FACTORS INFLUENCING LEARNING AT LOWER PRIMARY LEVEL IN MACHAKOS DISTRICT

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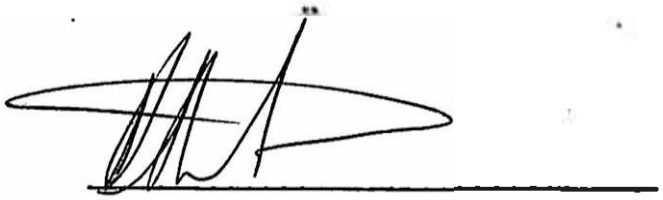
DECLARATION

This thesis is my original work and has not been presented for a degree in any other University.



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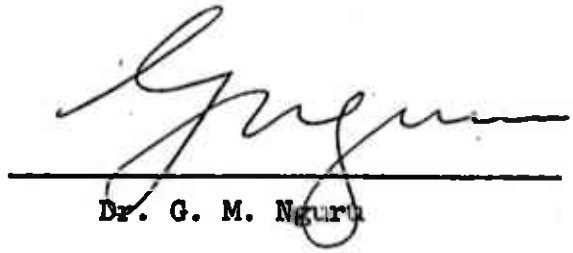

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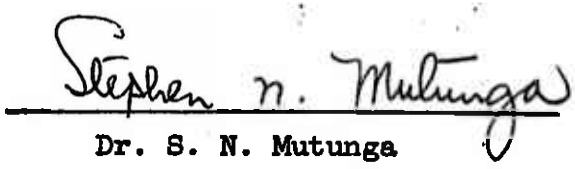

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ABSTRACT

In recent years, a great deal of concern has been voiced all over the world over the lopsided development in education in which quality in education has fallen casualty to quantitative linear expansion. A look at educational statistics shows spectacular increases in the number of children participating in education. A look at the same statistics shows a sharp decline in the proportion of the pupils who complete any prescribed course of studies indicating rising failure and drop-out rates. These two measures of educational participation are available for all to see. What is not available and yet is even more important is the quality of education that is given and received by those who participate in the educational process. This aspect of expansion is much more difficult to measure because it is less tangible, its results being visible years after the event. It is the apparent deterioration of quality in education that has occupied the minds of the educationists of the 1970s.

The purpose of this study was to isolate some of the factors that are said to influence the quality of education and attempt to measure the degree of their influence. The factors that were considered in this study are (a) The teacher; his professional qualification and experience and (b) The size of the class in which the pupil learned. In addition to these two factors four sub-factors were analysed for the purpose of demonstrating the wide and varying nature of the factors that are at play in the educational process. In all, seven factors were considered.

The main source of data was a test administered to Standard 2 pupils in selected schools in Machakos District. Further data was obtained through questionnaires to school heads and Standard 2 teachers in the selected schools. These data were analysed using two different statistical methods; (1) The Simple Analysis of Variance and (2) Multiple Correlation Analysis.

The major findings of the study were:-

(1) That teacher professional qualification was important as a determinant of pupil academic performance.

(2) That there was an inverse relationship between pupil academic performance and the size of the class in which they learned.

(3) That teacher experience had little effect on pupil academic performance.

(4) That class size, teacher professional qualification and teacher experience had a greater effect on pupil performance in language than in number work.

Based on the findings of the study it was recommended that:-

(1) Research instruments which are relevant to Kenya should be developed.

(2) More intensive and extensive research into the quality aspect of educational expansion should be undertaken.

(3) The primary school curriculum should be revised to emphasize the 'desirable' changes in the affective domain of development in the young children.

(4) The educational authorities should strive to maintain a reasonable class size. It was found in this study that the pupils in classes larger than 40 had the poorest performance.

ACKNOWLEDGEMENTS

The writer is indebted in many ways to many people who contributed to the completion of this piece of research.

First of all my thanks to the Deans' Committee of the University of Nairobi who awarded me a grant to pursue this investigation; to my Supervisors, Dr. G. M. Nguru, Dr. A.J. Maleche and Dr. S. N. Mutunga I owe a heavy debt of guidance throughout the investigation; they read and re-read the drafts and put their time and knowledge at my disposal. If this study should raise some objectionable or controversial points the writer takes the responsibility for them. To the Chairman of my Department, Dr. M. K. Maleche and all the members of the Department for their encouragement and constant prodding to get on with it, I express my sincere appreciation.

Were it not for the understanding and assistance of the staff at the Center for Computer Science, this investigation would have been a non-starter; to Mr. Tim Ahuta and the staff of the Computer Room I have a special word of thanks. To Dr. W.C.E. Young of the Department of Psychology, University of Nairobi I owe my present level of knowledge of statistics, he led me step by painful step to an understanding of basic statistics to help me to interpret the data I had collected.

To the teachers and heads of seventeen primary schools in Machakos District who assisted me in designing the test, conducting the pilot study and finally conducting the experiment I owe gratitude for their co-operation.

The typing of a thesis is a specialised job whose expertise few of us appreciate I am indebted to Mrs. A.M. Gacii for her patience and specialised knowledge in the typing of this work.

To those friends both inside and outside who helped me burn the midnight oil, to Masaku, whose perennial question was "Aren't you ever going to finish"?; and to Mwikali, who did not see what all the fuss was about. Their patience and understanding are the major contribution to this piece of work.

This thesis is dedicated to my late father, Timothy N. Chomba who, at a time when it was not socially wise to do so, invested in the education of all his children, boys and girls alike; and to my husband, David W. Mutua who convinced me that it could be done.

CHAPTER ONE

BACKGROUND

Introduction

In its broadest terms this study is concerned with that amorphous characteristic in education, namely, 'quality'; amorphous because despite the daily growing literature in education there has been no consensus on what constitutes educational quality. The term quality in education is used in two different senses indicative of its amorphous character. Firstly, it is used in a neutral or descriptive sense without inferring measurement. On the other hand it is used in an evaluative sense implying a scale of 'goodness' against which an educational system can be measured. In trying to find a suitable definition writers within education have had to fall back on comparisons as in comparing quality and 'quantity' with regard to educational expansion; others have compared 'good' and 'poor' quality education usually by pointing out factors that lead to either one or the other. In this study the second definition, implying goodness has been adopted.

Neither have educationists agreed on how to measure quality in education. Some schools of thought, notably the education/economists would measure the quality of education in economic terms such as cost/benefit, meeting of manpower targets efficiently and the contribution of education to overall economic development.[1] The 'pure' educationist school of thought, on the other hand, would measure the same characteristic in terms of the achievement of overall educational objectives, the training of a well rounded individual.[2] Yet a third group of educationists,

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[1]Much of the support for the economic approach to education is to be found from the industrialised world notably by organizations such as OECD and IBRD. See also Mark Blaug and Theodore W. Schultz.

[2]The educationists school of thought is composed of such original educators as H. Pestalozzi, B. Russell, J. Dewey and others.

seeking more concrete evidence of either poor or good quality education have fallen back on pupil performance in examinations and tests. This group seems to define educational quality in terms of the effectiveness with which the pupils learn and the teachers teach. They are concerned with performance in examinations. But whatever the difficulties or disagreements in its definition or measurement there is general agreement among educationists that quality as a characteristic does exist in education.

This study took this agreement as the basis of investigation and sought to analyse some of the factors that have a bearing on the quality of education. It was hoped to do this by establishing a relationship between these, among others, and the end product of the learning process. For the purpose of this study 'the end product of the learning process' was defined as 'pupil academic performance'. The factors looked at are:

1. Teacher professional qualifications.
2. Teacher experience.
3. Class size.

Other factors that were recognized as having a definite effect on the quality of education have been pointed out in educational literature. Jeffreys argues that the personal qualities of the teacher, a sense of vocation and school administration are important.[3] Jones, in his discussion of education quality attributes poor quality education to such factors as repetition, non-attendance and premature withdrawal of pupils from the educational system. He adds to this poor physical facilities, poorly trained teachers and irrelevant courses.[4] On the problem of its measurement he agrees that it

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[3] Jeffreys, M.V.C., 'Glaucon', An Inquiry Into the Aims of Education; Sir Isaac Pitman and Sons Ltd., London, 1950, 2nd Impression, p. 43.

[4] Jones, G., Population Growth & Educational Planning in Developing Nations, Irvington Publishers Inc., New York, 1974, p. 40.

is difficult to measure quality as such in education. Nevertheless, Jones argues, a limited view of what can happen to quality can be obtained by studying trends in certain measureable variables that can be expected to either influence or reflect the quality of an educational system. Among such variables he cites trends in drop-out rates, pupil/teacher ratios and expenditure per pupil.[5]

Writing on the same subject another educationist, Ta Ngoc Chau, argues that the quality of education can be measured in terms of the trends in population growth, intake and retention rates, pupil/teacher ratios and the qualification of the teachers.[6] His argument, based on a demographic approach, is that growth in the school-age population raises the demand for school places and consequently the demand for educational resources (classrooms, equipment and teachers). The failure of the supply of these resources to keep pace with the demand for them results in crowded classrooms and high pupil/teacher ratios which will adversely affect the quality of education.[7]

Richard Jolly, writing on the need to plan quantitative educational expansion so as to maintain quality in education argues that rapid quantitative expansion, unless well planned for in advance, must inevitably lead to a decline in the quality of education.[8] This argument, based on an elitist approach, is supported in some social groups who believe that a larger intake into the educational system lowers the quality of input (pupils and teachers), by including those who are less able. Elaborating on this point Jolly goes on to point out that rapid quantitative expansion will necessitate expansion of teacher training programmes and therefore less capable persons will be recruited

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[5] Ibid, p. 41.

[6] Ta Ngoc Chau, Population Growth and Costs of Education in Developing Countries, UNESCO/IIEP, Paris, 1972, pp.59-60.

[7] Ibid, pp. 59-60.

[8] Jolly, R., Planning Education for African Development: East African Publishing House, Nairobi, 1967, pp. 104-113.

into the teacher training institutions. In addition to this, less adequate buildings will be used. Finally, Jolly argues, rapid quantitative expansion creates administrative and disciplinary problems in larger schools and larger classes.[9] In agreement with Jolly is T.David Williams who argues that the efficiency of the educational system may be profoundly influenced by the relative quality of its recruits, both pupils and teachers.[10]

In his study on basic education H.M. Phillips concludes that in educational systems quantity and quality are interlocked, but that while it is relatively easy to define and measure the quantitative aspects, only some of the qualitative ones are measurable. Such quantifiable factors are: (a) the size of the class, (b) the amount of time spent in school, and (c) the proportion of trained to untrained teachers.[11] But Phillips adds the further dimensions of curriculum, teaching methods and teacher/learner aids as affecting the quality of education. According to him an optimum class size can be negated if the content, curriculum and teaching methods are poor; neither can a trained teacher operating in optimum size classes be fully effective if the textbooks and teaching aids are ill-conceived or lacking, the school premises are poorly constructed or if the curriculum is irrelevant or badly structured. He further argues that the quality of education also depends, indeed primordially, on the quality of the learning which is achieved.[12] P.H. Coombs

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[9] Ibid, pp. 104-113.

[10] Williams, T. David, 'The Efficiency of Education' in Lowe, J., Education and Nation Building in the Third World; Scottish Academic Press, Edinburgh, 1971, pp. 66-78.

[11] Phillips, H.M., Basic Education; A World Challenge, John Wiley and Sons, London, 1975, p. 45.

[12] Ibid, p. 45.

sees evidence of poor quality in education in apparently poorer average performance measured by academic tests, evident decline in quality and quantity of educational resource inputs per student, such as high proportion of poorly qualified teachers, overcrowded classrooms and shortages of textbooks and other teaching materials.[13]

A rather different view of the quality of education is presented by C.E. Beeby in his book on education in developing countries.[14] Beeby emphasizes the difficulty in trying to define quality in education by circumventing its definition and leaving the onus of defining it on anyone who refers to it. He nevertheless offers his own conception of it. He sees quality in education as having two facets or two levels:-

(a) The classroom facet as seen by an inspector of schools who looks at the pupil's mastery of such measurable skills as the 3 Rs and the acquisition of attitudes and habits. This aspect is measured by the speed at which pupils pass through the prescribed grades and the rates at which they pass external examinations.

(b) The second facet is more the concern of economists who look at the quality of education in terms of its external productivity, by its contribution to the Gross National Product or the life-time earnings of its recipients. In this connection Schultz considers as quality components in education "the skills, knowledge and such other attributes that affect human capabilities to do productive work."[15]

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[13] Coombs, P.H., "Time for a Change of Strategy" in Beeby, C.E., Qualitative Aspects of Education Planning. IIEP, Paris, 1969, p. 17.

[14] Beeby, C.E., The Quality of Education in Developing Countries, Harvard University Press, Cambridge, Mass., 1966, pp. 9-10.

[15] Schultz, T.W., Investiment in Human Capital. The Free Press, New York, 1971, p. 24.

John Gardner seems to have presented the very basic concept of quality in education.[16] He argues that quality of education can be measured in terms of achievement or non-achievement of the goals that particular educational systems have set.[17] This view upholds the very basis on which educational systems should judge themselves; for trained teachers, adequate buildings, good equipment, favourable pupil/teacher ratios are only there to assist the system to achieve the goals that it has set itself.

From the foregoing it is clear that quality as applied to education has different shades of meanings for different people according to individual orientation. Moreover, individuals ascribe different values to the various factors that they consider more important in influencing or reflecting this characteristic.

An ideal study of quality in education would be one which could bring under one umbrella all these factors and analyze each individual factor's contribution, but this is an impossible task in terms of time and space. This study, therefore, sought to isolate some of these factors and borrowed two of them from Phillips model, i.e. size of the class and teacher professional qualification.[18] A third factor, teacher experience was added as it was believed that this would give a deeper insight into the role of the teacher in the maintenance of quality in education.

On their own these, or any other factors do not indicate either good or poor quality in education. For this reason Gardner's conception of the measurement of quality was adopted in this study.

