frac{1}{2}+\frac{1}{4}$, $\frac{3}{10}+\frac{2}{5}$. The researcher led the class in solving some examples on the chalkboard by first converting one of the fractions into an

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equivalent fraction such that the two fractions have the same denominators. Initially, this posed some difficulty for the pupils. Their difficulty was how to find the equivalent fraction. With careful explanation and a lot of activities they came to understand and were able to solve most of the problems given to them.

In this particular lesson the responses were not encouraging in the English classes, especially, at Budu L/A Primary which was a rural school. For most of the questions, the presenter had to repeat the questions in about three to five different ways before they were able to answer some of them. Even most of the questions had to be accompanied by gestures and demonstrations. In spite of all these, the presenter had to provide some of the answers himself. More seriously, some of their responses were in no way related to the questions. Sample of such questions and responses are the following.

1. Which of the fractions, $\frac{1}{3}$ and $\frac{1}{6}$ do we have to find its equivalent fraction?

    Response: Numerator, denominator, 3 etc.

2. Why do we have to change the $\frac{1}{3}$?

    Some of the responses: $\frac{3}{3}$, 9, denominator.

3. Are the two problems the same?

    Reponses: Numerator, $\frac{1}{5}$.

This situation showed that the pupils did not understand the questions that were asked. Although in the Twi classes they found it difficult to understand some of the questions, their responses were coherent and meaningful. They were more active than their English counterparts.

Day 4:

This was the last day for the experimentation. The lesson started with revision on addition of fractions with the same denominator and related denominators. The pupils were given some problems to solve and explain the processes involved.

The researcher then related these to subtraction of fractions with the same denominator and related denominators. Because of the transfer of knowledge from addition of fractions, the pupils found it very easy and showed much excitement especially with fractions with the same denominator. The researcher and the assistant were fascinated with the way the Twi classes – Suhum Methodist and Okanta Presby responded to questions asked. However, at Budu the previous session's problems continued to manifest. Unrelated answers were given to questions and questions had to be varied in many ways before they were able to answer some of them. Throughout the lessons none of the pupils could ask any question in spite of the opportunities given them.

Two weeks after the experimentation, the test was administered in each of the schools. It was administered by the researcher himself. All instructions relating to the administration of the instrument were indicated on the instrument. These included time, how to respond to the items and scoring. Forty (40) minutes were allowed for the test. This was to ensure that

all the pupils were able to complete answering the items. In all the schools, the test was administered at 9.30 a.m. on each day it was held. The researcher ensured that the examinees were well spaced so as to minimise malpractices. The test was administered in the pupils' respective classrooms. Before the beginning of the test the instructions were read audibly to the pupils.

After the administration of the test the scripts were marked by the researcher and the scores recorded. Since the items were objective type, they were dichotomously scored- either 1 or 0, where 1 indicated a correct response and 0 indicated a wrong response. The total score was, therefore, twenty (20).

Data Analysis Procedure

The study was to compare the effects of using the Local Language (L1) and English Language (L2) as media of instruction on achievement in Mathematics of P3 pupils in the Suhum Kraboa Coaltar District. The statistical tools used in the analysis were purely parametric t-test and two way Anova. The level of significance (α) was set at 0.05.

Hypothesis1; H_o: There is no statistically significant difference between the mean achievement in mathematics of P3 pupils who were taught using Twi (L1) as a medium of instruction and those taught using English (L2) as a medium of instruction.

To test for hypothesis 1, the independent t-test was applied. This tool was found appropriate because the hypothesis sought to find out whether there is a significant difference in the achievement of mathematics between

P3 pupils using the local Language (L1) as medium of instruction and the English (L2) by comparing means. Also the sample was chosen from independent populations. The statistical programme for social sciences (SPSS) was employed for the computation. The Levene's test was computed to determine the homogeneity or otherwise of the variance. To determine this, the p- value was compared with α of 0.05 level of significance. When the p-value is more than 0.05 it showed that equality of variance is not achieved but when the p-value was less than 0.05 then equality of variance is achieved. In determining the significance or otherwise of the difference at 0.05 level of significance, the p- value of the independent t-test was examined and compared with 0.05. Where the p-value was greater than 0.05 the difference was considered not significant and where the p-value was less than 0.05 it showed that the difference was significant.

Hypothesis 2

H_o: There is no statistically significant interaction between the type of language used for instruction and the location of a school given P3 pupils' achievement in Mathematics.

Hypotheses 2 sought to find out if there is a significant effect of the type of language used for instruction on P3 pupils' achievement in Mathematics of a given location of the school. The hypothesis was tested by employing the two- way ANOVA. This test was found suitable because the factors involved were two and the samples used were randomly selected. Besides, the Levene's test showed that the variances were equal.

The two- way ANOVA was computed using the SPSS. The p- value of the interaction was examined and compared with 0.05 level of significance. A p-value greater than 0.05 implied no significant interaction and a p- value less than 0.05 showed a significant interaction. When the interaction was not significant the main effect would have to be considered. On the other hand, if the main effect were significant, the appropriate post-hoc test would be conducted to determine where the difference lies. However, since the variables were only two, no post- hoc would be conducted. When the interaction was significant (when p was less than 0.05) the simple effect would be examined.

Hypothesis 3

H_o: There is no statistically significant difference in Mathematics achievement between P3 pupils who receive instruction in Twi (L1) and those who receive instruction in English (L2) in answering questions on mechanical problems in mathematics.

In testing for hypotheses 3 the independent t-test was computed from the SPSS programme. This was because the hypothesis was to compare two means whose samples emanated from independent populations. The Levene's test was examined to determine the homogeneity or otherwise of the variances. In this case the P-value was compared with 0.05 level of significance. A p- value greater than 0.05 implied that variances were not assumed equal. On the other hand, a p- value less than 0.05 implied that homogeneity of variance was assumed. In determining the significance or otherwise of the difference, the P-value of the t-test was examined and

compared with 0.05. Where p was greater than α, the implication was that the difference was not significant and where p was less than α, implied a significant difference between the means.

Hypothesis 4

H_o: There is no statistically significant difference in Mathematics achievement between P3 pupils who receive instruction in Twi (L1) and those who receive instruction in English (L2) in answering questions on problem solving in mathematics.

The independent samples t-test was employed to test hypothesis 4. This became necessary because the hypothesis involved one factor- achievement with two levels – L1 and L2. SPSS was employed for the computation. The Levene's test was examined to determine whether the variances were assumed equal or not. The p- value was compared with α of 0.05. Where the p-value was greater than 0.05 it implied that the variances were not equal. But a p-value of less than 0.05 implied that the variances were equal. In the t-test the sig (P) – value was compared with α of 0.05 to determine whether the difference was significant or not. Where p was greater than α, the implication was that the difference was not significant and where p was less than α, it implied a significant difference between the means.

Hypothesis 5

H_o: There is no statistically significant difference in P3 mathematics achievement between urban schools, where Twi (L1) is used as

a medium of instruction at P3, and where English is used as a medium of instruction.

The independent t-test was computed for the analysis. The Levene's test was conducted to determine the equality or otherwise of variances. In the t- test the p-value was compared with α of 0.05 to determine whether the difference was significant or not. Where the p-value was less than 0.05 it showed a significant difference while a p-value greater than 0.05 implied that the difference was not significant.

Hypothesis 6

H_o: There is no statistically significant difference in P3 mathematics achievement between rural schools, where Twi (L1) is used as a medium of instruction at P3, and where English is used as a medium of instruction.

The independent t-test was used for the analysis. The Levene's test was conducted to determine the equality or otherwise of variances. In the t-test the p-value was compared with α of 0.05 to determine whether the difference was significant or not. Where the p-value was less than 0.05 it showed a significant difference while a p-value greater than 0.05 implied that the difference was not significant.

CHAPTER 4

RESULTS AND DISCUSSION OF FINDINGS

The purpose of this study was to compare the effectiveness of using

the local language (L1) and the English Language (L2) as media of instruction

on Mathematics achievement in the lower primary schools in the Suhum

Kroboa Coalter District in the Eastern Region of Ghana. The population for

the study was the P3 pupils in the district. The convenience and the purposive

sampling techniques were used to select four primary schools in the District.

Two of the schools were selected from Suhum – (urban) and the other two

were selected from the rural areas in the district. The two schools selected

from Suhum were Suhum Presby Primary "C" and Suhum Methodist Primary

"A" and the rural schools selected were Okanta Presby Primary and Budu L/A

Primary.

An intervention involving the teaching of addition and subtraction of

fractions in Mathematics was carried out in these schools. The intervention

was carried out in P3 classes. The local language (Twi) (L1) was used to

teach at Suhum Methodist Primary "A" (urban) and Okanta Presby Primary

(rural) while at Suhum Presby Primary "C" (urban) and Budu L/A Primary

(rural) English Language (L2) was used as the medium of instruction. After

the intervention a test was conducted for the sampled classes of all the four

schools. In all 120 pupils took the test. There were 44 pupils from Suhum

Presby and 36 from Suhum Methodist. At Okanta Presby the number of pupils was 25 and there were 15 of them at Budu L/A Primary.