According to Gardner the quality of education can only be measured by the achievement or non-achievement of the goals that

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[16] Gardner, J.W., Excellence; Can We Be Equal and Excellent Too? Harper and Row, New York, 1961, Ch. IV.

[17] Ibid, p. 14.

[18] Phillips, M. H., Op. Cit., p. 45.

the education system has set itself.[19] Therefore, although the concept of quality does not change, its measurement varies according to the objectives of different educational systems. In systems where academic excellence is the major objective, the quality of education will be judged by the academic performance of the pupils; class size; teacher qualification and experience and buildings and equipment being selected and deployed to achieve this goal as effectively as possible. On the other hand in systems where a wider interpretation is given to education its quality will be measured on the basis of the objectives of that system. But whatever the objectives, class size, teacher qualification, buildings and equipment will be tools in the achievement of those objectives.

No educational system has only one objective. In most cases there are many interwoven objectives all supposedly leading up to the development of the 'whole man.' The quality of education, therefore, can be measured by the achievement of changes in behaviour, attitudes, skills, abilities and characteristics in some desired direction towards the development of a 'whole man.'

Ideally, therefore, research into quality in education should take into account the values and ideals in education as spelt out in national educational objectives. It should also take into account all the aspects of pupil growth; intellectual, emotional, attitudinal and physical, i.e. both the affective and the cognitive domains of growth. Finally, it should take into account all those factors within and without the educational system that facilitate or hinder such growth.

It was appropriate to define the two terms 'affective' and 'cognitive' as used in this study. These terms have been adopted from B.S. Bloom's Taxonomy of Educational Objectives, Handbooks I and II[20] and refer to those aspects of learning that

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[19] Gardner, J., Op. Cit., p. 14.

[20] Bloom, B. S., Taxonomy of Educational Objectives, Handbook I, Cognitive Domain, Handbook II, Affective Domain, Longman Groups Ltd., London, 1956.

are related to attitude formation (affective) and those that are related to knowledge acquisition (cognitive).

Educational objectives are rarely as clearly spelt out as they should be. Furthermore, researchers, on the whole, are not equipped to test all the desired changes in the pupils and neither can they, within limited financial and spatial circumstances, test all the factors that influence such changes. The problem therefore, becomes one of selecting the aspect or aspects of growth or the factors affecting growth to be measured.

The major factors considered in this study are briefly outlined below. In a young country like Kenya where research is still in its infancy, the choice of a field of research is governed mainly by the researcher's interest and national requirements. The factors discussed below met these criteria and were thus selected for research.

Teacher Professional Qualification

Much of the literature in education seems to indicate a universal belief that a professionally trained teacher contributes more positively to effective learning than an untrained one. It is for this reason that teacher training exists as a major part of education systems throughout the world.

The oldest form of teacher education is the observation and emulation of a master; in ancient Greece, Plato learned to teach by sitting at the feet of Socrates.[21] Advice to teachers and instruction in teaching methods were available long before teacher education and training were institutionalised. For example in Roman times Quintilian was the authority on teacher education while Erasmus was the great teacher educator of the 16th century.[22] In the 17th century the Didactica Magna was

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[21] Goodrig, P., Teacher Education; The Fifth Year Book of the National Society for the Study of Education. Part II. University of Chicago Press, 1975, p. 1.

[22] Ibid.

essential for any aspiring teacher. In the Didactica Magna Comenius stated his objectives in teacher training as "to find a method of instruction by which teachers could teach less but learners learn more."[23]

It was at this time that teacher education gathered momentum and France introduced L'Ecole Normale while in Prussia, Frederick William I issued the Principia Regulativa prescribing the training of teachers. Initially the prospective teacher was only required to have "a sound knowledge of the subjects taught ... be virtuous, industrious, dedicated to work and obedient to superiors,"[24] so as to promote a country of politically stable, thrifty, virtuous and hard-working citizens.

Later, teacher training in Europe and America was influenced by Pestalozzi with the new concept of the worth, dignity and individuality of the child. From then on there has been an acceleration in child-centered teacher education influenced by philosophers and educationists like Johann F. Herbert, William J. Hall and John Dewey.

More recently many educationists have stressed the need for trained teachers. Jeffreys, while agreeing that training "cannot produce genius" notes that genius can profit by training.[25] He argues that teaching, like any other art, has its techniques and that the process of acquiring those techniques is by training. Beeby has written with great concern on the crucial role of the teacher and therefore the importance of having good teachers in the classrooms.[26]

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[23]Alexander, T., The Training of Elementary Teachers in Germany; Teachers College Press, N.Y., 1929, p. 2.

[24]Goodrig, P., Op. Cit., p. 9.

[25]Jeffreys, M.V.C., Education, Its Nature and Purposes; George Allen & Unwin Ltd., London, 1974, p. 1.

[26]Beeby, C. E., Op. Cit., pp. 9-10.

There seems to be general agreement that one of the major factors contributing to quality in education is the teacher. It was the purpose of this study to try to assess the degree to which the professional qualification of the teacher contributes to effective learning. For the purpose of this study 'effective learning' was defined as that learning that alters, positively, the state of knowledge in an individual.

Teacher Experience

Although literature on this aspect of the quality of education is rather limited, there seems to be a general belief, at least among governments, that pupils under the tutelage of an experienced teacher learn more effectively than pupils under a relatively inexperienced teacher. This is evinced by the salary structures within the educational system in which the teachers are rewarded more on the basis of the length of service than on the quality of performance in the classroom. Further support of this is found, albeit indirectly, in A. J. Maleche's study of some correlates of Teacher Role and Teacher Satisfaction in Seven European Countries.[27] In this study Maleche finds partial support for an increase insatisfaction with age. If it is argued that the quality of work improves with job satisfaction, and that the latter improves with experience, then Maleche's findings lend support to the view that a more experienced teacher contributes more to effective learning. It was intended in this study to test the validity of this view.

Class Size

In contrast with the teacher experience, the class size aspect of learning and teaching is well researched and documented

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[27]Maleche, A.J., "Some Correlates of Teacher Role and Teacher Satisfaction in Seven European Countries". Unpublished Ph.D. Dissertation, University of Michigan, 1970, p. 2.

in educational literature. The importance of this literature lies not only in that there seems to be no agreement on the ideal class size, this varying in time and place, but also that there is disagreement among educationists on the effects of different class sizes on learning.

Some researchers and educational administrators believe that pupils learn more effectively in smaller classes than in large ones. Others find no difference in the effectiveness of learning in different class sizes.

Maleche in his study already referred to found only partial support for the proposition that teachers of small classes are more satisfied with their work than teachers of medium size classes and the former only slightly more so than teachers of large classes.[28] The range of class sizes studied by Maleche were 0-20 (small), 21-40 (medium) and over 40 (large) which differ substantially from the sizes used in this study, 30-39 (small), 40-49 (medium) and over 50 (large). The differences reflect the fact that Maleche's study was conducted in industrialised Europe where enrolment ratios are already of the order of 1:1 whereas in Kenya they are considerably lower than 1:1 and where, therefore, educational expansion is more in the nature of quantity rather than quality.

Summing up the literature on class size and its variants pupil/teacher and pupil/class ratios in relation to learning, T. David Williams concludes that the persistent calls to reduce the pupil/teacher ratio are based more on logic and common sense than objective evidence that class size has a significant effect on student performance.[29] This aspect of quality in education is discussed more fully under literature review. It is sufficient to note here the belief that a class size significantly different from the accepted norm, whatever that norm is, leads to less effective learning. It was the intention in this study to analyse the extent to which varying class sizes affect learning.

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[28] Ibid, p. 2.

[29] Williams, T. David, Op. Cit., p. 71.

THE PROBLEM

The problem in this study can be stated in three interlocked relationships:-

1. The relationship between growth in the school-age population and growth in class sizes.
2. The relationship between growth in the school-age population and the demand and supply of educational resources, teachers and classrooms.
3. The relationship between the demand and supply of educational resources and the quality of education.

These relationships are interlocked in the sense that a change in one of these factors inevitably affects the others. The growth in the school-age population calls for more educational resources, for example, an increase in the number of classrooms. If the growth in the number of classrooms is unable to keep pace with the growth in the demand for them the inevitable result is the enlarging of the class sizes so that a classroom designed and constructed to accommodate a smaller number of pupils will be used to hold more. This raises not only the pupil/teacher ratio but also the class/pupil ratio.

Secondly, growth in the school-age population affects the demand for teachers. Since there is world-wide belief that pupils should be under the tutelage of professionally qualified teachers this demand only refers to such teachers. If the supply from the training colleges is unable to keep pace with the demand the result is that each qualified teacher will be required to take responsibility over a larger number of pupils than the accepted norm, thus raising the pupil/teacher ratio. The alternative to this is the utilisation of professionally unqualified teachers.

The third relationship which is tied up to the first two is between the demand and supply of educational resources and the quality of education. In this study only teachers and classrooms were considered. It was tested here whether the failure to meet

the demand for these two inputs leads to a decline in the quality of education. A high pupil/teacher ratio makes it difficult for the teacher to adopt modern methods of teaching, makes it difficult to keep reasonable discipline in class and leads to an authoritarian approach to teaching. High pupil/teacher and class/pupil ratios make it difficult for the individual pupil to receive the necessary attention from the teacher while the employment of professionally unqualified teachers may lead to the use of non-professional methods of teaching.

Finally, the demand for teachers would be and is met by a larger output of teachers from teacher training institutions, sometimes after crash training programmes. If the demand is high this means the recruitment of a large number of inexperienced but professionally trained teachers. It was the objective in this study to discover whether in teaching, experience is an important factor which affects the quality of the output.

The problem then was seen as the relationship between quantitative expansion in education as it affects the quality of education given and received.

Current literature in education seems to indicate that there is an inverse relationship between quantitative expansion and the maintenance of quality in education. Many educationists appear to be convinced that trends in quantitative educational expansion have not been matched by a maintenance, leave alone an improvement in the quality of education. Jolly qualified this belief by interjecting a critical need for planning in advance in order to avoid a decline in the quality of education.[30]

The problem of the apparent decline in quality seems to have stemmed from what B. Morris terms as "tremendous pressure

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[30]Jolly, R., Op. Cit., pp. 105-111.

for educational expansion, pressure from the people and pressure of drives by governments,"[31] leading to enlarged schools, classes, teacher programmes and the increase in the proportion of relatively inexperienced teachers. To Jolly, this has also led to the recruitment of less able candidates for teacher training and to the use of less adequate buildings.[32] Without going into Jolly's and Williams' elitist approach that 'more means worse,' educationists have expressed concern, not over quantitative educational expansion per se but over unplanned and rapid rises in enrolments which tend to run ahead of the ability of nations to supply educational resources.[33]

BACKGROUND TO THE PROBLEM AND RATIONALE OF THE INVESTIGATION

Growth of the School-Age Population

The take-off point for the debate on quantitative education expansion is the observed inverse relationship between the growth of the school-age population and hence school enrolments and the apparent decline in the 'quality' of education, measured particularly in terms of the supply of not only an adequate teaching force but one that is also adequately educated and trained.

Jones, in his work already referred to, maintains that the quality of education has, in the last two decades, become a casualty of rapid quantitative growth especially in the developing countries.[34] Kenya, where this study was undertaken falls

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[31] Morris, B., Objectives and Perspectives in Education: Routledge & Kegan Paul, London, 1972, p. 72.

[32] Jolly, R., Op. Cit., pp. 105-111.

[33] Jolly, R., Op. Cit., pp. 105-111.
Williams, T. David, Op. Cit., p. 66.

[34] Jones, G., Op. Cit., p. 41.

among the developing countries and is therefore included in all the literature relating to them. Again, Ta Ngoc Chau, in a succinct analysis of educational costs in developing countries concludes that growth in enrolments leads to an increase in both recurrent and capital costs in the form of teachers' salaries and [illegible] of training and new classrooms.[35] If a country is unable to supply the number of teachers required for the increased enrolment it seeks a solution in enlarging class sizes so that one teacher is responsible for more pupils. This is the solution that many developing countries have resorted to despite the widespread belief, reflected in policy decisions, that the quality of education cannot be maintained if individual pupils do not have a claim on the personal attention of the teachers.[36]

The proponents of this argument of school-age population growth and quality of education further draw attention to the fact that population growth is not the only factor leading to increase in enrolments and consequently, large classes. The other factor, operative in educational system where education is not compulsory, is the desire by these countries to increase participation in education by raising enrolment ratios.[37] In such instances, starting from a situation of less than 1:1 enrolment ratios, the actual numbers in schools can be increased even if the growth in the school-age population remained static. But population growth in developing countries is far from static. As Jacques Hallack in his study of educational systems in developing countries points out, high rates of demographic growth makes it difficult for the government to raise the enrolment ratios.[38]

According to the United Nations Population Projection,

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[35] Ta Ngoc Chau, Op. Cit., pp. 44-56.

[36] Williams, T. David, Op. Cit., p. 71.

[37] Ta Ngoc Chau, Op. Cit., p. 71.

[38] Hallack, J., 'Ceylon: A Case Study' in Ta Ngoc Chau. Population Growth and Costs of Education in Developing Countries; UNESCO/IIEP, Paris, 1972, p. 79.

825 million people will be added to the world in the decade 1970-80, 705 million of them in the developing world.[39] The projected rate of this growth for different regions is shown below:-

Table 1

Projected Rates of Population Growth in Different Regions: 1970-95

	1970-75	1980-85	1990-95
World	2.0	2.0	0.8
Developing Regions	2.5	2.4	2.1
Developed Regions	1.0	1.0	0.9
Africa	2.8	3.0	2.9
Europe	0.7	0.7	0.7
Latin America	2.9	2.8	2.7
North America	1.3	1.5	1.1

Source: Jones, G., p. 10.

It is important to note that the highest rate of growth is to be found in Africa.

For the educational planner, the implications of a perpetuation of high levels of fertility, combined with prospective declines in mortality are clear; the school-age groups will grow rapidly. The table below shows the school and prospective school-age population as a percentage of total population.

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[39] Jones, G., Op. Cit., pp. 9-10.

Table 2

School-Going and Prospective School-Going Age Groups as a Percentage of Total Population: 1970

Region	Age in Years		
	0-4 %	5-14 %	15-24 %
World	14	23	18
Developing Regions	16	25	16
Developed Regions	9	18	17
Africa	18	26	19
Latin America	16	26	19
Europe	9	16	16
North America	9	20	18

Source: Jones, G., p. 12.

According to this table, in 1970 14% of the world population was made up of pre-school age children who in a few years would be demanding places in the educational system; 18% of the population in Africa was in this age group while only 9% of the population in Europe was in this group. Africa, together with Latin America, had the highest percentage, 26% of their population in the primary age group (5-14 years), higher than the world average and the average in the developing regions.

Phillips points out that in 1970 there were 836 million children in the world aged between five and fourteen years. Of these, 640 million were in the developing world.[40] Moreover, the United Nations Medium Population Growth Projections estimate that while in 1970 there were 412 million pre-school children in the developing world this number would rise to 500 million by 1980 and 620 million by the year 2000.[41] According to the United

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[40] Phillips, M. H., Op. Cit., p. 8.

[41] In all population growth projections the United Nations uses three levels, low, medium and high to indicate expected changes in demographic trends.

Nations, the school-age group would rise from 640 million in 1970 to 822 million in 1980 and 1152 million in the year 2000.[42] The same population rose by 105 million between 1950-60 and 136 million between 1960-1970.[43] The following table shows the average increase of the pre-school and school-age population.

Table 3

Average Rate of Increase in Pre-School Age and School-Age Population in Developing Countries: 1960-76

Age in Years	1960-65	1965-70	1970-75
0 - 4	1.6	2.8	2.1
5 - 9	2.4	2.7	3.0
9 -14	3.2	2.4	2.7
15 -19	2.7	3.2	2.5

Source: Unesco Statistical Year Book, 1973, p. 25.

Growth in Enrolments

Comparative figures on population growth and the growth in school enrolments indicate that the growth in enrolments has lagged far behind the quantitative growth of those seeking school places at all levels of education. The table below shows the rise in enrolments in the developing regions with special reference to Africa:-

Table 4

Total Enrolments in Developing Countries: (millions)

	1960	1965	1970	1971
Africa	18.9	25.9	32.4	33.6
Developing Region	119.0	159.6	201.5	207.0

Source: Unesco Statistical Year Book, 1973, p. 102.

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[42] Ibid, p. 20.

[43] Ibid, p. 20.

In this study of the development of basic education in Africa, Phillips notes that in the developing world of the 836 million children aged between five and fourteen in 1970 there were 269 million out of school. This number is expected to rise to 375 million by 1985.[44] Although Table 4 shows a growing increase in enrolments the rates of such increases are on a declining scale as shown in Table 5:-

Table 5

Percentage Increases in Enrolments in Developing Regions (Primary Education only)

	1960-65	1965-71
Africa	6.5	4.4
Asia	5.5	3.7
Arab States	8.1	3.6
Latin America	5.2	4.6
Developing Countries	6.0	4.4

Source: 1. Phillips, p. 30.

2. Unesco Statistical Year Books, 1970, 1971 and 1973

Tables 4 and 5 show that although there is an increase in real numbers or pupils enrolled (Table 4) the rates of the increase are declining. This seems to support Hallack's argument that enrolment rates can remain static or indeed decline even while enrolments in absolute numbers continue to rise.[45] The conclusion drawn from these two Tables is that the major contributing factor to the rise in enrolments is the rapidly increasing school-age population.

But despite this apparently dismal picture painted by a comparison between the growth in enrolments and the growth in the

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[44] Phillips, M. H., Op. Cit., p. 4.

[45] Hallack, J., Op. Cit., p. 79.

school-age population, there is no doubt that the rise in actual enrolments in the developing world has been spectacular. A look at some specific countries in Africa will illustrate this point.

Adam Curle notes that in Nigeria enrolments rose by 300% between 1950-1964 while in Senegal it rose from 38,000 to 219,000 between 1965-75[46] In the whole of Africa enrolments in secondary schools more than doubled during the 1950s and more than doubled again between 1960-68 while all enrolments, primary included, more than trebled between 1950-1966.[47]

Growth of the Teaching Force

The growth of the number of teachers in service depends largely on the output of the teacher training institutions. This growth can be seen in the table below:-

Table 6

Growth in the Number of Teachers. (in thousands) Primary Level Only

	1960	1965	1970	1971
World Total	8176	9780	11392	11667
Developing World	3745	4547	5702	5957
Africa*	353	468	580	592

*Excludes Arab States.

Although the increases in teacher supply have been phenomenal they have been smaller in percentage terms than the rapidly increasing school-age population. The following tables gives the growth in pupil/teacher ratios:-

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[46] Curle, A., Educational Problems of Developing Societies: Praeger Publishers, New York, 1973, p. 82.

[47] Jones, G., Op. Cit., p. 34.

Table 7

Primary Education Pupil/Teacher Ratio

	1960	1968	1970
World	30	31	30
Africa	39	40	41
Latin America	34	32	33
Asia	30	36	34
Arab States	38	34	31

Source: Phillips, M. H., p. 49.

The table shows that Africa has the highest pupil/teacher ratio and that this ratio, unlike in other regions has consistently increased. The two tables (6 and 7) indicate a worsening educational situation in as far as quality in education is measured in terms of pupil/teacher ratio. It is this inability of teacher supply to keep pace with the demand that led Najman, a Director of Unesco's Department of Education to state that:-

> From a quantitative point of view not only is education in Africa failing to achieve the result which the governments and the people expect, but in practically all countries, and certainly on the continent as a whole, it has undergone a permanent process of worsening.[48]

One of the factors said to contribute to this worsening situation is the teacher; his low education standard, poor professional preparation and his declining social status.

The Kenyan Situation

The position in Kenya is not different from that in other African countries. In 1969 the figures for the school-age population vis a vis those actually enrolled are as follows:-

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[48] Najman, D., Education in Africa: What Next? An Essay, Aubenas, France, 1972.

Table 8(a)

The School-Age Population and Enrolments in Kenya: 1969

Age Groups	Total School-Age Population (a)	Population Actually in School (b)	Proportion of (b) over (a)
5 - 14	3,188,473	1,322,133	41.5%
14 - 19	1,104,999	75,410	6.8%

Source: Raju, B. M., Education in Kenya: Problems and Perspectives in Educational Planning and Administration; Heinneman Educational Books (E.A.) Ltd., Nairobi, 1973, p. 15.

For the purposes of comparison similar figures for the developing world in 1970 are given below:-

Table 8(b)

School Enrolments (1970) (in millions)

Age Groups	Total Numbers (a)	Numbers in School (b)	Numbers out of School	Proportion of (b) over (a)
5 - 14	481	212	269	44%

Source: World Bank Sector, Working Paper on Education, December, 1974.

B. M. Raju, in her book referred to above, draws attention to the fact that the school-going age population in Kenya is larger than the active population.[49] This places a heavy burden on the active population in the provision of financial and

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[49] Raju, B. M., Education in Kenya: Problems and Perspectives in Education Planning and Administration. Heinneman Educational Books, Nairobi, 1973, p. 14.

physical resources. Raju comments on the shortage of trained teachers, particularly in the rural areas, and the utilization of untrained teachers in Kenya, and concludes that this leads to a poor quality of education.[50]

On the question of enrolments, figures indicate that up to 1970 projected enrolments in primary schools tended to exceed the actual enrolments.[51] This can be explained by two phenomena, the government's desire to raise the enrolment ratios and the high rate of drop outs. Indeed the problem of drop outs was very noticeable during the conduct of this study. In many cases the streams had started with 50 or 60 pupils but at the end of the year these had dwindled to under 40. This was the case in the two unstreamed classes in the study. They had started off as two streams but had to be combined as they fell to uneconomic (by the standard of the area) units. After 1970, however, the actual enrolments caught up and indeed exceeded the projected enrolments.

The educational authority's policy in Kenya regarding class size changed in 1974. Formerly a class size of forty pupils was the norm in lower classes (Standard 1 - 4). In 1974, in anticipation of drastically increased enrolments in the whole of the primary school system, the official class size was raised to fifty pupils in lower primary classes. It was recommended that any class that was larger than fifty pupils should be split into two. In some cases, however, the financial status of the local community dictated against such a move since it required extra classrooms. The over-fifty pupil classes, therefore, were the result of either amalgamation of smaller, uneconomical units or the failure to split large ones.

Kenya has the second highest fertility rate (7.6) in Africa.[52] This combined with declining infant mortality rates gives Kenya a very youthful population. According to the 1969 census the population for the different age groups was as follows:

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[50] Ibid. pp. 53-54.

[51] Ibid. p. 37.

[52] Ministry of Finance and Planning, Central Bureau of Statistics; Statistical Digest, 1971, p. 14.

Table 9

Population in Kenya
by Age-Groups: 1969

Age Group	Number in Millions
0 - 4	2,081
5 - 9	1,783
10 - 14	1,352
15 - 19	1,085
20 - 24	861
25 - 29	744
30 - 34	563
35 - 39	502
40 - 49	710
50 - 59	477
60+	576

Source: Kenya Population Census 1969, Government Printer, p. 16.

The table above shows that the school-age population, (5 -19 age groups) was almost as large as the entire adult population. This is borne out by the latest demographic figures which put the population under 15 years of age at approximately 50% of the rest of the population.[53] The primary school-age population (the target population in this study) was 3,135,000.

School Enrolments and
Teacher Training in Kenya

In the ten years between 1964 and 1974 the enrolments in primary schools and corresponding enrolments in teacher training have grown as shown below:

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[53]Central Bureau of Statistics, Ministry of Finance and Planning; Social Perspectives. Vol. 2, No. 1, March 1977, p. 2.

Table 10

Growth of Primary School and Primary Teacher Training Enrolments (1964-73)

Year	Primary Enrolments	Teacher Training Enrolment	Proportion of Pupils to Prospective Teachers
1964	1,010,889	4849	208:1
1965	1,014,719	5355	187:1
1966	1,043,416	5474	191:1
1967	1,133,179	5904	191:1
1968	1,209,680	6634	182:1
1969	1,282,297	7194	178:1
1970	1,427,589	8107	176:1
1971	1,525,498	8626	177:1
1972	1,675,919	8683	190:1
1973	1,816,017	8905	203:1
1974	2,734,400	8863	308:1

Source: Statistical Abstract: 1973, p. 179.
Ministry of Education Annual Report, 1974.

PURPOSE OF THE STUDY

The purpose of this study was to analyse some of the factors that influenced the quality of education measured in terms of pupil academic performance. These are, class size,, teacher professional qualification and teacher experience.

IMPORTANCE OF THE STUDY

Reliable information about the relationship between numbers and quality of inputs into the educational system on the one hand and student performance on the other provides a useful and necessary first guide in assessing the merits of the range of options available to educational planners. Such options as raising the class size, the utilization of professionally unqualified teachers or even the possibility of

sandwich courses for teachers in which they acquire both training and experience simultaneously should be considered in the never-ending fight against the shortage of teachers with the required professional training and experience. It is also important to know the levels of experience above which the effectiveness of the average teacher increases or decreases significantly. This would be helpful in indicating when re-training or additional training might be useful and important in planning the distribution of teachers with particular levels of experience. It was hoped that this study would indicate the scale of the comparative contribution to pupil learning of class size, teacher professional qualification and teacher experience. The study cannot claim to be exhaustive but it is hoped that in addition to its own findings it will provide a starting point for further research into the qualitative aspects of education in Kenya.

Literature Review

Although there is a growing body of research and literature in education in Kenya, there is very little that is related to the quality aspect of educational development. Much of the literature is either historical as in the works of J. Anderson,[54] or only semi-qualitatively analytical as in the works of B. M. Raju[55] and J. R. Sheffield.[56]

The Institute for Development Studies of the University of Nairobi has contributed the main body of the non-historical research on education in Kenya. Such studies as conducted by

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[54] Anderson, J., The Struggle for the School; Longmans Co., London, 1970.

[55] Raju, B. M., Education in Kenya; Problems and Perspectives in Educational Planning and Administration, Heineman Educational Books, Nairobi, 1973.

[56] Sheffield, J. R., Education in the Republic of Kenya; United States Government Printing Office, Washington, D. C., 1971.

A. Somerset, D. Court, D. Ghai, K. Kinyanjui and others at the Institute have made useful contributions in analysing the Kenyan educational system.[57] They, however, have concentrated on educational resource deployment and its contribution to inequalities within the system. A rather different kind of study, an evaluative one, was done by D. Sifuna on the use of English as a medium of instruction in Kenyan primary schools.[58] But, as far as the investigator in this study is aware, there has been no research in Kenya on the quality aspect of education. This lack of research on this important area of education is the major justification for this study.

Much of the literature in this section has already been referred to in the first part of this chapter. Nevertheless, the review that follows is intended to give a clearer focus on the specific variables examined in this study.

The Teacher

A general review of literature on teachers as a factor in the quality of education indicates an agreement by researchers, educationists and administrators alike on the crucial role they play. Professor B. Morris in his work referred to earlier presents the teacher in the following words, "In the system of personal relationships within which children learn the teacher is probably, next to members of the immediate family, the most important factor."[59] He goes on to point out that experiments in education methods leave the impression that efficiency in learning is more a function of the teacher than the method and cites Vernon Gardner and Anderson as having come to the same

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[57] Court, D. and Ghai, D., Education, Society and Development, Oxford University Press, Nairobi, 1974.

[58] Sifuna, D. N., Revolution in Education; East African Literature Bureau, Nairobi, 1975.

[59] Morris, B., Op. Cit., p. 119.