In this chapter the results of the study are presented and discussed in relation to the hypothesis formulated. The level of significance was set at 0.05.

Presentation of Results

Hypothesis 1

H_o: There is no statistically significant difference between the mean achievement in mathematics of P3 pupils who were taught using Twi (L1) as a medium of instruction and those taught using English (L2) as a medium of instruction.

The hypothesis was tested by using data from the posttest. The test involved all the 120 pupils from both rural and urban schools who were taught by either Twi (L1) or the English (L2). The total score was 20. The results of the test conducted are presented in Table 4.

Table 4

Posttest Results

School	Location	Lang.	N	Min	Max	Mean	Median	Mode	Std. Dev.
Suhum Presby 'C'	Urban	Eng.	44	0	13	6.18	6	8	3.10
Suhum Meth 'A'	Urban	Twi	36	1	12	5.39	4	3	3.28
Okanta Presby	Rural	Twi	25	1	11	6.00	6	6	2.63
Budu L/A	Rural	Eng.	15	1	10	4.60	4	4	2.41

Table 4 shows that the mean score of Suhum Presby Primary "C", an urban school where English was used as medium of instruction was 6.18 and was the highest among the participating schools. The least performance was recorded at Budu L/A Primary, a rural school where English was used for instruction. In schools where Twi was used for instruction, Okanta Presby (rural) performed better than Suhum Methodist Primary "A" (urban). Between the urban schools, Suhum Presby Primary "C" (English) performed better than Suhum Methodist Primary "A" (Twi) while in the rural schools Okanta Presby (Twi) performed better than Budu L/A Primary (English).

Table 5

Descriptive statistics and t-test of pupils Taught using Twi (L1) and English (L2)

Medium of instruction	Number of pupils	Mean	Std Deviation	T-test df	t	p
Twi	61	5.64	2.91	118	-0.264	0.8
English	59	5.78	3.41			

Table 5 shows that P3 pupils who were taught in English (L2) ($\underline{M}$ = 5.78) performed better on the average than those who were taught in Twi (L1) ($\underline{M}$ = 5.64).

In the Levene's test p=.644 indicated equality of variance. The independent t-test showed that the test was not significant, t (118)=-0.254, p=0.8. The researcher failed to reject the null hypothesis at 0.05 level of significance. The Mathematics achievement of P3 pupils in the Suhum Kraboa

Coaltar District of those who received instruction in Twi was not

significantly different from those who received instruction in English (L2)

Hypothesis 2

H_o: There is no statistically significant interaction between the type

of language used for instruction and the location of a school

given P3 pupils' achievement in Mathematics.

The purpose of the hypothesis is to find out if the use of a particular

language as a medium of instruction has any significant effect on

mathematics performance of P3 pupils of a given location. The statistical test

made use of the post test results of all the 120 pupils from both rural and

urban schools who received instruction in either Twi (L1) or English (L2). The

total marks was 20.

Table 6

Posttest mean scores of pupils by type of language/location of school

Location of School	Type of Language	
	Twi	English
Rural	6.00	4.60
Urban	5.39	6.18

Table 6 shows that with regard to type of language, where Twi (L1) was used for instruction in mathematics in P3, those in rural schools (M = 6.00) had a higher mean score than those in urban schools (M = 5.39). But where English was used as medium of instruction those in the urban schools (M = 6.18) had a higher mean score than those in rural schools (M = 4.60). In terms of location, in rural schools those who were taught in Twi (M = 6.00) had a higher mean score than those who were taught in English (M = 4.60). In urban schools, however, P3 pupils who were taught in English (M = 6.18) achieved higher than those who were taught in Twi (M = 5.39).

Table 7

A Summary of a two way ANOVA result showing the relationship between type of language of instruction and the location of a school

| Source | A two-way ANOVA | | | | | |
	ss	Df	ms	F	sig	eta
Language (L)	2.345	1	2.345	0.2345	0.611	.002
Locate	5.995	1	5.995	0.664	0.417	.006
Type* location	30.597	1	30.597	3.391	0.68	.028

The Levene's test showed equality of variance (p=0.199). The two-way ANOVA test shows that there is no significant difference in mathematics achievement at P3 between location of school and type of language used in instruction. F(1,1)=3.391, p=0.68.

Hypothesis 3

H_o: There is no statistically significant difference in Mathematics

achievement between P3 pupils who receive instruction in Twi

(L1) and those who receive instruction in English (L2) in

answering questions on mechanical problems in mathematics.

The testing of this hypothesis was to compare the effect of using the L1 and

L2 as media of instruction on the ability of P3 pupils in answering mechanical

questions in mathematics. Consequently, the scores of the 120 pupils on

mechanical questions of the post test were utilised. The data is presented in

Table 8.

Table 8

Posttest performance of the schools on mechanical questions

School	Lang.	N	Min	Max	Mean	Median	Mode	Std. Dev.
Suhum Presby 'C'	English	44	0	7	3.57	4	4	1.58
Suhum Meth 'A'	Twi	36	1	6	2.97	3	1	1.61
Okanta Presby	Twi	25	1	7	3.28	3	4	1.49
Budu L/A	English	15	1	4	2.7	3	3	0.96

Table 8 shows that in the posttest, Suhum Presby Primary "C"

(English) had the highest mean score on mechanical questions, while Budu

L/A Primary (English) had the least mean score. The minimum score of zero

was recorded at Suhum Presby Primary "C" while the maximum score of 7

was recorded at both Suhum Presby Primary "C" (English) and Okanta

Presby (Twi).

Table 9

<u>Mean scores and t-test of P3 pupils on mechanical questions by language</u>

Language	Number	Mean	Standard Deviation	Independent t-test		
				df	t	p
Twi	61	3.10	1.56	118	0.926	0.358
English	59	3.36	1.49			

Table 9 shows that schools where English (M = 3.36, SD = 1.46) was used for instruction in mathematics at P3 performed better in Mechanical arithmetic than where Twi (L1) (M = 3.10, SD = 1.56) was used.

The Levene's test showed that variances were homogenous. The test was not significant, $t(118) = 0.927$, $p = 0.358$. Achievement in mechanical arithmetic of p3 pupils who received instruction in Twi (L1) was not significantly different from those who received instruction in English (L2).

Hypothesis 4

H_o: There is no statistically significant difference in Mathematics achievement between P3 pupils who receive instruction in Twi (L1) and those who receive instruction in English (L2) in answering questions on problem solving in mathematics.

The purpose of hypothesis 4 was to compare the impact of L1 and L2 on media of instruction on p3 pupils' ability to answer questions on problem solving in mathematics. In other to achieve this, the scores of both the Twi and English groups of all the 120 pupils on problem solving were compiled and presented in Table 10. The total score was 10.

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Table 10

Posttest performance of schools on problem solving

School	Lang.	N	Min	Max	Mean	Median	Mode	Std. Dev.
Suhum Presby 'C'	English	44	0	8	2.61	2	2	2.03
Suhum Meth 'A'	Twi	36	0	7	2.42	2	0	2.08
Okanta Presby	Twi	25	0	6	2.72	3	4	1.65
Budu L/A	English	15	0	6	1.87	2	0	1.73

For problem solving questions Okanta Presby Primary had the highest

mean score while Budu L/A Pimary obtained the lowest mean. The least

score of zero was recorded in all the schools but the highest score of 8 was

obtained at Suhum Presby Primary "C".

Table 11

Mean scores and t-test of P3 pupils in problem solving by language

Language	Number	Mean	Standard Deviation	Independent t-test		
				df	t	p
Twi	61	2.45	1.90	118	0.332	0.741
English	59	2.42	1.97			

Table 11 indicates that pupils who received instruction in Twi had

higher scores in problem solving than those who received instruction in

English. Variances were found to be equal (in the Levene's test, p= 0.838).

The test was not significant, t(118) = 0.332, P = 0.741. The researcher failed

to reject the null hypothesis. In problem solving, performance of P3 pupils who

were taught in Twi (L1) was not significantly different from those who were taught in English (L2).

Hypothesis 5

H_o: There is no statistically significant difference in P3 mathematics achievement between urban schools, where Twi (L1) is used as a medium of instruction at P3, and where English is used.

The hypothesis was formulated to compare the effects of using Twi (L1) and English (L2) as media of instruction on mathematics achievement of P3 pupils in urban schools. The number of pupils from urban schools who took part in the posttest was 80. The English group was 44 and the Twi group was 36. The data whose total score was 20 is presented in Table 12.

Table 12

Mean scores and independent t-test of urban schools by language

Language	Number	Mean	Standard Deviation	Independent t-test		
				df	t	p
Twi	61	5.39	3.28	78	-1.102	0.274
English	59	6.18	3.10			

Table 12 shows that in urban schools pupils who received instruction in English had higher mean score than those who received instruction in the local language. The Levene's test (p = 0.95) showed that variances were equal. The difference was not significant, t (78) = -1.102, p = 0.274. The test showed that in urban schools the mathematics achievement of P3 pupils who

received instruction in Twi (L1) was not significantly different from those who received instruction in English (L2).

Hypothesis 6

H_o: There is no statistically significant difference in P3 mathematics achievement between rural schools, where Twi (L1) is used as a medium of instruction at P3, and where English is used.

Hypothesis 6 was tested to compare the effects of using Twi (L1) and English (L2) on achievement of p3 pupils in mathematics in rural schools. The Twi group and English group in the rural area were 25 and 15 respectively making a total of 40. The total marks was 20. The data is shown in table 13.

Table 13

Mean scores and independent t-test of rural schools by type of language

Language	Number	Mean	Standard Deviation	Independent t-test		
				df	t	p
Twi	25	6.00	2.63	38	1.679	0.101
English	15	4.60	2.41			

Table 13 shows that in rural schools pupils who received instruction in the local language had higher mean score in mathematics than those who received instruction in English. In the Levene's test (p = 0.689), variances were found to be equal. The test was not significant, t (38) = 1.679, p = 0.101. The achievement of the P3 pupils in the rural schools who received

...instruction in Twi (L1) was not significantly different from those who were instructed in English (L2).

Discussion of Findings

Comparison of P3 Pupils' Achievement in Mathematics using Language of Instruction

Studies on medium of instruction had established that the use of local language produces better academic achievement than the use of a second language (Akinoso, 1993; Andoh Kumi, 2002; Bamgbose, 1991; Fafunwa 1989; Klein 1994). Other studies also favour the use of the second language (L2) as a medium of instruction (Wagner & Spratt, 1988).

The independent t-test was conducted to determine whether the difference is significant or not. The test was appropriate because two means of samples that emerged from independent populations were compared.

The result of the t-test (independent) shows that the performance in mathematics of P3 pupils in the Suhum Kraboa Coaltar District who received instruction in Twi was not significantly different from those who received instruction in the English language. The result of the statistical test partly supports Ando-Kumi's (2001) study of the Central Region of Ghana on medium of instruction at the basic education level. He found out that when pupils were taught in their L1 it did not always necessarily results in lower achievements in pupils' general school performance. Andoh- Kumi's study showed no significant difference in mathematics achievement between the use of Akan and English as media of instruction among half of the schools

used. At Winneba (an urban town), the study showed no significant difference between the use of Akan (L1) and English (L2) as media of instruction. However, at Enyan Denkyira, (a rural community), a significant difference was recorded. This goes to explain that the result of this study which showed no significant difference was the effect of combining the performance of both the rural and the urban schools who were taught in the same language. For example, the mean score of Suhum Presby, an Urban school where English was used as a medium of instruction (M= 6.18) (Table 4) was the highest among the schools. But the mean score of Budu L/A Primary, a rural school where English was also used (M = 4.6) was the least among the schools. Again while two pupils scored the highest mark of 13 from Suhum Presby (see appendix H1), the highest score of Budu L/A primary was 10 and was scored by only one pupil (see appendix H2). This means that the performance of Suhum Presby compensated for the shortfall of their English counterpart in the rural area.

The data of the study showing that schools in the urban areas perform better with the use of English as a medium of instruction is also captured by the Education Sector Review Paper from the Local Language Initial Literacy Project in Northern Ghana (1998). The study noted among other things that:

> The English-only readers in town schools had higher scores than those in the rural schools. However, the findings for rural schools were very dramatic. In rural schools no child who learned to read in English reached the 'high pass' level (p504).

Consequently, the results the study showed that the achievement of lower primary pupils in mathematics when the local language is used for instruction would not be different from using the English language for instruction.

Another factor that is worth considering in discussing the effects of the language used as medium of instruction on performance in mathematics at the lower primary is the level of mastery of that language. During the intervention it was observed that schools where English was used for instruction encountered some difficulty. Although in all the schools, class participation was very high, it was observed in the English classes that the pupils could not cope with questions that called for explanation of how some problems were solved. In schools where local language was used as medium of instruction, such problem was, however, minimal. Not only this, but the responses of the English group indicated that they did not understand some of the questions asked, especially, at Budu L/A primary. In that school some of the responses they gave did not relate to the respective questions. This situation conforms to the threshold theory (Cummins; 1977 Skutnaab-Kangas & Toukomaa, 1977) which noted among other things that when a bilingual does not attain the threshold level in both the L1 and L2, his/her academic work is likely to be impoverished. This is exemplified by relating the post test results to the entry behaviour test scores. While Suhum Presby and Budu L/A (English group) had means of 9.7 (Table 1) and 9.1 (Table 2) respectively in the entry behaviour test, Okanta Presby had a mean of 8.3 (table 2). If these results were anything to go by, then it was expected that Suhum Presby and Budu L/A would have performed far better than Okanta Presby in the posttest. But the post-test results showed that Okanta Presby rather performed better

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than Budu L/A (mean scores of 6.00 and 4.6 respectively) (Table 4) while it almost equalled the performance of Suhum Presby Primary 'C' (Table 4). It can, therefore, be explained that the inability of the English group to excel in the posttest so as to have brought about any significant difference might have been due to the fact that some of the pupils had not developed the English language sufficiently to cope with conceptual learning. Indeed, in formal education, the degree of mastery in the language of instruction influences school achievement quite considerably (Bamgbose, 1976).

On the other hand, the Twi group did not have the difficulty described above. It was noted during the intervention that they were at home with the medium of instruction. This reflected in their active participation and contribution to the lessons.

In interacting with the pupils in all the schools it was gathered that almost all of them use Twi to communicate at home and among themselves outside the classroom. It was, therefore, not surprising that the mean score of Okanta Presby Primary (Twi- rural) was higher than that of Budu L/A Primary (English-rural) which was contrary to the entry behaviour achievement.

Given the evidence advanced, the result that there is no significant difference in mathematics achievement of P3 pupils between those taught using the local language (L1) and those taught using English (L2) was not by chance.

The Effect of the Type of Language used for Instruction on the Location of a School in Terms of Mathematics Achievement at P3

Hypothesis 2 was tested to find out if there is a significant effect of the type of language used for instruction on achievement in mathematics of P3 pupils of a given location. A two- way analysis of variance (ANOVA) was conducted to determine the effect of the type of language used for instruction on Mathematics achievement of p3 pupils of a given location of school. The test was appropriate because two factors – type of language and location of a school were involved. Also, the selection of schools for the respective languages was randomised. Besides, the Levene's test ($\underline{F}$=1.577), $\underline{P}$ = 0.199 indicated that variances were homogeneous.

The ANOVA test was not significant (Table 9). There is no significant interaction between the type of language used for instruction and the location of a school. In the main effect (location of a school) the test was not significant. In urban schools, the mean score of the English group was not significantly different from the mean score of the Twi group. In the rural schools too, the mean score of the English group was not significantly different from the Twi group.

Similarly, for the type of language, the test was not significant. In schools where the local language was used there was no significant difference between the performances of urban and rural schools. Where English was used, the mean score of urban schools was not significantly different from the rural schools. The researcher failed to reject the null hypothesis at 0.05 level of significance.

The ANOVA test (Table 7), shows that when the local language (L1) is employed as language of instruction at P3, mathematics achievement of urban schools was not significantly different from that of the rural schools. This conclusion supports part of the observation made in the study by the Local Language Initial Literacy (LLIL) project in Northern Ghana that there was no difference between rural and urban schools who were engaged in initial local language literacy. The conclusion that there is no significant difference in achievement between the urban and rural schools using the Twi as a language of instruction conforms with Bamgbose's (1976) contention that in formal education the degree of mastery in the language of instruction influences school achievement considerably. This is confirmed by the interaction the investigator had with the pupils. In both urban and rural schools they claimed that in their homes they communicate solely in Twi and when they come to school they interact among themselves in Twi outside the classroom. It shows that before they come to school the pupils had already mastered the Twi language and their continuous use of it makes them proficient in it. The implication is that any instruction given in this language at the early stages of their education would not have any adverse impact on them. This supports the fact that it is logically sound to take advantage of the child's linguistics development and maturity in the mother tongue to facilitate learning (Dakubu, 1988; Fobih,1988; Kroch, 1994). Palling (1988) suggested that mathematics teaching at the early stage of the primary school be based on the child's previous experiences including language. Indeed, if the discussion method is suitable for teaching mathematics at the early stages of the primary school (Kennedy & Tipps, 1988) then the language of instruction

should be the one the pupils are already conversant with. This will create opportunities for them to ask and answer questions. Of course, the mathematics classroom must be vibrant and interactive and must create an atmosphere of inquisitiveness, exploration and discovery (Garafalo, 1989).