Conclusion.[60] Wall (1955) describes the teacher as, "group leader, giver and withholder of security and the source of authority, law and order."[61] Beeby argues that what you can do in a school system depends first and foremost on the quality of your teachers.[62]

Particular attention has been paid to the primary school teacher by educators because of the wide field into which he has to carry his proteges. Unlike the secondary school teacher who specialises in his teaching subject(s), the primary school teacher usually operates in a one-teacher class in which he teaches all subjects. P. B. Renes depicts the primary school teacher as a master of all trades. He is expected to excel in all fields; culture, story-telling, arithmetic, nationalism and language.[63] This view is supported by Professor William K. Medlin who sees the teacher as a transmitter of cultural heritage, a purveyor of specialised knowledge and a political educator.[64]

In underscoring the importance of the teacher as the final decider on what is to be learnt and how, Beeby says,

> ... the great majority of the primary school teachers ... are shut up with their 30-60 children in a classroom where they practice their art ... unaided and unseen. An Administrator soon learns how extraordinarily difficult it is for those in final control of a large school system to know just what <u>does go</u> on

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[60] Ibid. p. 124.

[61] Ibid. p. 124.

[62] Lowe, J., (ed.), <u>Education and Nation Building in the Third World</u>, Scottish Academic Press, Edinburgh, 1966, p. 12.

[63] Renes, P. B., 'Teacher Training in Educational Problems in Developing Countries' in <u>Education Problems in Developing Countries</u>. CESO, Wolters-Noordhoff Publishing Groningen, Amsterdam, 1969, p. 63.

[64] Medlin, William K., 'The Role of Education in Social Development', Ibid. pp. 133-140.

in most of the classrooms for most of the time.[65] On the same theme Dr. Olu Ibukun argues that even when basic teaching materials and quipment and the necessary communication media are available, successful teaching depends on the teacher.[66] Further literature reveals a preference for the professionally qualified teacher to the unqualified one. This aspect is looked at below.

The Professionally Qualified Teacher

In general the term 'qualified teacher' is used to differentiate those who have received some recognized form of teacher training from those who, regardless of how many years of education they have received are not graduates of a teacher training programme. These two aspects of teacher qualification, i.e. academic versus professional qualifications, will be discussed in the section dealing with the limitations of the study. Suffice it to note here that these are two important complementary aspects and that only one of them viz. professional qualification is considered in this study.

The importance of having a professionally qualified teaching force has been emphasized by numerous educationists and writers of educational literature. In his paper referred to earlier Olu Ibukun stresses that all teaching materials, equipment and communication media cannot compensate for the lack of trained teachers.[67] Drawing a comparison between the trained and untrained teacher Beeby asserts that what can be done with an educated and trained teacher is quite different from what can be done with teachers who are educated and

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[65] Beeby, C. E., Op. Cit., p. 39.

[66] Ibukun, O., 'The Objectives of Primary Education in Emerging Countries and the Necessary Educational Means in Developing Countries', in Education Problems in Developing Countries, Op. Cit., p. 51.

[67] Ibid. p. 51.

untrained.[68] Yet, the rapid expansion of school systems has been achieved by taking on less qualified teachers, for an annual increase in school enrolment means a commitment to a corresponding increase in the number of teachers.

Ideally, a professionally qualified teacher should have been exposed to six components of training which fall into two broad categories, viz. pedagogical and general. In the pedagogical field he should be familiar with the curriculum content and the most effective way of presenting it. He should have learnt how to encourage learning attitudes and to creat productive learning situations. Finally, he should have been made familiar and continue to make himself familiar with the various textbooks and teaching aids available. In general he should be given a sense of his social role, should have an open mind towards innovation and should be made aware of his position within the framework of the national policy. This is what differentiates a professionally qualified from an untrained teacher. It is in the light of such arguments that one must view the desire and willingness of governments all over the world to spend large sums of money in an attempt to increase the ratio between the trained and the untrained teachers.

The professionally qualified primary school teaching force in Kenya has been trained at different levels of academic attainment. Formerly, in the 1950s and early 1960s such teachers were trained after they completed eight years of primary education. The teachers thus trained taught in the lower classes in primary schools while those who trained after two years of secondary education taught in the higher classes. As the output from secondary schools increased, the level of entry for primary school teacher training was raised to junior secondary and later to successful completion of four years of secondary education. The training takes two years in each case.

In spite of the rising output from the educational system, the teacher training institutions have been unable to keep pace with the ever growing demand for trained teachers. At the same

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[68] Beeby, C. E., Op. Cit., p. 39.

time there has always been a sizeable proportion of untrained teachers in the Kenya teaching force. Consequently, the government embarked on an in-service scheme in which untrained teachers already in service could take some prescribed courses by correspondence for four years and after satisfactorily sitting an examination, qualify as trained teachers. This period of training has recently been extended to four years. So, apart from trained teachers of different academic levels there are also teachers who have undergone different modes of training as well as untrained teachers. These were categorised as college trained, 'in-service trained' and 'untrained' teachers in this study.

The Experienced Teacher

Unlike teacher training, teacher experience seems to have been given scanty attention in educational literature. One writer who seems to have thought of it gives it the benefit of one sentence in his paper thus, "differences in the average level of experience may be of great significant."[69] To the researcher this is a serious omission. A look at government expenditure shows that education takes the biggest share of the Kenyan national budget. Between 70-80% of the expenditure in primary education goes to the salaries of teachers. Of the expenditure on teachers' salaries a substantial proportion goes into the annual increments to teachers who have been in service for some time. Incremental payments seem to be a recognition that experience plays a role in making the teacher more effective. The question of payment for experience may be looked at in two ways. The early stages in any job, whether one is professionally trained or not are spent learning the job. Therefore, a teacher, in her first year of teaching should be under pupilage. As she stays on the job and gains more confidence she becomes more effective. But there is also surely a danger that teaching may become a routine, experience which can bring about a sense of

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[69] Williams, T. David, Op. Cit., p. 70.

over confidence and less care in its performance. In this study the researcher attempts to correlate teacher experience and pupil academic performance as a measure of learning effectiveness.

BASIC ASSUMPTIONS

The basic assumption of this study is that there exists a relationship between class size, teacher professional qualification and teacher experience on the one hand and learning effectiveness measured in pupil academic performance on the other.

HYPOTHESES

1. The following null hypotheses were tested in this study: There is no difference in the effectiveness of learning between pupils in large and those in relatively smaller classes.
2. There is no difference in the effectiveness of learning between pupils taught by teachers of different professional qualifications.
3. There is no difference in the effectiveness of learning between pupils taught by experienced and those taught by relatively inexperienced teachers.

SCOPE AND LIMITATIONS OF THE INVESTIGATION

The first set of limitations refer to the test design used in the study. This was a three-step one-group test as described by Borg and Gall in their book on introduction to educational research.[70] The three steps are:

1. The administration of the pre-test to measure the dependent variable.
2. The application of the experimental treatment.

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[70] Borg, W.R. and Gall, M.D., Educational Research: An Introduction, David McKay Co. Inc., New York, 1963, p.377

3. The administration of the post-test to measure the dependent variable again.

In this case differences due to the application of the experimental treatment are then determined by comparing the pre-test and the post-test scores.[71]

The study was of the one-group variety because there was no control group i.e. a group that was not subjected to the experimental treatment.

Borg and Gall point out that this one-group pre-test post-test design suffers from a major limitation in that since no control group is used, it is assumed that the changes between the pre-test and the post-test are brought about by the experimental treatment, although they could as easily be brought about by one or more extraneous variables.[72] They recommend that in order to reduce the likelihood of extraneous variables altering the post-test results studies employing this test design should keep the interval between the two tests as short as possible.[73] In this study this interval was of thirty minutes duration.

The study was an evaluative one seeking to assess the effects of some specific variables on learning. These variables were:-

1. Teacher professional qualification.
2. Teacher experience.
3. Class size.

To evaluate the effects of these variables seven hundred and seventy-six (776) Standard Two pupils from the Machakos District of Kenya were selected and subjected to the pre-test post-test designs. The major constraint here was seen to be what Borg and Gall describe as the interaction of the experimental treatment with particular characteristics, measuring instruments and the time of the study.[74] As this investigation

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[71] Ibid. p. 377.

[72] Ibid. p. 378.

[73] Ibid. p. 379

[74] Ibid. p. 369.

was conducted with a specific group of pupils in a particular area and at a particular time in their educational development its findings cannot be generalised except with regard to this particular group of children in that particular area and at that particular time. The reason for this is that later presence or introduction of one or more extraeous factors would make these findings invalid even in the same area.

The second group of limitations pertained to the Kenyan curriculum. A major purpose of evaluation in education is to test the validity of assumptions that underlie each individual course. Two such assumptions are the attainability and desirability of course objectives. For example, it is assumed that at the end of each course the pupils will have changed, for the better, their behaviour patterns; they will have acquired ideas and knowledge they did not have before; they will have improved their ways of thinking, developed new (desirable) tastes and sensitivities and will have made general improvements in some desired direction. To evaluate a course, therefore, or to devise any kind of evaluation procedure it is essential to have knowledge of the aims and directions of change defined in terms of desired student behaviour. As Bloom rightly points out, it is only by matching the test objectives with the course objectives that one would know what changes to look for.[75] With the knowledge of the course objectives one can then evaluate their attainability and the desirability of their results.

Furst, writing on the construction of evaluation instruments, notes that good teaching can go on without any clearly defined aims in terms of student behaviour, or if the aims are only set out in general terms.[76] From the standpoint

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[75] Bloom, B. S., Hasting, J. T. and Madans, G. F., Handbook on Formative and Summative Evaluation of Student Learning. McGraw-Hill Co., p. 8. Bloom, B. S., Taxonomy of Educational Objectives; Handbook I, Cognitive Domain, Longmans Group, 1956.

[76] Furst, E. J., Constructing Evaluation Instruments; Longmans, Greene and Co., London, 1958, p. 100.

of research too, Furst agrees with Bloom that such conditions are not satisfactory for evaluation because they do not yield evaluative factors. This was the first and major problem encountered in this study.

The standard 2 syllabus[77] was of little help in determing what attributes or properties, other than cognitive, could be evaluated. It is axiomatic that all the subjects in a curriculum are interrelated and none can be divorced from the others. Lessons in number work discipline the pupils' mind into orderly and systematic thinking in the solution of problems. On the other hand lessons in language increase the pupil's vocabulary and help him to understand instruction in number work. Thus all the subjects work in concert, reinforcing each other, to develop a physically, emotionally and intellectually whole person. The ideal syllabus, therefore, should combine all disciplines emphasising the connections between them. In such a situation the researcher would be in a position to evaluate comprehensively the changes and developments resulting from exposure to the whole curriculum.

The subjects of the study (Standard 2 children in selected primary schools in Machakos District) had undoubtedly undergone certain changes, but no where could the researcher find a definition or definitions of the 'desired' or 'expected' changes in areas like attitude formation or change, civic outlook, social sensitivity and other areas of human behaviour, in other words, the 'affective domain'.[78] It would seem that the Kenya educational system follows what Furst refers to as a system without clearly defined objectives.[79] For the teacher, as for the

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[77] Ministry of Education: Kenya Primary Mathematics: Standard Two Pupils' Book. Ministry of Education, Kenya Primary Mathematics: Standard Two Teachers' Guide, Jomo Kenyatta Foundation, Nairobi.

[78] Bloom, B.S., Handbook II, Taxonomy of Educational Objectives; The Classification of Education Goals; Affective Domain, Longman Group Ltd., London.

[79] Furst, E. J., Op. Cit., p. 100.

researcher, lack of clarity of objectives poses problems. Where the researcher cannot evaluate the teacher cannot implement and vice-versa.

Attainability of course objectives should be evaluated. But this means that the teacher understands the global objectives so that he can design each classroom activity as a step towards the achievement of the overall goal. In the absence of clearly defined objectives the teacher can only evaluate his achievement by the amount of knowledge that his pupils have accumulated over a period of time. This is done through tests in knowledge acquisition and retention.

In Kenya, education at the primary school level is almost totally geared towards success in examinations to the extent that the teaching of non-examinable subjects is considered by teachers and pupils alike as a waste of valuable time. The effects of this emphasis on success in examinations on both the teachers and pupils, on what is taught and how it is taught, has been the subject of many research papers in the Institute for Development Studies at the University of Nairobi.[80] The importance attached to the Certificate of Primary Education has ripple effects throughout the primary school system as academic performance on the part of the pupils is seen to be the only measuring rod of their educational growth and the effectiveness of their teachers. A. Somerset notes that despite attempts by the educational authorities in Kenya to avoid labelling those who do not gain entrance to secondary schools as 'failures' by issuing them with a certificate of completion, the majority of those who do not enter secondary schools still regard themselves as 'failures;[81] since no achievement, other than academic is rewarded.

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[80] Prewitt, K., 'Education and Social Equality in Kenya: IDS Discussion Paper No. 157. King, K., 'Primary Schools in Kenya', IDS Discussion Paper No. 130.

[81] Somerset, A., 'Who Goes to Secondary School? Efficiency, Equity and Relevance in Secondary School Selection', IDS Discussion Paper No. 184. King, K., Primary Schools in Kenya, IDS Discussion Paper No. 130.

This study therefore did not attempt to analyse the achievement of the affective values like changes in attitudes and civic training that are set out in the national objectives for the simple reason that these have been overshadowed by the more concrete aspect in the form of performance in examinations. This is not to say that the non-concrete aspects cannot be analysed and quantified. Tools for this do exist but such an undertaking calls for time and resources beyond those available here. The researcher, therefore, worked on the premise that educational objectives exist, that each year's syllabus is a step towards their achievement and that the end of year examination was a sound indicator of the effectiveness with which the pupils moved towards the attainment of these objectives.

The study did not take into account any long term effects of the educational process. Neither did it take into account the pupil's success in future life or achievement in subsequent schooling, important though these aspects are. It did not take into account the non-concrete (affective) effects of their stay in primary school either. It was limited in time to a comparison of pupil growth up to the end of their second year of primary schooling and in scope to a consideration of their academic achievement as an aspect of their growth.