During the intervention, it was observed that in the Twi classes, because the pupils were proficient in the language of instruction, they participated actively in the lessons and showed confidence in their responses. On the contrary, at Budu L/A primary, in particular, where English was used as medium of instruction the pupils showed signs of timidness and most of their responses were not relevant to some of the questions asked. These characteristics become clearer when the results of both the entry behaviour test and the posttest are compared. In the entry behaviour test (pre test) Budu L/A primary had a mean score of 9.1 while Okanta Presby had a mean score of 8.3. It was, therefore, expected that Budu L/A primary would have performed better in the posttest than Okanta Presby but rather Okanta Presby (M = 6.00) performed better than Budu L/A primary (M=4.60).

This explains that if children are made to use a poorly developed language in school, the quality and quantity of what they take in from the teacher's curriculum materials and produce by oral and written means will be relatively impoverished (Baker, 1988). This conforms to the threshold theory (Skutnabb - Kangas &Toukomaa, 1976). Because the schools in both the urban and the rural areas were equally proficient in the local language it is not surprising that in spite of the difference in their mean test scores the test established that the difference is not statistically significant.

In the main effect of location, the two-way ANOVA test shows that there is no significant difference in mathematics achievement at P3 between urban and rural schools when English is used as the language of instruction. In spite of this conclusion, an examination of the mean difference suggests that a difference in the means cannot easily be brushed off. The mean score of Suhum Presby (an urban town) (M =6.18) was greater than that of Budu L/A Primary (rural-English) (M = 4.60) (see table 4). This shows that the use of English as a medium of instruction is more effective in urban schools than in the rural schools. If Palling's (1988) suggestion that mathematics teaching at the early stages of the primary school be based on the child's previous experience is anything to go by, then the use of English (L2) as language of instruction in mathematics teaching should be more effective in the urban schools than in the rural schools. This is because the socio- cultural conditions prevailing in urban towns make most of the children conversant with the English language before they go to school. Pupils in urban towns come mostly, from affluent and middle-income homes and their parents take particular interest in their wards' education. In such homes, some of the parents communicate with their children in English. Furthermore, it is the wish and perception of the majority of parents in the middle and upper social classes in Ghana that their children learn to speak English as an indicator of being "educated" as observed by the Minister of Education, in a parliamentary debate (28th February, 2002). As a result, such parents make conscious effort to help their wards to learn the English language. Consequently, before such wards enter school most of them are already conversant with the English language. This is to say that in most urban schools most of the children have

sufficient background in the English language such that it could conveniently be used as language of instruction without impeding the pupils' achievements. Besides, the existence of varied linguistics background of pupils in urban towns, makes the use of English as medium of instruction more convenient and suitable.

The situation is quite different in the rural areas. For example, at Budu L/A primary (a rural school where English was used for instruction) a different picture was painted during the intervention. In most cases the researcher had to repeat some of the questions, reframed some and at times, accompanied such questions with gestures before the pupils could answer some of them. Besides, some of their responses did not relate to the corresponding questions. This disparity between the urban and rural schools when English is used as medium of instruction is illuminated by their performance in the post-test. In the entry behaviour test (pretest) the performance of Suhum Presby ($\underline{M}$ = 9.4) (see Table1) and Budu L/A Primary ($\underline{M}$ = 9.1) (see Table2) was about the same but in the post test there was a difference of 1.58 between the two schools. This gives evidence that the pupils of Budu L/A primary were less grounded in the English Language than Suhum Presby, pupils. It, therefore, confirms the import of the threshold theory that when a bilingual fails to attain the first threshold level in both the L1 and L2 his/her academic work is likely to be impoverished (Cummins, 1976; Toukomaa & Skutnabb - Kangas, 1977). This is also highlighted by Andoh Kumi (2000) when he opined that it is imperative for learners to have high proficiency in the language used for the acquisition and transmission of knowledge. Since language is the vehicle for thought (Bever, 1975), if the learner is not

proficient in the language of instruction he/she cannot express himself for the teacher to identify his/her weaknesses and find remedy to them, thus impoverishing his/her academic performance. Okyere (1999) in a study of rural schools made similar observation and reported that:

"the pupils could comprehend only simple instructions like 'sit down', 'stand up' etc. They were generally unable to respond correctly to oral directions that require the use of vocabulary. Generally, they were unable to express themselves in English" (p.74). Examining the entry behaviour test result (see Table 2) one could conjecture that if Twi had been used at Budu L/A Primary they could have performed better than they did in the posttest.

The available evidence shows that the surface mean difference in achievement between urban and rural schools when English (L2) is used as medium of instruction can not be over looked and that the use of English language for instruction would favour urban schools than rural schools. However, the ANOVA test shows that there is no significant difference between the two means.

The Language of Instruction that Favours P3 Pupils' Performance in Answering Questions on Mechanical questions

In order to determine the language that can facilitate lower primary pupils performance in answering questions on mechanical questions, hypothesis 3 was formulated and tested. The hypothesis was tested to find out if there is a statistically significant difference in performance between P3 pupils who receive instruction in Twi (L1) and those who receive instruction in English (L2) in answering questions on mechanical questions.

An independent samples t-test was conducted to find out if the performance of lower primary pupils who received instructions in Twi (L1) in answering questions on mechanical questions differs significantly from those who received instructions in English (L2). Variances were assumed equal. The test showed that there was no significant difference. This means that at 0.05 α there is no statistically significant difference in the achievement of the P3 pupils in mechanical questions between those who received instructions in Twi (L1) and those taught in English (see Table 9). So the researcher failed to reject the null hypothesis.

From the test it can be concluded that in mechanical arithmetic, achievement of P3 pupils who received instruction in Twi (L1) is not significantly different from those who received instruction in English (L2), although the English group mean score (M = 3.36) was slightly greater than their Twi counterparts (M = 3.1). This conclusion supports a number of studies in which no significant difference was reported between monolinguals and bilinguals in mechanical arithmetic. Andoh Kumi, 2001; Handerson & Shama; 1974. MaCnamara, 1964; and Morris, 1974, attributed such conclusion to the test items' degree of dependence on language. It is explained that mechanical arithmetic solutions demand only computing skills, unlike problem solving which depends primarily on perceiving the problem through reading and understanding of the language involved. Since achievement in mechanical arithmetic is not relative to the use of language, pupils ability to perform in this area depends very much on their ability to compute which also depends on one's intelligence (Anastasi, 1984) and motivation.

With regard to the location of schools some differences were noticed. In the urban schools, between Suhum Presby Primary "C" (M = 3.57) and Suhum Methodist Primary "A" (M = 2. 97) (see Table 8) there was a mean score difference of 0.6 in favour of English (L2) while in the rural areas Budu L/A primary (M = 2 .73) and Okanta Presby Primary (M = 3.28) (see Table 8) there was a difference of 0.55 in favour of Twi (L1). These differences were too small to make any significant impact. Besides, the differences occurred in favour of the two types of languages. One can, therefore, conclude that when the local language (L1) is used as language of instruction at the lower primary, the achievement in mechanical arithmetic will not differ significantly from the achievement when English (L2) is used for instruction.

The Language of Instruction Appropriate for Lower Primary Pupils Performance in Answering Problem Solving Items in Mathematics

Hypothesis 4 was tested to find out if there is a statistically significant difference in achievement between P3 pupils who received instruction in Twi (L1) and those who received instruction in English (L2) in answering questions on problem solving in mathematics. The hypothesis was tested for significance using the t- independent test.

The Levene's test indicated that equality of variance was assumed. At 0.05 significant level, the achievement in problem solving items of P3 pupils who received instruction in Twi (L1) does not differ significantly from those taught in English (L2).

From the independent t-test it can be concluded that in problem solving there was no significant difference in P3 pupils achievement between those

Twi (L1) was employed as medium of instruction and those that English (L2) was employed. In spite of the t- test result the means showed that achievement in problem solving slightly favours the use of local language as a medium of instruction for P3 pupils as against the use of English. This corroborates the findings of some studies. Mcnamara cited in Morris (1974) found out that bilinguals were inferior to monolinguals in problem solving arithmetic. This is further supported by Handerson and Shama in ADEA (1992) in a study which produced similar results. They noted that there is a significant difference between monolinguals and bilinguals in problem solving. Morris explained the rationale behind this finding and observed that unlike mechanical arithmetic, problem solving depends, primarily, upon perceiving the problem through reading and understanding. This implies that if the language of instruction is not well mastered by the learners they cannot perform well in problem solving (Bamgbose, 1976). This can be illustrated by the posttest results. While at Suhum Presby (English group) only 1 (2.3%) scored zero in mechanical arithmetic as many as 8 (18.2%) had zero in problem solving (see Appendix H 6). Again, in the urban schools, Suhum Presby's mean score of 2.61 in the problem solving was greater than that of Suhum Methodist "A" (M= 2.41) (see Appendix H 8). However, the difference (0.2) is very small. This is because during the intervention there was evidence that Suhum Presby (English) had control over the English language, the medium of instruction and Suhum Methodist also did not have any difficulty with the Twi (medium of instruction).

However in the rural schools, a greater difference was noted. The difference between Okanta Presby (Twi) (M = 2.72) (see Table 10) and Budu

L/A (English) (M=1.87) (Table 12) was 0.85. This is because while Okanta Presby did not have any problem with the Twi (medium of instruction) Budu L/A Primary found it difficult to cope with the English which was the medium of instruction. This notion is expressed by Macnamara (1967) in a study in which he contended that bilinguals are inferior to monolinguals in problem solving arithmetic. Furthermore, at Budu L/A primary, 4 of the pupils (26%) scored 0 (see Appendix H xii) which was the modal score for the problem solving while at Okanta Presby (rural-Twi) only 3 of the pupils(12%) scored zero with a mode of 4 which was scored by 6 (24%) of the class (Appendix10).

From the the independent t-test it can be concluded that there is no statistically significant difference in mathematics achievement in problem solving between P3 pupils who received instruction in Twi (L1) and those taught in English (L2). However, it is likely that this may hold in urban schools but in the rural areas the use of local language may enhance achievement in problem solving more than the use of English (L2) as medium of instruction.

Comparing the Effectiveness of Twi (L1) and English (L2) in the Teaching of Mathematics at the Lower Primary of Urban Schools

Hypothesis 5 was tested using the independent t-test. It was to find out if In urban schools where Twi (L1) is used as medium of instruction at the lower primary, achievement in mathematics is statistically different from where English (L2) is used as medium of instruction.

The Levene's test indicated that equality of variance was achieved. The test showed no significant difference. The results indicated that mathematics achievement of urban P3 pupils who were taught in Twi (L1)

was not significantly different from those who were taught in English although the mean achievement of the English group was slightly greater than the Twi group.

The t-test supports findings of other studies on urban schools. Fafunwa (1989) reports of the results of an experimental study on the use of L1 as medium of instruction. Although differences were found in both urban and rural areas in which the local language users performed better than the English users in all subjects including Mathematics, it was, however, reported that in a First School Leaving Certificate Examination there was no statistical difference in performance in mathematics. In another study in the Central Region of Ghana, Andoh-Kumi (2002) reported of no significant difference in achievement between the use of Twi (L1) and English (L 2) as media of instruction This result was found at Winneba, an urban town but at Enyan Denkyira, a rural community, a significant difference was reported. These confirm the point that in the urban towns the use of a particular language as a medium of instruction would not bring any significant change in mathematics achievement of lower primary pupils. If this were the norm, the system would require examination of the language background before a language of instruction is selected. Such a system would enable teachers to select the language in which the pupils have mastery. This has also been suggested by Andoh-Kumi (2002) that the language of instruction in mathematics for the beginner should be the one in which the child is already conversant with. It also conforms to the threshold theory (Skutnaabb Kangas &Toukomaa,1977). This implies that the medium of instruction in Mathematics needs to be evaluated, at least in part, by its ability to develop relationships within which

mathematical dialogue can be fostered. This would ensure that the mathematics classroom is vibrant and interactive and has an atmosphere of inquisitiveness, exploration and discovery (Garafalo, 1989). But Andoh-Kumi (2001) expressed the fear that mother tongue instruction would be difficult in urban areas. This is because the children have varied linguistics background.

The above observations not withstanding, other studies have reported significant differences in mathematics achievement in urban areas between local language and English as languages of instruction (Andoh-Kumi 1992; Fafunwa et al, 1989; Handerson Shama 1974; Macnamara, 1967). In the intervention it came out that the pupils of Suhum Presby ("C") (English, urban) could reasonably communicate in English. In the same way the pupils of Suhum Methodist (Twi, urban), naturally had control over the Twi language. As a result of this, the performance of the two urban schools in the posttest was almost the same. Their mean scores were very close (Table 4). It is, therefore, not surprising that there is no statistically significant difference between their means.

Comparing the Effects of using Twi (L1) and English (L2) as Medium of Instruction in Mathematics at the Lower Primary in the Rural Schools

In order to determine which of the media of instruction is more effective in teaching mathematics at the lower primary in rural schools, the difference between the mean scores were tested for significance using the t–independence test. The test was to determine if in rural schools where Twi (L1) is used as medium of instruction at the lower primary, achievement in mathematics is statistically different from where English (L2) is used as medium of instruction.

The independent t – test shows that there is no significant difference between the two groups. There is evidence to support the conclusion that in rural schools achievement in mathematics of lower primary pupils who are taught in Twi (L1) is not significantly different from those who are taught in English (L2).

The results of the test contradict the outcome of a number of studies on mathematics in the rural area. Andoh-Kumi's (2002) study of Enyan Denkyira – a rural community – revealed that in mathematics there was a significant difference in achievement between schools where the local language was used as a medium of instruction and those that English was used. The Local Language Initial Literacy project study conducted in 1996 also showed that local language readers only in the rural schools performed remarkably better than the English readers only. However, the mean achievement scores of the two groups in this study conform to these observations. In the rural schools, theTwi group scored a mean of 6.00 and the English group scored a mean of 4.6 (see Table 4). The difference of 1.4 is greater than the difference that occurred in the urban schools. This shows that in the rural schools, the use of the local language as a medium of instruction has some urge over the use of English. This position is highlighted by the results of the entry behaviour test in which Budu L/A primary (rural, English) mean score was higher than Okanta Presby Primary (rural, Twi) (see Table 2). For the fact that Okanta Presby Primary mean score in the post-test was higher than Budu L/A Primary shows that the gains made by the use of the local language in the posttest was greater than the use of English. Cummins, (1976); Skutnabb-Kangas &Toukomaa (1977); in the threshold theory postulated that until the

L2 has been developed to a level sufficient to cope with conceptual learning, performance below average may be expected. This is buttressed by the mean scores in the problem solving items of the two groups in the rural area. While Budu L/A primary scored a low mean of 1.87 Okanta Presby Primary's mean score was 2.72 (see Table 10). This was because the level of development of the pupils of Budu L/A primary in the English language (L2) was very weak as was observed during the intervention. The fact that pupils with weak language development cannot perform well in problem solving is due to the fact that problem solving depends, primarily, upon perceiving the problem through reading and understanding the language used (Morris, 1997). This supports the fact that the best learning situation exists where language can be used freely as the interactive medium (Hanley, 1978).

In rural schools, the statistical test showed no significant difference in mathematics achievement of P3 pupils between the local and the English languages as media of instruction. It has however, been shown in the discussion that in rural schools, mathematics achievement, favours instruction in Twi (L1) rather than English (L2).

Summary

The independent t-test was conducted to test five of the hypotheses and the two-way-ANOVA was used to test hypothesis 2. In all cases the tests indicated no significant difference at 0.05 level of significance. The findings are presented below.

1. There was no statistically significant difference in mathematics achievement between the two groups with regard to the two types of languages.

2. There was no significant interaction between the type of language used for instruction and the location of a school in terms of mathematics achievement at the lower primary. That is, the effect of a type of language of instruction on mathematics achievement at the lower primary is not influenced by the location of the school.

3. There was no statistically significant difference in achievement on mechanical questions between pupils who received instruction in Twi (L1) and those who received instruction in English (L2).

4. There wais no statistically significant difference in mathematics achievement in problem solving at the lower primary between those who received instruction in Twi (L1) and those who received instruction in English (L2).

5. In urban schools, the achievement in mathematics at the lower primary of those who received instruction in English (L2) was not statistically different from those who received instruction in Twi (L1).

6. In rural schools, there was no significant difference between lower primary pupils who received instruction in Twi (L1) and those who received instruction in English (L2).

CHAPTER 5

SUMMARY, CONCLUSION AND RECOMMENDATION

Overview of research problem and methodology

The study was conducted to compare the effects of using the local language (L1) and English (L2) as media of instruction on mathematics achievement at the lower primary, specifically, at P3. It was conducted in the Suhum Kraboa Coaltar District in the Eastern Region of Ghana.

The convenience, purposive and random sampling techniques were used to select the schools and pupils for the sampling. Four schools were sampled for the study. Two of them were selected from Suhum township (urban) and the other two came from the rural areas. Two of the schools were designated as English group and the other two as Twi group. A lesson on addition and subtraction of fractions was presented to the subjects in their assigned language of instruction for one week in each of the schools. The intervention was followed by a posttest and the scores recorded. The scores were analysed by means of independent samples t-test and a two-way ANOVA.

Summary of key findings.

(1)   In schools where English (L2) was used for instruction the pupils performed better than pupils in the schools where the local language was used for instruction in mathematics at the lower primary. However,

the independent t-test showed that the difference was not statistically significant.

(2) There was no statistically significant interaction between the type of language used and the location of a school on mathematics achievement at the lower primary. The results showed that the use of Twi (L1) yielded higher achievement in the rural schools than in urban schools. On the other hand, where English was used for instruction in mathematics at the lower primary the achievement of pupils in urban schools was higher than the achievement in rural schools.

(3) On mechanical items those who received instruction in English (L2) performed better than those who received instruction in Twi (L1) but the independent t-test indicated that the difference was statistically not significant.