The third limitation pertained to the tools of investigation. Williams, in talking about testing efficiency draws attention to the difficulties in establishing appropriate indices of output and argues that

> The use of examination results as a measure of output suffers not only from the fact that they are relevant only to part of the activities of a school but that they may be deficient measures of the things that they are supposed to measure.[82]

Generally, however, the use of tests and examinations is accepted as a means of obtaining evidence of the effects of the educational process. Bloom has defended it on the grounds that education has a rather intangible quality and that examinations

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[82] Williams, T. David, 'The Efficiency of Education' in Lowe, J., (ed.), Op. Cit., p. 61.

seem to yield the only tangible evidence of the consequences of instruction. To him, it is the "concreteness of examination performance and the availability of normative data"[83] that leads both teachers and educational researchers to concentrate on the cognitive domain of the educational process.

This study therefore, like many before it, was limited to the evaluation of the cognitive domain of learning. It was also limited to Standard Two pupils in 1975 and to educational conditions pertaining then.

The other limitations were demographic and geographical. Machakos District has the third highest total population as well as primary age population in the whole country. In 1969, the last population census year, the district had a child population of 354,627 of whom, it was estimated, 167,000 were of primary school age.[84] By 1974, it was estimated that the primary school-age population would have risen to 191,000.[85]

In terms of enrolments, number of schools and teacher supply, Machakos District has the highest primary school enrolment, the largest number of streams and the highest number of less professionally qualified teachers.[86] The table below gives the figures for Machakos District in relation to nine other Districts with numerically similar school-age population.

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[83] Bloom, B. S., 'Testing Cognitive Ability and Achievements' in Handbook of Research in Teaching, 1956.

[84] Government Printer; Kenya Population Census. 1969.

[85] Central Bureau of Statistics; Kenya Statistical Digest, 1972, Vol. 10, No. 3, pp. 8-10; Ministry of Finance and Economic Planning, Nairobi.

[86] Ministry of Education, Tracer Survey. Op. Cit., March, 1974.

Table 11

Number of Schools, Streams and Teachers in Kenya: 1974

District	No. of Schools+	Estimated Streams*	Actual Steams	Estimated Teachers
Masaku	804	4597	6131	5160
Gusii	618	3883	5754	3869
Kakamega	617	4155	6111	5113
Meru	594	3589	4349	3672
Kipsigis	307	2054	2764	2215
Bungoma	305	2020	2620	2072
Murang'a	294	3461	3901	3598
Kiambu	286	3461	3973	3713
Kitui	285	1823	2216	1874
Siaya	261	1586	2701	1623

+These are the new schools opened for 1974 according to a circular letter from the Permanent Secretary, Ministry of Education, primary 20/74 of 8/12/73 and those which were already approved and in existence in 1973.

*These are the number of streams originally expected to open in 1974 according to the Returns for 1973-74.

NOTE: These figures were obtained from a Tracer Study conducted by the Ministry of Education in March 1974 to determine the growth in enrolments and resource requirements as a result of the declaration of free primary education.

In the body of the study, however, and for the sake of familiarity the name Machakos has been adopted.

Table 12

Number of Teacher by Grade and Professional Qualification, 1974

District	Graduates	S1	P1	P2	P3	P4	UT EACE	UT KJSE	UT CPE	Total
+Masaku	-	3	239	1057	1970	147	480	406	858	5160
Gusii	-	8	587	786	1604	46	259	314	265	3869
Kakamega	-	15	441	1441	1508	283	960	502	263	5113
Meru		4	376	1068	1157	157	423	81	406	3672
Murang'a		15	415	760	1432	121	336	313	85	3598
Kiambu	1	13	501	1126	1486	107	163	213	85	3713
Siaya	-	8	211	417	753	150	141	75	68	1623

+The names 'Machakos' and 'Masaku' are used interchangeably. In all official reports after independence the District is referred to as Masaku and therefore, especially in tables, this is the name used.

Machakos (Masaku) District, with 804 primary schools, 6131 streams in actual operation a total of 5160 teachers of whom 1744 or 33% are untrained and 49% of the untrained teachers being of CPE academic level merits a place in educational research because it is such a significant portion of the total educational system in Kenya. It experiences in an acute form most of the difficulties of running an effective education service in a developing country with a rapidly rising population. Academic research in education tends to be concentrated in urban and other thickly populated areas. Machakos District was selected as being representative of the problems and difficulties of a rural area.

The final limitation was geographical accessibility. The researcher was based in Nairobi and her regular duties precluded long absences from the base. Machakos District borders on Nairobi and the researcher was able to make daily trips for data collection.

This is not to say that the research was conducted in and around the township of Machakos. In fact, it was the deliberate

intention of the researcher to confine the investigation to schools truly representative of rural setting. Consequently, schools around Machakos township or around any sizeable trading centres were avoided. Talks with the heads of those schools confirmed that they were infrequently visited by education officials and that equipment was invariably received late.

OPERATIONALISATION OF THE INVESTIGATION

A major point regarding tests is their construction and adoption and again Williams has something to say on this. He observes that scores on tests may be significantly affected by factors which have little to do with innate mental ability. Since most tests have been developed in industrialised countries, students from other countries may obtain lower scores than they should in terms of their ability.[87] It is therefore difficult to interpret the results of tests designed for one population and used on another.

In support of Williams, H. Arici warns test constructors against ignoring the 'culture-bound' character of tests. He argues that even the so-called 'culture-free' tests reflect cultural differences as the test-form, content and meaning are 'culture-bound' and concludes, "every test is developed and validated within a specific cultural framework."[88] Drenth goes even further in questioning the values of cross-cultural testing and says that even testing within a country is 'culture-bound' because of the many differences in environmental influences. " A test is validated with respect to a certain population. Strictly speaking (such a) test may only be used for decisions for the population on which it is validated."[89] This cultural phenomenon is described by

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[87] Williams, T. David, Op. Cit., p. 67.

[88] Arici, H., 'Laying the Foundation Groundwork for Test Application', in Cronbach, L. I., and Drenth, P. J., (eds.), Mental Tests and Cultural Adaptation. Psychological Studies 7, The Hague, 1972, p. 20.

[89] Ibid, p. 26.

S. Biesheuvel as "the inevitable involvement of non-cognitive elements in cognitive test performance."[90] This is not to say that there are no tests that can be used cross-culturally. Biesheuvel quotes several, e.g. the Porteus Maze, Elithern's Perceptual Maze, the Witkin Rod and Frame and Gottschaldt's Embedded Figures.[91] These, he says, have built-in non-cognitive components conducive to adaptability.

On the strength of Williams, Drenth's and Arici's arguments against the use of cross-cultural testing it was decided not to use tests designed in foreign cultural backgrounds. The tests used in this study, therefore, were designed by the researcher in conjunction with the teachers of Standard Two classes in three schools in Machakos District. Technical help was generously given by G. S. Eshiwani in Number Work and C. R. Wang'ombe in Language test designs.

The researcher felt justified in using these locally designed tests on the grounds that the teachers knew more about the level of intellectual development of their pupils and that technical expertise was available locally to assist in designing tests which were relevant to Kenyan pupils.

Sample Selection

The Schools

To test the hypotheses set out it was necessary to find schools which met the following criteria:-

(a) The presence of any of the following class size ranges:
   (i) 38 - 39
   (ii) 40 - 49
   (iii) 50+

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[89] Ibid. p. 26.

[90] Biesheuvel, S., 'Adaptation; Its Measurement and Determinants' in Cronbach, L. I. and Drenth, P. J., (eds.); Ibid. pp. 56-57.

[91] Ibid. pp. 56-57.

For purposes of statistical computation the actual sizes of the classes were used.

(b) The presence, within classes of the above ranges, of both trained and untrained teachers teaching the relevant classes.

(c) The presence of teachers (trained and untrained) with an experience range between under three years and over five years. Teachers with under three years of experience were considered to be relatively inexperienced while those with over five years were considered to be experienced. For the purposes of statistical computations the actual number of years of experience were used.

Ideally, each school should have yielded an operational model of the following dimensions:-

1. Three classes: 30 - 39
   40 - 49
   50+

2. Teachers of similar qualifications teaching the three different class sizes.

3. Teachers of similar experience teaching different class sizes. In other words, each school should have been able to test the hypotheses that,

   (i) Pupil academic performance is a function of class size,

   (ii) Pupil academic performance is a function of teacher professional qualification,

   (iii) Pupil academic performance is a function of teacher experience.

No single school met the necessary requirements, the main deficiency being on class sizes. Although many schools had three or four streams they did not correspond to the ones selected by the researcher and, therefore the third class size, almost invariably the 50+, had to be obtained from another school.

Most of the schools adhered to the 40+ class size. If a school had, for instance, 60 pupils in Standard Two the community preferred it to be split into two streams of thirty pupils each. The main source of the 50+ class size was in

schools where, after the initial influx on the declaration of free lower primary education in 1974, there had been a subsequent sharp drop out. In such instances two streams which had started off with 35-40 pupils had dwindled to 25-30 and it was considered economical to amalgamate them.

The class size variable was the most difficult to obtain and although it was realised that by comparing pupil performance in different class sizes in different schools additional factors like school environment, teacher personality and the school head's capability would be introduced, it was considered that some of these factors would have been present in the same school anyway. After going through over 100 primary schools in the district it became obvious that no one school would yield the required combination of class size, teacher professional qualification and experience. This, and the inability to control such factors as school environment is the main constraint in the study.

Since no one school met all the requirements with regard to both class size and teachers, comparison had to be made between schools. Thus, for example, pupil performance in a large class taught by an untrained teacher in one school was compared to pupil performance in a small class taught by an untrained teacher in another and to pupil performance in a large class taught by a trained teacher in yet another school. Cases of such extensive cross-school comparisons, however, were few. Finally, to obtain a measure of homogeneity the schools were selected on the basis of their distance from urban or trading centre influence. Only schools in what was considered a truly rural setting were selected.

The Pupils

The population sample in this study were Standard Two pupils. The choice of this group was primarily based on the Presidential pronouncement of tuition-free lower primary education from January 1974 in Standards One to Four. The researcher made an assumption (later supported by figures from

the Ministry of Education)[92] that the pronouncement would result in a considerable rise in enrolments, particularly in the lower primary grades. Within the short time between the pronouncement (on December 12, 1973) and the beginning of the school year (January 1974) it was impossible to build additional classrooms and train additional teachers. Consequently, the existing classrooms had to accommodate additional pupils thus raising the class sizes and the class/pupil ratio and the existing teachers had additional pupils thus raising the pupil/teacher ratio. In an analysis of the situation in the primary school system in 1974, Muhoro, the then Deputy Director of Education showed that the enrolment figures for the four lowest grades in primary schools rose by one million above the pre-pronouncement estimate of 4000,000.[93] This additional intake was not ascertained until March 1974.[94] The effect of the Presidential pronouncement was to throw the problems of untrained teachers and large class sizes into high relief, especially at Standard One and Two levels.

The second consideration in the selection of the pupils was one of the length of time spent in the educational system. Of those who had been enrolled under the tuition-free education the Standard Two group had attained the highest level on the educational ladder at the time the research was undertaken.

The Teachers

In all cases it was found that a school with two or more streams had a combination of trained and untrained teachers as well as teachers with different levels of experience. For example, School A would have two streams, one taught by an

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[92] Ministry of Education, Tracer Survey, March 1974.

[93] Muhoro, J.M.G., 'The Kenyan Experience', Paper presented to the Association of Teacher Educators of Africa, Nairobi, 1975.

[94] Ministry of Education, Tracer Survey, Op. Cit., March, 1974.

untrained and the other by a trained teacher. Almost invariably the untrained teacher had less than three years of experience thus confirming what Mohoro had indicated to the Association of Teacher Educators regarding the failure to meet the demand for qualified teachers and the subsequent use of untrained teachers. According to Muhoro in 1973 Kenya had a teaching force of 56,000 at the primary school level. Out of these 12,000 were professionally unqualified. In 1974 an additional 25,000 teachers were required for the new classes. By 1975 the number of professionally unqualified teachers stood at 40,000 (44%) out of a teaching force of 90,000.[95]

Apart from the untrained teachers Kenya has for some time made use of an in-service scheme for the training of her primary school teachers. It was assumed in this study that there would be a difference in performance between pupils taught by the college trained and those taught by the in-service trained teachers. The sample of teachers is, therefore, divided into:-

a. In-service trained teachers.
b. College trained teachers.
c. Untrained teachers.

In all there were seven hundred and seventy-six (776) pupils in eleven (11) schools taught by twenty-one (21) teachers. Of the seven hundred and seventy-eight pupils, two hundred and sixty-three (263) were taught by six teachers trained through the in-service scheme, two hundred and eighty-eight (288) were taught by eight teachers trained through teacher training institutions while two hundred and twenty-five (225) were taught by untrained teachers.

The ratio of pupils taught by teachers trained through teacher training institutions i.e. 288 ÷ 8 = 36 seems to support the pre-1974 pupil/teacher ratio of 40:1 in lower primary classes. This further indicates that the output of the teacher training institutions in Kenya is not sufficient to meet the demand for trained teachers in the country. It is

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[95] Muhoro, J.M.G., Op. Cit.

this failure for the supply of trained teachers to meet the demand for them that led the educational authorities to accept the enlarged class size of fifty pupils in lower primary while at the same time utilizing the sources of untrained teachers. It is important to note that the sample in this study supported the earlier observation that Machakos District had, at the time of the study, a very high proportion of untrained teachers.

Additional Relevant Variables

The major constraints in this study have already been mentioned as the impracticability of measuring abilities other than the cognitive and the inability of the researcher to control some important relevant variables. In recognition of the large number and varying nature of factors that affect cognitive learning it was considered necessary to analyse a sub-set of several variables that do not form the major part of the study.

These are:

1. The school environment.
2. The streams.
3. The sex of the teacher.
4. The sex of the pupil.

These particular variables were selected on the basis of the availability of information about them.

DEFINITION OF KEY TERMS AND VARIABLES IN THIS STUDY

In this study certain terms not in everyday usage were employed. Simple definition of these terms is attempted below.

1. School-age population

According to international terminology adopted by the United Nations the school age of a child runs from the official age of admission to school to the end of the compulsory period of education. In countries where there is no compulsory registration of births or compulsory education, however, this delimitation is impracticable. In this case children are admitted to school as and when they seek admission and the length of their stay is determined mainly by socio-economic factors. This period could range between one and eighteen or more years depending on the ability of the parents to meet the cost of schooling and the ability of the pupil to pass the prescribed examinations. In such cases the school-age population does not technically correspond to the international definition of 'all children aged between six and fifteen years' in the sense that late entry and repetition affects the age range of the children in school. Nevertheless for purposes of international comparisons and, therefore, for the purposes of this study where comparative figures are used the international definition was employed.

2. Primary school-age population

In countries where there is compulsory primary education and a specific age of admission to school this population is delienated by taking account of the duration of compulsory education.

In the case of Kenya the official age of admission to school (six years) is rarely adhered to partly because it is difficult to determine the precise age of the children and partly because of the structure of the educational system.

The latter makes it desirable for pupils to stay longer than the prescribed period (seven years) in primary schools in preparation for the national examination to enable them to proceed to secondary school. Consequently, early entry, where economic factors allow, is preferred. Nevertheless, for the purpose of this study the official age of admission, which is six years was adopted and no account was taken of repetition. The primary school-age population was therefore defined as that population between the ages of six and thirteen years. The subjects of this study were therefore deemed to be approximately eight years old although it was recongized that they are by no means a homogeneous group in terms of age.

3. Intake rate

This is the quantitative growth in the intake of pupils into the educational system and refers only to the first year of each educational cycle e.g. Standard One in the primary cycle and Form One in the secondary cycle.

4. Enrolment rate

This is the quantitative growth in the total number of pupils within an education cycle; e.g. enrolment at the primary cycle refers to the total numbers of pupils from Standard One to Standard Seven. Where repetition is taken into account the enrolment rate could apply to a single class where it would refer to the intake or promotion into that class plus the repeaters.

5. Drop-outs

These are pupils who leave the educational system before they have completed a prescribed period or course.

6. Quality of education

As indicated earlier in the study the term 'quality' in education is open to different interpretations.

For the purpose of this study quality was used in an evaluative sense implying a scale of 'goodness' against which an educational system can be measured. If an educational system achieves the goals that have been set for it then it is of 'good' quality and conversely, if it does not achieve such goals then it is of 'poor'quality. To achieve these goals an educational system needs certain inputs. The nature and quality of these inputs determines the quality of education given within the system. In this study the teacher, his professional qualifications and the pupils, the size of the class in which they learned were adopted as factors that could be used to measure quality in education.

7. Effective and effectiveness

These words were used in relation to the learner and learning. According to the Dictionary of Behavioural Sciences, B. B. Wolman defines 'effect' as an event that invariably follows a specific other phenomenon as in a casual relationship.[96] Webster agrees with this definition that 'effect' is derived 'effective' defined as 'having the intended or expected effect or producing the desired response.[98]

This definition was adopted in this study. The pupils were subjected to a pre-test and a post-test. The event was the teaching that took place in between the tests and the expected response was better performance in the post-test.

Variables

There were three major and four minor independent variables and one dependent variable in this study.

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[96] Wolman; B. B., Dictionary of Behavioural Sciences, Van Nostrand Reinhold Co., New York.

[97] Webster, Third New International Dictionary (unabridged version).

[98] The Heritage Illustrated Dictionary of the English Language; International Edition.

Independent
Variables

1. Class Size

The term class size, adopted from T. David Williams, was used to designate the number of pupils undergoing identical instruction in the same room at the same time.[99] Consequently, in this study the stream was the unit of analysis. For example, class size did not refer to the whole of the Standard Two class but to each of its component streams.

2. Teacher Professional Qualification

T. David Williams defines a qualified teacher as one who has received some recognized form of teacher training as opposed to those who, regardless of how many years of academic education they have received, are not graduates of a teacher training programme.[100]

3. Teacher Experience

In this study teacher experience was confined to experience in teaching.

Additional Independent
Variables

The additional independent variables were:

1. The school and its environment.
2. The stream.

The difference between 'stream' as used here and 'class size' as used in the major part of the study was that while in the latter the investigation was concerned with the number in the stream the former dealt with the type of stream in the traditional sense of grouping pupils into A, B and C learning groups.

3. The sex of the pupils.
4. The sex of the teachers.

CHAPTER TWO

DESIGN AND METHODOLOGY OF INVESTIGATION

Theoretical Background

In the first chapter of this study the question was posed as to whether there was any relationship between pupil academic performance on the one hand, and teacher professional qualification, class size and length of teacher experience on the other in Kenya. In this chapter an attempt was made to find out whether these relationships existed. An attempt was also made to assess the degree of these relationships.

To test and describe the existence of a relationship between dependent and independent variables is one of the major purposes of experimental research. The main assertion is that a variation or change in a dependent variable is a function of a change in an independent variable. This relationship can be obtained through several statistical methods. These are divided into two major categories, the parametric and non-parametric tests. In this study two methods, representing each of the two major categories were used.

A parametric statistical test is a test whose model specifies certain conditions about the parameters of the population from which the research sample was drawn.[1] When these conditions are met these tests are the most likely to reject the null hypothesis if it is false.[2] The F-test and the t-test are categorised as parametric tests.[3]

A non-parametric statistical test is a test whose model does not specify conditions about the parameters of the populations from which the sample was drawn. It also has fewer assumptions than the parametric test and is therefore, said to

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[1]Siegel, S., Non-Parametric Statistics for the Behavioral Sciences; McGraw-Hill and Co., New York, 1956, p. 31.

[2]Ibid. p. 19.

[3]Ibid. p. 19.

be weaker than the latter.[4] The choice of an appropriate statistical test, however, depends mainly on its power, the manner in which the sample scores were drawn, the nature of the population and the kind of measurement of scaling employed in the operational definitions of the variables involved.[5] A good statistical test is one which has a small probability of rejecting the null hypothesis if it is true but a large probability of rejecting it if it is false.[6]

In this study the Simple Analysis of Variance (ANOVA) using the F-test and the t-test was selected as the parametric test to be used with one of the independent variables, teacher professional qualification. It was considered the most appropriate because it met all the conditions underlying parametric tests.

The analysis of variance provides a procedure for determining the factors that influence the variation of the dependent variable. The total variation, which is represented by the total sum of suqares is divided into its component parts to permit the investigator to identify particular parts as sources of variation.[7] In the simple analysis of variance only two sources of variation are considered; one which is attributable to the independent variable and the second which is attributable to sampling error. The first is represented by the sum of squares between groups and the second is represented by the sum of squares within groups. These sums of squares are converted into variance estimates by dividing each by its respective degree of freedom. These variance estimates are referred to as the Mean Square between (MS_b) and the Mean Square within (MS_w). An F-ratio is formed by dividing the MS_b by MS_w (MS_b/MS_w).

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[4] Ibid. p. 31.

[5] Ibid. p. 18.

[6] Ibid. p. 18.

[7] Roscoe, J. T., Fundamental Research Statistics for the Behavioral Sciences; Holt, Rhinehart and Winston Inc., 1969, p. 231.

The F-Ratio and its Rationale

Certain assumptions must be met for the MS_b/MS_w calculated in the simple analysis of variance as described above to be distributed as the theoretical F-distribution. These assumptions are that the data must come from independent samples, are normally distributed and come from equal variances within population. If these assumptions are met then the magnitude of the MS_b is dependent on the differences in the mean scores. If these differences are significant the MS_b will be significantly larger than the MS_w. Consequently, the F-ratio calculated from the sample data will be larger than the critical F-ratio, indicating that the group of means is not homogeneous.[8]

The data in this study were obtained from test scores of seven hundred and seventy-six Standard Two pupils for the dependent variable and from teachers with different professional qualifications for the independent variable. Thus, they meet the first assumption (sample independence) necessary for the use of the F-test. The data were also drawn from normally distributed population and come from equal variances within the population as recommended by Siegel.[9] The independent variable, teacher qualification was classified on an interval scale as in-service trained (1), college-trained (2) and untrained (3) while the test scores (dependent variable) were on a nominal scale, correst (1) wrong (0). Thus, the variables were measured on an interval scale making possible the use of arithmetic operations (adding, dividing, etc.) on the scores. Since the data met all the assumptions necessary for the F-test it was considered that the outcome of the data analysis using the F-test would be valid.

In this study the two-tailed test was used at the 0.05

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[8]Turney, B. L. and George, P. R., Statistical Methods for Behavioral Sciences; In test Education Publishers, New York, 1973, p.

[9]Siegel, S., Op. Cit., p. 19.

level of significance with infinite degrees of freedom where the critical F-ratio is 3.89.[10] Any calculated F-ratio which is higher than this is considered to indicate the existence of differences in the scores. To proceed to the next step in the analysis it is necessary to find out if the differences in the scores are significant through the t-statistic.

The t-test and its Rationale

The t-test is used to determine whether the criterion means (Mean Scores) differ significantly. The established level of significance within which the scores are compared is the critical t either at the 0.05 or 0.01 levels of significance. As with the F-ratio the two-tailed test at the 0.05 level of significance with infinite degrees of freedom was used in this study. The critical t is 1.960.[11]

There are two groups of assumptions that must be fulfilled for the use of the t-test. The first group pertains to the data as follows:-

(a) The dependent variable is on an interval scale.

(b) The dependent variable within each sample is normally distributed.

(c) The samples are independent.

The second group pertains to the model and assumes that the means of the two scores are equal. The last assumption is necessary for the distribution of the calculated t to equal that of the critical t. Consequently, if the calculated t is greater than the critical t it is concluded that it is the homogeneity assumption that has been violated, that is, that the difference between the means is significant or real.[12] If, on the other hand, the calculated t is smaller than the critical t it is concluded that no significant difference in

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[10] Ibid.

[11] Roscoe, J. T., Op. Cit., p. 293.

[12] Ibid. p. 168.

the score has been established.

The first group of assumptions for the t-test are similar to the assumptions necessary for the F-test and were met in the data. The second group is in reality what is tested in the study. If the scores in the pre-test are not different from the scores in the post-test then the pupils would have made no improvement at all. In that case only the differences in scores by different pupils would be available as an indicator of the different performance by pupils taught by teachers of different professional qualifications. These, however, would not be a valid indicator because of the unavailability of the 'gain' scores after the experiment. In this case the calculated t would equal or be smaller than the critical t and no difference in the means of the scores would have been established This would lead to the upholding of the null hypothesis.

It was here necessary to define the criterion measure used in this study. Roscoe equates pre-test with IQ test.[13] This would seem to suggest that the pre-test is administered before the subject has had the opportunity to learn the material at hand at all. If we accept the fact that education is a continuous process, then Roscoe's definition could not be admissible in a school situation where each learning situation is either a follow-up or a predecessor to another learning situation. In this study it was accepted that the pupils who had already finished the Standard Two syllabus had gone through the process of learning the material in which they were tested. The pre-test therefore was seen as a test of long-term retention of material learned in Standards One and Two. On the other hand the post-test was seen to test short-term retention.

The non-parametric test used in this study was the Multiple Correlation Analysis. Non-parametric statistical tests have fewer assumptions than parametric tests, the most

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[13] Roscoe, J. T., Op. Cit., pp. 264-265.

important one being that the variable under study has underlying continuity. Siegel describes this as a variable that is not restricted to having only isolated values but can take any value in a certain interval.[14] Consequently, non-parametric tests also require that the data be on at least an interval scale but this is secondary. Their major advantage, indeed, lies in the fact that they can treat data which are inherently in ranks only enabling the researcher to establish a 'greater than' or 'less than' relationship without saying how much 'greater' or 'less.' An added advantage in the use of a non-parametric test is that the probability statements obtained are exact probabilities, regardless of the population distribution from which the sample is drawn.[15] Consequently, the conclusions drawn from data analysed by such tests can be applied more generally rather than only to populations from whom the data was drawn. For these reasons a non-parametric test was selected for two of the independent variables i.e. Class Size and Teacher Experience.

The data in the study was presented in a manner suitable for use with a non-parametric test. The test scores (dependent variable) was on an interval scale making it amenable to arithmetic operation and also had an underlying continuum. The independent variables, Class Size and Teacher Experience were assigned real numbers by using both the actual size of the class and the actual number of years of experience for individual teachers. This established the continuum necessary for the use of a non-parametric test.

Multiple Correlation

The Multiple Correlation analysis was used as recommended by Cooley and Lohnes.[16] The techniques of multiple correlation

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[14] Siegel, S., Op. Cit., p. 25.

[15] Ibid. p. 32.

[16] Cooley, W., and Lohnes, P., Evaluation Research in Education, Irvington Publishers Inc., New York, 1976, p. 208.

enables a researcher to use a knowledge of two or more independent variables to predict scores on a single dependent variable with greater success than is possible with a knowledge of a single independent variable. This is so because variation in a given dependent variable is a function of concommitant variation in many independent variables acting simultaneously.

According to Roscoe, different kinds of variables encountered by researchers, especially in the behavioural sciences, are correlated with each other, and to the extent that two variables are correlated they can be said to measure the same thing.[17] Consequently, there will be some overlap in the contribution of two or more predictor variables in the typical multiple correlation situation. In this study the two independent variables were used to determine:-

(a) The contribution of the combination of class size and teacher experience to changes or variations in pupil academic performance.

(b) Which of the two independent variables made the greater contribution to pupil performance.

Test Design

The tests were designed for general comprehension and application of facts and principles already learned in language and number work. In number work such symbols as addition and substraction, elementary multiplication and division, equations and inequalities and simple fractions had already been learned.[18]

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[17] Roscoe, J. T., Op. Cit., pp. 264-265.

[18] Jomo Kenyatta Foundation, Kenya Primary Mathematics, Pupils Book 2; and Teachers Guide for Standard Two, Nairobi, 1975.