(4) In problem solving, the achievement of those who were instructed in Twi (L1) was higher than those who were instructed in English (L2) but the difference was found to be statistically not significant

(5) In urban schools, instruction in English resulted in better performance in mathematics at the lower primary than instruction in Twi (L1) however, the test showed that the difference was not statistically significant.

(6) In rural schools, lower primary pupils who received instruction in Twi (L1) performed better than those who were instructed in English (L2) but the difference was found to be statistically not significant.

Conclusion

The study has shown that the difference between the effects of using the local language (L1) and the English language (L2) as media of instruction at the lower primary is not statistically significant. This means that the use of either of the languages for instruction in mathematics at the lower primary would not significantly differ in achievement from the use of the other. It was, however, noted that the use of the local language (L1) as medium of instruction appears to be more effective in rural schools than the use of English (L 2). In urban schools, due to the favourable socio-cultural background of most of the pupils and the heterogeneous nature of the prevailing local language, the use of English Language would yield better results than the use of the local language in the study of mathematics at the lower primary.

The basic education mathematics syllabuses emphasise problem solving as the basis for mathematics teaching and learning. In view of this, the use of the local language for instruction may be more effective for mathematics teaching at the lower primary than the use of English. This is because, the study showed that the use of the local language improves achievement in problem solving more than the use of English (L2) as medium of instruction, although the difference may not be significant. But for achievement in mechanical arithmetic, the use of the local language (L1) would not yield any significant difference from the use of the English Language (L2).

The most important factor to consider in determining the effective language for instruction in mathematics at the lower primary is the level of

mastery in the two languages by the pupils. This and other studies have shown that the degree of mastery in the language of instruction influences school achievement (Andoh-Kumi, 19992, Bamgbose, 1976).

Recommendations

With respect to the findings of the study, the following recommendations are made:

1. The type of language to select as medium of instruction at the lower primary should be based on pupils' mastery of the language. Since, in the study, there was no significant difference in mathematics achievement between P3 pupils who received instruction in the local language (L1) and those who received in English (L2), the use of either of them for instruction in mathematics at the lower primary would not yield any achievement significantly different from using the other. Furthermore, the study showed by implication that, anyone of the languages used for instruction would not favour all pupils from different schools in terms of achievement. The choice between the vernacular (L1) and English (L2) as medium of instruction should, therefore, be vested in the hands of the staff of a school. That is, the staff should study the linguistics' background of the pupils to determine between the vernacular and the English as to the one the pupils had mastered more to select for instruction.

2. In urban areas, where there exist cultural diversity coupled with favourable socio-economic background among most of the pupils,

English (L2) may be adopted as language of instruction for teaching mathematics at the lower primary. However, where the staff find that most of the pupils cannot cope with the English they can choose the most popular local language among the pupils as the medium of instruction.

3. In rural schools, the local language would be preferred to English as medium of instruction in mathematics teaching at the lower primary. This, not withstanding, in situations where the staff is convinced of the pupils sound development in English, it may be adopted as the language for instruction.

4. Where the local language is used as medium of instruction in mathematics, mathematical concepts and terms should be introduced with the technical names but the local language could be used to explain them. This will help the pupils to get used to such concepts and terms from the scratch. If these concepts are translated into the local language and during the transition they are reintroduced in the English language the pupils are likely to be confused.

Suggestions for Further Research

The following are recommended for future research;

1) The study can be replicated to examine the effects of the local language (L1) and English (L2) as media of instruction on achievement in other subject areas at the lower primary.

2) The study used only P3 pupils as subjects. It is, therefore, recommended that further studies should cover all three classes of the lower primary

3) It is suggested that a further studies in mathematics could be made to cover more topics during the intervention and should cover a longer period, at least, for a term. This would ensure that the treatment provides the desired impact.

4) A replication of the study at the upper primary level would be useful. This is because it will provide the opportunity to examine the appropriateness of using English (L2) as a medium of instruction at this level.

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UNIVERSITY OF CAPE COAST

DEPARTMENT OF EDUCATIONAL FOUNDATIONS

ENTRY BEHAVIOUR TEST FOR SELECTION OF SCHOOLS TO

PARTICIPATE IN AN EXPERIMENTAL STUDY INTO THE EFFECTS OF

USING ENGLISH AND VERNACULAR ON THE STUDY OF MATHEMATICS

AT THE LOWER PRIMARY IN THE SUHUM KRABOA COALTAR DISTRICT

OF GHANA

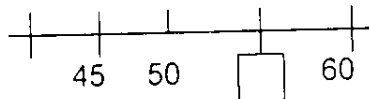SUBJECT: Mathematics   CLASS: BS3

TIME ALLOWED: 40minutes

There are 20 questions in all. Answer ALL questions. Work out each of the questions

and write your answer in the space provided. The total mark is 20.

1. 59 = ...tens and ....ones.

2.   43
     + 35

3. Write the missing numeral in the box

   45   50   □   60

4. $12 + \boxed{} = 28$

5. 703 = ...hundreds.......tens.......ones

6. $46 + 33 = \boxed{} + 46$

7. What fraction of the circle is shaded?
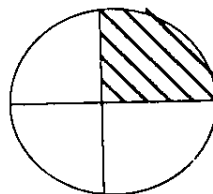
8. Kofi has 6 pencils. His father gave him 7 more pencils. How many pencils

   dos Kofi has altogether?

of these is a triangle? Put a mark (√) on the triangle

□ ○ △

10. What is the time shown on the clock?

11. There are 12 mangoes. If 3 girls are to share them equally, how many mangoes will each get? ☐

12. Use one of these signs (<, >, =) to make the sentence 48......56 true.

13. If one pen costs ☐600, how much will John pay for 3 pens? ☐

14.   64
    + 48

15.   58€
    + 247

16.   9 - 2 =........

17.   17 – 2 =........

18.   There are 4 boxes. In each of the boxes, there are 6 oranges. How many oranges are there in the boxes? ☐

19. There 257 shirts in a box. A woman bought 124 of the shirts. How many shirts are there in the box? ☐

20. There are some marbles in the box. What fraction of the marbles is in the circle? ☐
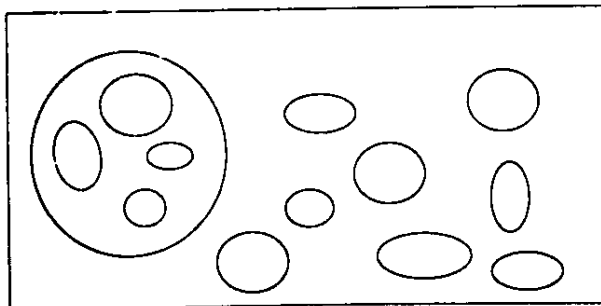
TEST SPECIFICATION TABLE

Content	Behavioural Objectives		Total
	Knowledge	Comprehension	
...ing of fraction.	2	1	3
...lent fraction.	2	2	4
...on of fractions with ...enominators.	2	3	5
...on of fractions with ...denominators.	3	1	4
...action of fraction with ...enominators.	4	2	6
...action of fraction with ...denominators	3	1	4
	16	10	26

ITEM ANALYSIS TABLE

	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	4	52	6	27	46	38	48	3	39	41	46	4	1	2	1	2	2	27	7
	0.08	1.00	0.12	0.52	0.88	0.73	0.92	0.06	0.75	0.79	0.88	0.08	0.02	0.04	0.02	0.04	0.04	0.52	0.13
	0.29	0	0.21	0.64	0.29	0.64	0.43	0.21	0.29	0	0.14	0.07	0.07	0.14	0	0	0.14	0.35	0.29
	0.44	0	0.38	0.51	0.33	0.31	0.29	0.49	0.20	0.05	0.22	0.29	0.51	0.05	0.00	0.31	0.61	0.30	0.11

Total number of testees =52

KEY:

P_i → Item difficulty

D_i → Item discrimination

P_{bis} → Point biserial

N → number of people who scored the item

THE INITIAL TEST ITEMS

UNIVERSITY OF CAPE COAST

DEPARTMENT OF EDUCATIONAL FOUNDATIONS

TEST ITEMS ON ADDITION AND SUBTRACTION OF FRACTIONS FOR THE

STUDY OF THE EFFECTS OFUSING ENGLISH AND VERNACULAR ON THE

STUDY OF MATHEMATICS AT THE LOWER PRIMARY IN THE SUHUM KRABOA
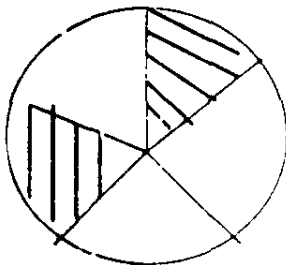
COALTAR DISTRICT OF GHANA

SCHOOL ID . . . .   NAME . . . .