Although this might sound too complicated for a Standard Two child, all it involves is the learning and application of the symbols + - x = < > . The test in number work was designed first to ascertain the extent to which the pupils were able to apply what they had already learned (pre-test) and retain material learned and reproduced within a short period of time (post-test).

In language the Standard Two Reader was used and simple comprehension questions were set to test understanding and mastery of the vocabulary. (Samples of the tests are at Appendices A and B). Initially the tests were set with the help of Dr. G. Eshiwani (Number Work) and Mr. C. R. Wang'ombe (Language).[19] These tests were then discussed with teachers of Standard Two pupils in three primary schools who made useful suggestions regarding the structure and content of the test items. The revised tests were then used in the pilot study in three other schools but not the schools in which the teachers had participated in test design. After the pilot study it was again found necessary to alter the test items particularly with regard to content. None of the six schools initially involved, either through teacher participation in test design or pupil participation in the pilot study, were used in the experiment. During the pilot study it was found that the questions in number work were relatively easy while those in language were beyond the intellectual level of Standard Two pupils in this area.

As a matter of interest to the researcher the same tests were informally administered to a similar group of pupils in Nairobi who found the test in number work difficult while they had no problems with language. The obvious conclusion is that the urban children are advantaged by the widespread usage of the

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[19] Dr. Eshwani has done substantial research in the teaching and learning of mathematics in Kenyan schools while Mr. Wang'ombe is closely associated with language teaching in Kenya.

English language in their environment. The difference in performance in number work is not easily explained, and opens up an interesting line for further research.

In both tests the questions were of the one answer variety recommended by Furst as representing the most direct way of testing cognitive outcomes.[20] Such questions, by setting up a forced-choice situation also minimize the possibility of the pupils' getting the correct answer through guesswork. To the researcher they present objective tests which can be scored quickly and are then relatively simple to subject to statistical analysis.

Professor Walker Hill's definition and distribution between testing for <u>understanding</u> and testing for <u>knowledge</u> were used as a basis for the language test. He says:-

> An item is considered to be a test of knowledge when it can be answered on the basis of rote learning, when all that is required is recall of something that the student has read or learned in the course.[21]

To test understanding, on the other hand, one must play down the role of memory. But before one can apply facts and principles (thus displaying understanding) one must have learned them. Therefore, even if we are dealing with the application of facts and principles, some kind of memory work is necessary for the demonstration of intellectual ability. Therefore, both the number work and language tests were set on the basis that the pupils had learned some facts (symbols and words) which they could interpret and apply.

In setting the tests the following factors and constraints were taken into account:-

(1) The Age of the Pupils

The researcher worked on the basis of the official age of

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[20] Furst, E. J., Op. Cit., p. 204.

[21] Quoted by Furst, E. J., Op. Cit., p. 209.

admission into primary schools of six years, though in the full knowledge that this was misleading as rarely in rural Kenya is this adhered to. Headmasters have discretion in admission and pupils are admitted earlier if they are mentally capable or much later if their parents' economic circumstances do not permit early admission. Moreover, many of the children do not know their specific ages. Consequently, since there is no uniformity in age, and to avoid penalising the younger pupils, the researcher worked on the lower age limits and considered that a thirty item test in number work was adequate without being too tiring. The items were selected to cover the five areas, addition (10), substration (5), multiplication (5), division (5) and fraction (5). The number of items were selected and arranged in order of difficulty, the most difficult ones being fewer and coming last in the test. After the experience of the pilot study and after consultation with the teachers, it was found that, as pupils had not mastered language to the same extent as number work, a ten item test in language was sufficient.

(2) The School Timetable

The other consideration related to the length of the test was the school timetable. It was considered essential to maintain the normal school routine as much as possible and the tests were therefore designed to fit neatly into the school timetable. Underneath is a typical primary school daily timetable and the test timetable that was used:-

Lower Primary School Daily Timetable[10]	Test Timetable	
8.15 - 8.50 - 1st period	8.15 - 8.55	Number work pre-test
8.50 - 9.25 - 2nd period	9.00 - 9.30	Number work teaching
9.25 - 10.00 - Break	9.30 - 10.00	Break
10.00 - 10.35 - 3rd period	10.00 - 10.30	Number work post-test
10.35 - 11.10 - 4th period	10.40 - 11.20	Language pre-test
11.10 - 11.45 - 5th period	11.20 - 11.55	Language teaching
11.45 - 12.20 - 6th period	11.55 - 12.25	Break
12.20 - 12.50 - 7th period	12.25 - 12.55	Language post-test

Administration of the Test

This was a test which set out to measure learning on the one hand and retention on the other. It was divided into two parts, the pre- and the post-test, i.e. the same test was done twice. The first part was expected to ascertain the pupils' knowledge acquired through the coverage of the syllabus. The post-test was expected to test the pupils' retention of facts learned in the previous lesson with an interval of approximately thirty minutes. It would be argued that the interval was too short but it had been established during the pilot study that this was by no means so. This interval was therefore maintained in all the schools.

In any kind of test it is necessary to establish conditions which would ensure the most efficient work by the pupils. These conditions were established by maintaining an atmosphere as close to normal as possible. The tests were administered by the class teachers in the normal classrooms to which the pupils were accustomed. It is relevant to note here that the Standard Two classes are one teacher classes and this

made the administration of the tests easier. To establish close liason with the teachers it was necessary to make between 4 and 6 visits to each school; by the time the tests were administered the researcher had become familiar to the school community and accepted by the headmaster, other teachers including Standard Two teachers and the pupils.

The day before the test was administered the researcher met with the relevant teachers and went through the procedure to be followed and the problems that might be encountered. It was particularly important to impress on the teachers the need to use their normal method of teaching and to clean the chalk board after teaching in readiness for the post-test. In no instance did the researcher encounter hostility or non-cooperation.

The test was administered to Standard Two pupils in eleven primary schools. As most of the schools which met the criteria of selection were close together, (considering the distances in the rural areas any school within 3-4 miles of each other were considered close), there were risks of pupils meeting and discussing the test at the end of the day. To avoid this the schools were 'bunched' together in twos and threes and the tests administered simultaneously and all on the same day. This raised the question of whether the teachers, anxious to see their pupils perform better than those in other schools would adhere to the established procedure of administering the tests. This was a risk that had to be taken and, as the scores showed later, there did not seem to have been observable violation of the established procedure. If, for example, there had been instances of whole groups showing unnatural improvement in the post-test over the pre-test this would have been suspected. Monday mornings were avoided as the pupils had been removed from the school environment for the duration of the week-end.

In the pilot study it had been found that the time taken to finish the test coincided more or less with the school morning. To a certain extent, however, it was inevitable that

the normal timetable be disrupted as the pre-tests were allowed to longer time than the school lessons which lasted thirty minutes. But even when this happened normal break was observed to avoid noise interruption from the rest of the school.

After the tests the teachers were requested to collect the test papers and deposit them with the school head for the researcher to collect later. On collecting the papers the researcher again met the teachers concerned and discussed the tests. As had been foreseen the language test was the more difficult of the two.

Manner of Recording Answers

The tests were typed on ordinary paper with blank spaces for the pupil's answers. This is the pattern that is used in much of the pupil's work in the Kenya Primary Mathematics books and is therefore familiar to them (See Appendix A).

Scoring

The tests were marked by the researcher with the aid of a research assistant. The single answer type of question facilitated easy marking.

For scoring, each individual item was treated as a unit and a one-point credit allowed for the correct answer, zero for the incorrect answer and a nine for the items that had been missed out altogether. This was done to facilitate analysis by computer. The correct answers, checked against a key, were then summed up to yield the raw score for each pupil. The raw scores for number work were out of a possible thirty and for language out of possible ten. The raw scores were entered on a computer coding sheet.

CHAPTER THREE

DATA ANALYSIS AND FINDINGS OF THE INVESTIGATION

In Chapter Two was discussed in detail the statistical methods that were employed in analysing the data in this study. In this chapter the data was analysed and the findings from this analysis discussed. The chapter is divided into two parts. The first part forms the analysis of the three major variables in the study, while the second part deals with other selected additional variables that were considered important in their influence on pupil performance.

PART ONE

Operational Variables

There were nine operational variables in the first part of this study. Of these, six were dependent and three independent.

Dependent Variables

(i) Number work pre-test scores.
(ii) Language pre-test scores.
(iii) Number work post-test scores.
(iv) Language post-test scores.
(v) Gain scores in number work.
(vi) Gain Scores in language.

For the purpose of this study gain scores were obtained as the difference between the post-test and the pre-test scores. It was assumed that the post-test scores would be higher than the pre-test scores, hence the order post-test scores minus pre-test scores. The difference between the two could be either positive, negative or zero. Where it was positive it indicated positive improvement in performance from the pre-test to the post-test. If it was negative it

it indicated a lower score in the post-test than in the pre-test and where it was zero there was no improvement at all.

Independent Variables

The three independent variables were:-

(i) Teacher professional qualification.

(ii) Class size.

(iii) Teacher experience.

Methods of Analysis

The statistical methods which were used to analyse the data to test the hypotheses set out in Chapter One were discussed more fully in Chapter Two. These are:-

(a) The Simple Analysis of Variance (ANOVA) using

(i) F-test.

(ii) t-test.

(b) The Multiple correlation method.

The Simple Analysis of Variance was used to test the hypothesis that there is no difference in academic performance between pupils taught by professionally qualified and those taught by professionally unqualified teachers. The teachers were grouped according to their professional qualification and sub-grouped according to their mode of training as follows:-

(a) Those trained through the in-service scheme.

(b) Those trained through teacher training institutions.

(c) Those who were untrained.

The Null Hypothesis

To test a null hypothesis it is first assumed that no difference exists between the population means, or in the case of this study that there was no difference between the mean scores of pupils taught by the different groups of teachers. When measurements have been obtained the difference between the independent sample means is observed and then the probability of obtaining an $\bar{X}_1 - \bar{X}_2$ which is as large as (or

larger than) the observed difference in the experiment is explored.[1] If this probability is small, the null hypothesis may be rejected.

Levels of Significance

Research in psychology and education normally uses the 0.05 and the 0.01 levels of significance to summarise the chances of differences being obtained in the experiment when in reality there were no differences in population means.

In this study the 0.05 level of significance was adopted. This relates that the chances are 5 out of 100 that the difference in means in the experiment will be obtained when in reality there are no differences in the population means. In other words, it was assumed that the population was homogeneous. At the same time, the two-tailed test was adopted. This is the test used when the investigation is not concerned with the 'direction' of the differences between the means. For this reason, it is sometimes referred to as non-directional. Consequently, the major concern of this study was not particularly with the direction (whether positive or negative) of the differences between the means of the dependent variables, but with their existence. Thus, the null hypothesis was rejected if the differences between the means were positive or negative so long as the probability of their existence was larger than the tabled value at the same level of significance. The levels of significance adopted in this study are: $t = 1.960$ and $F = 3.890$.[2]

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[1] Turney, B. L., and George, P. R., Statistical Methods for Behavioral Sciences, Intext Educational Publishers, New York, 1973. Also Young, R.K. and Veldman, D. J., Introductory Statistics for the Behavioral Sciences, 3rd Ed., Holt, Rinehart and Winston, New York, 1976.

[2] Turney, B. L. and George, P. R., Op. Cit., p. 247.

Hypothesis One

'There is no difference in performance between pupils taught by professionally qualified and those taught by professionally unqualified teachers'.

The F-ratio was used to test the existence of differences in the mean scores. The F-ratio, calculated as the ratio between the means square within, yielded the ratio shown in the following two tables:-

Table 13(a)

F-Ratio Obtained for Scores by Pupils Taught
by the Different Categories of Teachers

NUMBER WORK

Pre-test Scores				Post-test Scores			Gain Scores		
Source	Sum of SQ.	D. of F.	Mean SQ.	Sum of SQ.	D.of F	Mean SQ.	Sum of SQ.	D.of F.	Mean SQ.
Between	1214.92	2	607.4588	530.35	2	265.1755	741.29	2	370.6469
Within	31399.47	773	40.6203	40912.91	773	52.9274	33766.04	773	43.6818
Total	32614.39	775	42.0831	41443.26	775	53.4752	34507.34	775	44.5256

F (2/773) = 14.955 F (2/773) = 5.010 F (2/773) = 8.458)

Table 13(b)

F-Ratio Obtained for Scores by Pupils Taught
by the Different Categories of Teachers

LANGUAGE

Pre-test Scores				Post-test Scores			Gain Scores		
Source	Sum of SQ.	D. of F.	Mean SQ.	Sum of SQ.	D.of F.	Mean SQ.	Sum of SQ.	D. of F.	Mean SQ.
Between	29.14	2	14.5712	80.42	2	40.2108	14.41	2	7.2062
Within	5166.69	773	6.6839	8080.36	773	10.4668	6653.59	773	8.6075
Total	5195.83	775	6.7043	8160.78	775	10.5436	6668.00	775	8.6039

F (2/773) = 1.180 F (2/773) = 3.842 F (2/773) = 0.837

The calculated F-ratio was compared with Turney's (critical) F-ratio of 3.890 for a two-tailed test with infinite degrees of freedom at the 0.05 level of significance.[3] The use of the infinite degrees of freedom was justified on the basis of the large sample in the study (776 subjects).

Table 13(a) shows that in number work scores the calculated F-ratios (F = 14.955 for pre-test; 5.010 for post-test and 8.458 for gain scores) were higher than the tabled (critical) ratio of 3.890 adopted in this study. It was concluded, therefore, that some differences existed in the scores of pupils taught by teachers with different professional qualifications. In language the F-ratios for all the scores were smaller than the critical F-ratio showing no differences in the scores of pupils taught by teachers with different professional qualifications.

The next step was to measure the strength or significance of these differences where they existed. This was done through the t-test with the t-statistic calculated from the formula

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\text{S.E.}\ (\bar{X}_1 - \bar{X}_2)}$$

where $\text{S.E.}\ (\bar{X}_1 - \bar{X}_2) = \sqrt{\text{MSW}}$

The t-values obtained are shown in the tables below:-

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[3] Ibid. p. 247.