SUBJECT: Mathematics   TIME ALLOWED. 40minutes

There are 26 questions in all. Answer ALL questions Work out each of the questions

and write your answer in the space provided The total marks is 20
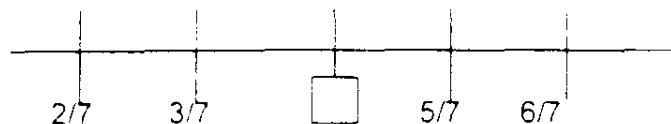
1. What fraction of the circle is shaded?

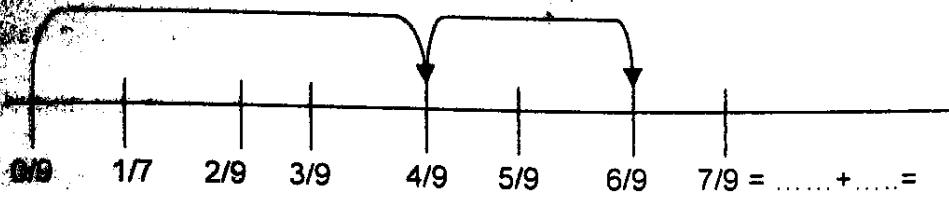2. There are 7 oranges Amina takes 2 What fraction of the oranges has Amina

   taken? ▢

3. $1/3 + 2/5 =$ ▢

4. Put the correct fraction in the box

2/7   3/7   ▢   5/7   6/7

114

sentence from the operation on the number line

0/9   1/7   2/9   3/9   4/9   5/9   6/9   7/9 = ...+.....=

A boy read 1/3 of his book in the morning and another 1/3 in the afternoon.

What fraction did the boy read altogether by the afternoon? ☐

5/17 ☐ = 12/17

What fraction will Esi add to 3/8 to get 7/8? = ☐

4/7 - ☐ = 2/7

10. Write a sentence from the operation on the number line.

0/5   1/5   2/5   3/5   4/5   5/5   6/5   7/5
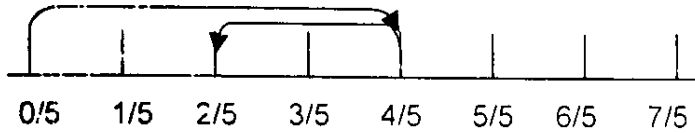
11. Ama and Efua were given 7/10 of a plot to weed. Ama weeded 4/10 of the

plot. What fraction of the plot did Efua weed? ☐

12. 11/13 – 7/13 = ☐

13. Use one of the signs (+, -) to make the sentence true. 5/8.....3/8 = 2/8

14. 1/4 + ½ = ☐

15. 2/3 + 2/3 = ☐

16. A boy walked 1/6 of the road to school and run 2/3 of it. What fraction did the

boy walk and run altogether? ☐

17. $\frac{3}{4} + \frac{1}{8} = \frac{☐}{8} + \frac{1}{8}$

Fiifi and Joyce ate 5/8 of a ball of kenkey. If Joyce alone ate 1/3 of the

kenkey, what fraction of the kenkey did Fiifi eat? ☐

— 1/4 = ☐

Use one of the signs (+, -, =) to make the sentence true. 5/8.....1/2 =1/8

A man gave 1/2 of an orange to john and 1/4 of it to Sam. What fraction of the orange did john receive more than Sam? ☐

22. $\frac{3}{8} - \frac{3}{8} = \boxed{}\ \overline{8}$ $-\frac{3}{8}$

$\boxed{}$

23. 2/5 = 10

24. $\frac{3}{4} = \frac{6}{\boxed{}}$

25. 1/3 of a class are girls. Write another name for the fraction of girls.

26. Adam. has 1/3 of some oranges and Kate has 6/10 of the oranges. Are their fractions equivalent? Yes / No

APPENDIX E

COMPUTATION OF THE TEST INTERNAL CONSISTENCY

$$\text{D} = \frac{K}{K-1} \frac{(1- \Sigma p_i q_i)}{x}$$

he number of items that make the test.

he item difficulty of item i.

$1 - p_i$

he variance of the group.

20

$= 2.769$

$= \frac{20(1 - 2.769)}{19 \quad 7.26}$

$= 0.651$

APPENDIX F

THE FINALTEST ITEMS

UNIVERSITY OF CAPE COAST

DEPARTMENT OF EDUCATIONAL FOUNDATIONS

TEST ITEMS ON ADDITION AND SUBTRACTION OF FRACTIONS FOR THE

STUDY OF THE EFFECTS OF USING ENGLISH AND VERNACULAR ON THE

STUDY OF MATHEMATICS AT THE LOWER PRIMARY IN THE SUHUM KRABOA

COALTAR DISTRICT OF GHANA

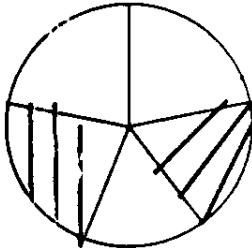SCHOOL ID....................   NAME........................

SUBJECT: Mathematics   TIME ALLOWED: 40minutes

There are 20 questions in all. Answer ALL questions. Work out each of the questions

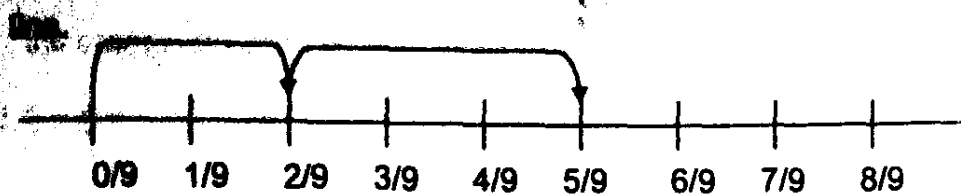and write your answer in the space provided. The total marks is 20.

1. What fraction o the circle is shaded?

2. There are 7 oranges. Amina takes 2. What fraction of the oranges has

Amina taken?

0/9 1/9 2/9 3/9 4/9 5/9 6/9 7/9 8/9

2/9........................ = ...

4. A boy read 1/3 of his book in the morning and another 1/3 in the afternoon . What fraction did the boy read altogether by the afternoon? = ☐

5. 5/17 + ☐ = 12/17

6. What fraction will Esi add to 3/8 to get 7/8? ☐

7. A boy walked 1/6 of the road to school and run 2/3 of it. What fraction did the boy walk and run altogether? ☐

8. 11/15 – 7/15 = ☐

9. What fraction will Yaw subtract from 6/15 to get 2/15? ☐

10. Ama and Efua were given 7/10 of a plot to weed. Ama weeded 4/10 of the plot. What fraction of the plot did Efua weed? ☐

11. 11/13 – 7/13 = ☐

12. 3/4 + 1/8 = $\dfrac{☐}{8} + \dfrac{1}{8}$

13. A carpenter painted 2/3 of a wood red and painted 2/9 of it green. What fraction of the whole wood is the red longer than the green? ☐

14. 1/4 + 1/2 = ☐

15. Fiifi and Joyce ate 5/8 of a ball of kenkey. If Joyce alone ate 1/3 of the kenkey, what fraction of the kenkey did Fiifi eat? ☐

16. Use one of the signs (+, -, =) to make the sentence true. 5/8.....1/2 =1/8

17. A man gave 1/2 of an orange to John and 1/4 of it to Sam. What fraction of the orange did John receive more than Sam? ☐

18. $\frac{1}{3} - \frac{4}{9} = \frac{\square}{9} - \frac{4}{9}$

19. $\frac{2}{3} = \frac{\square}{9}$

20. Adam had 1/3 of some oranges and Kate has 6/10 of the oranges. Are their fractions equivalent? Yes / No

EFFECTS OF THE USE OF ENGLISH AND VERNACULAR ON THE STUDY

MATHEMATICS AT THE LOWER PRIMARY IN THE SUHUM KRABOA

ALTAR DISTRICT

LESSON PLAN FOR THE INTERVENTION

DAY 1

SUBJECT:	Mathematics	Class: P.3
TOPIC:	Revision of the Concept of fraction and equivalent fraction	
DURATION:	60 minutes	
OBJECTIVE:	By the end of the lesson pupils should be able to:	

1. define a given fraction

2. name a given fraction

3. give, at least, three different names for a given fraction

T.L.M:	Strips of paper, bottle tops, fraction cards.
R.P.K.:	Topics were treated in P.2
INTRODUCTION:	By using the idea of sharing, guide pupils to define fraction by using strip of paper, bottle tops and number lines.

ACTIVITY 1: a. With the strips of paper ask pupils to illustrate $\frac{1}{2}, \frac{1}{4}, \frac{2}{3}$

      b. Let them use the bottle tops to illustrate the same fractions

      2. With fractional cards let children identify names of given fractions

      3. Guide pupils to write fractions and distinguish between numerator and denominator.

4. By observing different names of fractions guide pupils to define equivalent fractions.

5. Assist, pupils to identify equivalent fractions from fraction chart and multiples of numbers.

6. With examples establish with pupils that the equivalent fractions of a given fraction $\frac{a}{b} = \frac{a}{b} \times \frac{c}{c}$

E POINTS:

1. A fraction is part of a whole

2. Equivalent fraction is a fraction with different names but have the same value.

3. To get the equivalent fractions of a given fraction multiply both the numerator and the denominator by the same number i.e

$$\frac{a}{b} = \frac{a}{b} \times \frac{c}{c}$$

LUATION. Let pupils do the following exercises.

1.
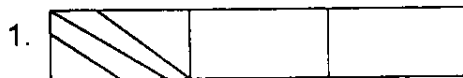
What fraction is shaded

2. In $\frac{2}{5}$ what is the (a) denominator
   (b) numerator?

3 Write three different names for 1/3.

2:

RATION: 60 minutes

IC: Addition of fractions with the same denominator less than 20

ECTIVE: By the end of the lesson pupils should be able to add two

fractions with the same denominator by using

(a) principles

(b) number line

Strips of paper and fractional cards

1. Pupils can illustrate fractions

2. Pupils add whole numbers

INTRODUCTION: Revise the concept of fractions with pupils by using fractional

cards

ACTIVITY: 1 Lead pupils to add the following fractions by means of strips

of paper $1/3 + 1/3$, $2/5 + 1/5$, $2/4 + \frac{1}{4} =$

2. With examples lead children to establish the principle for adding

fractions with the same denominator.

1. Guide pupils to use the number line to add two fractions with the

same denominator.

Solve these examples on the chalkboard with pupils

1/4+2/4, 3/7+2/7, 2/6+3/6

POINTS: To add fractions with the same denominator, add the numerators and maintain the common denominator.

EVALUATION: Let pupils solve the following problems by using the

(a) principle
(b) number line

1. 2/5 + 2/5,   2. 1/3 + 2/3,   3. 5/7 + 1/7,   4. 3/10 + 6/10

DAY 3:

DURATION: 60 MINUTES

TOPIC: Addition of fractions which have related denominators.

OBJECTIVE: By the end of the lesson pupils should be able to add two fractions which have related denominators.

T/M: Strios of adding machine tape

1. Pupils can add fractions with the same denominator.

2. Pupils can find the equivalent fractions of given fractions.

INTRODUCTION: Let children solve some problems on addition of fractions with the same denominator and equivalent fractions.

ACTIVITY: 1.   Lead pupils to solve the addition of two fractions with
selected denominators eg. 1/4 + 1/2, 1/3 + 2/9,
1/2 + /16

2.   Let pupils solve the following problems

1.   1/3 + 1/6   2. 2/10 + 2/5   3. 1/4 + 3/8

CORE POINTS: To solve addition of fractions with related denominators

1.   determine the fraction whose equivalent fraction has to be
found.

2.   find its equivalent fraction such that it has the same
denominator with the other fractions

3.   apply the principle of adding fractions with the same
denominator

EVALUATION: Let children do the following exercises

1.   1/2+ 2/6   2. 3/4 + 1/8   3. 1/3 + 4/9   4. 2/5 + 3/10

DAY 4

DURATION: 60 minutes

TOPIC: Subtraction of fractions with the same and related denominators.

By the end of the lesson pupils should be able to:

1.   state the principles for subtracting fractions with the same denominator

2.   subtract one fraction from another with the same denominator by applying the principle.

3   subtract one fraction from another with the same denominator by using the number line

4.   subtract one fraction from another with related denominators.

P.K: 1.   Pupils can apply the principle for adding fractions with the same denominator

2.   Pupils can add two fractions with related denominators

INTRODUCTION

1.   Lead pupils to solve the following addition of fractions on the chalkboard

i. 2/5 + 1/5 ii. 2/7 + 3/7   iii 2/3 + 1/6   iv ¼ + 1/12

2. Let pupils explain the process involved in each solution

ACTIVITY 1: a. With strips of paper let pupils brainstorm on how they would solve the problem 2/3 – 1/3

b. Lead the pupils to solve the following problems on the bb by using

i. strips of paper   ii. the number line

(a) 3/4 - 1/4   (b) 4/5 – 2/5   (c) 5/8 – 1/8

ACTIVITY 3. Let pupils state the principle involved in subtraction of fractions with the same denominator.

Lead pupils to solve subtraction of fractions with related denominators eg. 2/3 – 1/6, 3/4 - 1/2

POINTS: 1. To subtract fractions with same denominator, subtract One numerator from the other and maintain the common Denominator.

2. To subtract one fraction from another with related denominator

i.   Find equivalent fractions in such a way that
       denominators would be the same.

ii.   Apply the principle of subtracting one fraction from
       another with the same denominator.

ATION: let pupils solve the following problem

1. 3/5 – 2/5   2. 4/7 - 2/7   3. 9/13 - 3/13

4. 1/3 – 1/6   5. 2/5 – 1/10

APPENDIX H

RESULT OF THE POST-TEST

Frequency distribution of marks scored by Suhum Presby Primary 'C' in the Post-Test

Marks	Frequency	Percentage
0	1	2.3%
1	4	9.1%
2	3	6.8%
3	3	6.8%
4	1	2.3%
5	6	13.6%
6	7	11.4%
7	4	9.1%
8	7	15.9%
9	4	9.1%
10	2	4.5%
11	1	2.3%
12	1	2..3%
13	2	4.5%
	$\sum f = 44$	100%
	$\overline{X} = 6.18$	

Frequency distribution of marks scored by Suhum Methodist Primary

Marks	Frequency	Percentage
1	2	5.6%
2	4	11.1%
3	7	19.4%
4	5	13.9%
5	3	8.3%
6	3	8.3%
7	2	5.6%
8	2	5.6%
9	4	11.1%
10	2	5.6%
11	0	0.6%
12	2	5.6%
	$\sum f = 36$	100%
	$\overline{X} = 5.39$	

Frequency distribution of marks Scored by Okanta Presby Primary for the Post-test

Marks	Frequency	Percentage
1	1	4%
2	1	4%
3	3	12%
4	2	8%
5	3	12%
6	5	20%
7	4	16%
8	2	8%
9	1	4%
10	1	4%
11	2	8%
	$\sum f = 25$	100%
	$\overline{X} = 6.00$	

quency distribution of scores obtained by Budu L/A Primary in the Post test

Marks	Frequency	Percentage
1	2	13.3%
2	0	0%
3	2	13.3%
4	5	33.3%
5	2	13.3%
6	1	6.7%
7	1	6.7%
8	1	6.7%
9	0	0%
10	1	6.7%
	$\sum f = 15$	100%
	$\overline{X} = 4.6$	

Frequency distribution of marks obtained from Mechanical questions in the Post-test by pupils of Suhum Presby Primary 'C'

Marks	Frequency	Percentage
0	1	1.3%
1	5	11.4%
2	5	11.4%
3	7	15.9%
4	13	29.6%
5	10	22.7%
6	2	4.6%
7	1	2.3%
	$\sum f = 44$	100%
	$\overline{X} = 3.57$	

Frequency distribution of marks obtained from problem solving items by P3 pupils of Sihum Presby Primary

Marks	Frequency	Percentage
0	8	18.2%
1	6	13.6%
2	10	22.7%
3	6	13.6%
4	6	13.6%
6	3	6.8%
7	3	6.8%
8	2	4.6%
$\sum f = 44$		100%
$X = 2.61$		

...cy distribution of marks scored from mechanical questions of the Post-test by P3 ... Suhum Methodist Primary.

Marks	Frequency	Percentage
1	9	25%
2	7	19.4%
3	7	19.4%
4	3	8.3%
5	9	25%
6	1	2.8%
	$\sum f = 36$	100%
	$\bar{X} = 2.97$	

Marks	Frequency	Percentage
0	8	22.2%
1	6	16.7%
2	6	16.7%
3	7	19.4%
4	3	8.3%
5	3	8.3%
6	0	0%
7	3	8.3%
	$\sum f = 36$	100%
	$\overline{X} = 2.42$	

... from mechanical questions of the post test obtained by ... Primary

Marks	Frequency	Percentage
1	4	16%
2	3	12%
3	6	24%
4	8	32%
5	3	12%
6	0	0%
7	1	4%
	$\sum f = 25$	100%
	$\overline{X} = 3.28$	

	Frequency	Percentage
	3	12%
	3	12%
	5	20%
	5	20%
	6	24%
	2	8%
	1	4%
	Σ f=25	100%
	$\overline{X}$ =2.72	

1. Frequency distribution of marks scored on mechanical arithmetic of the posttest by P3 pupils of Budu L/A primary.

Marks	Frequency	Percentage
1	2	13.3%
2	3	20%
3	7	46.7%
4	3	20%
	Σf = 15	100%
	$\overline{X}$ = 2.7	

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Frequency distribution of marks scored on problem solving of the Post-test by P3

of Budu L/A Primary

	Frequency	Percentage
0	4	26.7%
1	3	20%
2	3	20%
3	3	20%
4	1	6.7%
5	0	0%
6	1	6.7%
	$\sum f = 15$	100%
	$\overline{X} = 1.87$	