Table 14(a)

t-Values Obtained from Differences Between Means of Pupils Taught by the Various Categories of Teachers

NUMBER WORK

	Pre-test Scores			Post-test Scores			Gain Scores		
	In-Service Teachers	College Trained Teachers	Untrained Teachers	In-Service Teachers	College Trained Teachers	Untrained Teachers	In-Service Teachers	College Trained Teachers	Untrained Teachers
In-Service Teachers	0.00	1.141	-4.10	0.00	-1.961	-3.327	0.00	-3.302	0.525
College Trained Teachers	-1.141	0.00	-5.278	1.961	0.00	-1.312	3.302	0.00	3.700
Untrained Teachers	4.10	5.278	0.00	3.327	1.312	0.00	-0.525	-3.700	0.00

Note: Entries in Tables indicate Row Mean minus Column Mean.

Table 14(b)

t-Values Obtained from Differences Between Means of Pupils Taught by the Various Categories of Teachers

LANGUAGE

	Pre-test Scores			Post-test Scores			Gain Scores		
	In-Service Teachers	College Trained Teachers	Untrained Teachers	In-Service Teachers	College Trained Teachers	Untrained Teachers	In-Service Teachers	College Trained Teachers	Untrained Teachers
In-Service Teachers	0.00	0.851	-1.243	0.00	0.650	-2.026	0.00	0.191	-1.021
College Trained Teachers	-0.851	0.00	-2.085	0.650	0.00	-2.694	-0.191	0.00	-1.225
Untrained Teachers	1.243	2.085	0.00	2.026	2.694	0.00	1.021	1.225	0.00

Note: Entries in Tables indicate Row Mean minus Column Mean.

Number Work
Scores Analysis

An analysis of the scores in the number work pre-test showed that the pupils taught by untrained teachers had the highest mean (14.000) followed by those taught by the in-service trained teachers (11.627) while those pupils taught by the college-trained teachers had the lowest mean (11.007). The mean scores for number work are given below:-

Table 15

Number Work Mean Scores

	Pre-test Scores	Post-test Scores	Gain Scores
In-Service Trained Teachers	11.627	17.418	5.795
College Trained Teachers	11.007	18.635	7.656
Untrained Teachers	14.000	19.484	5.480

In the post-test the means rose significantly in all the three categories of pupils with those taught by College trained teachers rising from 11.007 in the pre-test to 18.635; the mean of those taught by in-service trained teachers rose from 11.627 to 17.418 while that of pupils taught by untrained teachers rose from 14.00 to 19.484. Thus, the pupils taught by College trained teachers made the highest gain in means (7.63), those taught by in-service trained teachers came second with a gain of 5.79 while those taught by untrained teachers made the lowest gain at 5.48.

The real indicator of the differences in the improvement in performance by the different categories of pupils was seen to be in the overall gain taken as the difference between the post-test and the pre-test scores. It has been shown that the pupils taught by the teachers with different professional qualifications performed differently in the two tests and that those pupils who were taught by college trained teachers made the highest gain in Mean Scores (7.63 compared to 5.79 for the

pupils taught by in-service trained teachers and 5.48 for pupils taught by untrained teachers).

Table 14(a) gives the t-values obtained from differences between mean scores of pupils taught by teachers with different categories of professional qualification in number work. In the number work pre-test the t-value between scores of pupils taught by in-service trained and those taught by college trained teachers was 1.141. This was not significant at the 1.960 level adopted in this study. Nevertheless, the t-value between pupils taught by in-service trained and those taught by untrained teachers ($t = -4.10$) was significant. The t-value was even higher between scores of pupils taught by college trained teachers and those taught by untrained teachers ($t = 5.278$).

In the post-test scores in number work the t-value between scores of pupils taught by in-service trained teachers and those taught by college trained teachers rose from $t = 1.141$ in the pre-test to $t = -1.961$ in the post-test but remained insignificant for the purposes of this study. For scores of pupils taught by in-service trained and those taught by untrained teachers the t-value fell from $t = 4.10$ in the pre-test to $t = -3.327$ in the post-test but remained significant. The t-value between scores of pupils taught by college trained and those taught by untrained teachers fell from $t = -5.278$ in the pre-test to $t = -1.312$ in the post-test.

The real measure of the difference in performance, however, was seen to be in the gain scores and as Table 14(a) shows, the t-values were significant between scores of pupils taught by in-service trained teachers and those taught by college trained teachers ($t = -3.302$). The t-value between scores of pupils taught by in-service trained teachers and those taught by untrained teachers was not significant ($t = 0.525$) while that between scores of pupils taught by college trained teachers and those taught by untrained teachers was significant ($t = -3.700$).

An examination of the mean scores on Table 15 (Number Work) indicates that in the pre-test and the post-test the

mean scores of pupils taught by in-service trained teachers (11.627 and 17.418 for pre-test and post-test respectively) were not very different from the mean scores of pupils taught by college trained teachers (11.007 and 18.635 for pre-test and post-test respectively). This relationship is borne out by the t-values (Table 14(a)) obtained between the scores of these two groups of pupils where t = 1.141 and t = 1.961 for pre-test and post-test respectively. Nevertheless, the gain scores showed that pupils taught by college trained teachers made a greater gain (7.656) than the pupils taught by in-service trained teachers (5.795). The t-value obtained between the gain scores of these two groups of pupils (Table 14(a)) was t = -3.302. This was considered significant at the 1.960 level adopted in this study.

Table 15 also shows that in both the pre-test and the post-test the mean scores of pupils taught by in-service trained teachers were relatively lower (11.627 and 17.418 for pre-test and post-test respectively) than those of pupils taught by untrained teachers (14.00 and 19.484 for pre-test and post-test respectively). The t-values obtained between scores of these two groups of pupils were t = -4.100 and t = -3.127 for pre-test and post-test respectively; both are significant for the purposes of this study. In the gain scores, however, there was little difference (5.795 for pupils taught by in-service trained teachers and 5.480 for those taught by untrained teachers respectively). The t-value obtained (t = 0.525) was not significant at the 1.960 level adopted in this study.

Finally, in both the pre-test and the post-test the pupils taught by college trained teachers obtained lower mean scores (11.007 and 18.635 for pre-test and post-test respectively) than those taught by untrained teachers (14.00 and 19.484 for pre-test and post-test respectively). The t-value obtained for these two groups of pupils was t = -5.278 for pre-test and t = -1.312 for the post-test. In the gain scores, however, the pupils taught by college trained teachers made a higher gain (7.656) than those taught by untrained teachers (5.480). The t-value obtained for these two groups of pupils

for the gain scores was 3.700. This was significant at the level adopted in this study.

To summarise, the analysis of the mean scores and t-values indicated that in number work pupils taught by college trained teachers made the highest gain followed by those taught by in-service trained teachers while those taught by untrained teachers made the lowest gain. Although pupils taught by college trained teachers had the lowest mean scores in the pre-test they caught up with and overtook their counterparts taught by in-service teachers as well as those taught by untrained teachers. The differences in the gain scores were high enough to yield significant t-values. The hypothesis that there was no difference in the effectiveness of learning between pupils taught by professionally qualified teachers and those taught by professionally unqualified teachers was rejected.

Language Scores
Analysis

The table below gives the mean scores for language:-

Table 16

Language Mean Scores

	Pre-test Scores	Post test Scores	Gain Scores
In-service Trained Teachers	2.281	4.489	2.190
College Trained Teachers	2.094	4.309	2.142
Untrained Teachers	2.573	5.084	2.462

Tables 15 and 16 indicate that the mean scores in language were much lower than the mean scores in number work. This was understandable, technically, because the means for number work are from a higher total score (a possible 30) while the language means are from a possible 10. But at the

same time, the standard of performance in language was much lower than in number work.

Table 16 gives the mean scores for language while Table 14(b) gives the t-value obtained from language scores. An examination of these two tables indicates that in the pre-test and post-test the mean scores of pupils taught by in-service trained teachers (2.281 and 4.489 for pre-test and post-test, scores of those pupils taught by college-trained teachers (2.094 and 4.309 for pre-test and post-test, respectively). The t-value obtained for these two groups of pupils (Table 14(b)) were 0.850 and 0.650 for pre-test and post-test respectively. Table 16 further indicates that in the pre-test and post-test the mean scores of pupils taught by in-service trained teachers (2.281 and 4.489 for pre-test and post-test respectively) were not very different from the mean scores of pupils taught by untrained teachers (2.573 and 5.084 for pre-test and post-test respectively). The t-values obtained for the two groups of pupils were t = -1.243 and t = -2.026 for pre-test and post-test respectively. Thus, for the pre-test and the post-test the difference in means was not significant at the 1.960 level adopted in this study. Only in one case, the difference in mean scores of pupils taught by college trained and those taught by untrained teachers was the t-value slightly higher than that adopted in the study, t= 2.026..

Table 16 shows that in the gain scores there is very little difference in the mean scores of pupils taught by the various categories of teachers. The mean scores for pupils taught by in-service trained teachers was 2.190, for pupils taught by college trained teachers it was 2.142 and for pupils taught by untrained teachers it was 2.462. The t-value obtained for the differences in the mean scores was t= -0.191 for pupils taught by in-service trained and those taught by college trained teachers, t = 1.021 for pupils taught by in-service trained teachers and those taught by untrained teachers and t =1.225 for pupils taught by college trained teachers and those taught by untrained teachers. None of these values were

significant at the 1.960 level adopted in this study. This supported the F-ratio for language. Table 13(b) which were smaller than the critical F-ratio of 3.890 indicating no differences in the scores, in language, or pupils taught by teachers with different professional qualifications. Thus, for language the hypothesis that there is no difference in the effectiveness of learning between pupils taught by teachers of different professional qualifications was upheld.

Summary of Findings:
Hypothesis One.

1. In number work pupils taught by college trained teachers made the highest gain in scores followed by those taught by in-service trained teachers while those taught by untrained teachers made the lowest gain.
2. In language there is no difference in performance by pupils taught by professionally qualified and those taught by professionally unqualified teachers.

Hypothesis Two

There is no differences in learning between pupils taught by experienced and those taught by relatively inexperienced teachers

Hypothesis Three

There is no difference in learning between pupils in large and those in relatively smaller classes.

For these two hypothesis the multiple correlation method of analysis was used.

The Multiple
Correlation

The multiple regression is ordinarily used for prediction purposes e.g. to predict a variable on the basis of

its correlation with one or more variables.[4] The step before the multiple regression is the multiple correlation using the Pearson product-moment correlation coefficient.[5] As this study was not concerned with prediction, the analysis stopped short of regression and only sought to establish whether there were any correlations between class size and teacher experience on the one hand and pupil scores on the other. The equation, which summarises the combined effects of the independent variables on the dependent variables, is presented

$Y = f(B_1 + B_2)$ where

Y is the dependent variable.

B_1 and B_2 are the independent variables.

The results of the analysis are presented in the correlation matrix on page 80.

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4. Cooley, W., and Lohnes, P., Op. cit., P. 208

5. Ibid, P. 208

Table 17

Correlation Matrix Between Scores,
Class Size and Teacher Experience

	Pre-Test (N.W.)	Pre-Test (L)	Post-Test (N.W.)	Post-Test (L)	Gain Scores (N.W.)	Gain Scores (L)	Class Size	Teacher Experience
Pre-Test (N.W.	1.00	0.43	0.54	0.28	-0.38	-0.08	-0.05	0.03
Pre-Test (L)	0.43	1.00	0.43	0.50	0.06	0.30	0.21	0.13
Post-Test (N.W.)	0.54	0.43	1.00	0.55	0.57	0.23	-0.27	-0.02
Post-Test (L)	0.28	0.50	0.55	1.00	0.33	0.65	-0.31	0.04
Overall Score (N.W.)	0.38	0.06	0.57	0.33	1.00	0.32	-0.25	-0.05
Overall Score (L)	-0.08	-0.30	0.23	0.65	0.32	1.00	-0.17	-0.06
Class Size	-0.05	-0.21	-0.27	-0.31	-0.25	-0.17	1.00	0.14
Teacher Experience	0.03	0.13	0.02	0.04	0.05	0.06	0.14	1.00

Note: N.W.=Number Work

L. =Language

The correlation matrix (Table 17) indicates that both class size and teacher experience correlated with the scores in both number work and language, with class size commanding higher correlations than teacher experience. Moreover, class size had negative correlations with all but one of the scores, thus establishing an inverse relationship between itself and pupil performance so that the larger the class the poorer the performance. These correlations, however, were moderate. Their level of significance is based on Siegel's recommended levels. Siegel suggests that in non-parametric tests the levels of significance can be based on sample size. With a small sample, of say 22 a correlation of over 0.85 is needed to establish significance while with larger samples, of say over 100, correlations as low as 0.25 are accepted as being significant.[6] With a sample of 776 pupils in this study the 0.25 correlation was adopted as significant.

In the pre-tests the number work scores correlated with class size at -0.05 while the language scores correlated with class size at-0.21. These correlations were not significant at the level adopted in this study. In the post-tests, however, the correlation between class size and scores in number work (-0.27) and language (-0.31) were significant. In the gain scores class size correlated with number work at -0.25, which is significant, while it correlated with language at -0.17. Thus, if the statistical model used was correct, then there is an inverse relationship between class size and pupil performance so that the larger the class the poorer the performance.

Teacher experience correlated with the scores at a much lower level than class size and established neither a negative nor a positive relationship between itself and pupil performance. If they were significant, the positive correlations

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[6]Siegel, S., Non-parametric Statistics for the Behavioral Sciences; McGraw-Hill and Co., New York, 1956, p.20.

between teacher experience and test scores in both the pre-tests (0.03 and 0.13 in number work and language respectively) and also the post-test in language (0.04) would have suggested that the more experienced the teacher the better the performance by his pupils. On the other hand, in the number work post-test and gain scores, the correlation with teacher experience was negative -0.02 for post-test and -0.05 for gain scores respectively. Had they been significant, they would have shown an inverse relationship between teacher experience and pupil performance so that the more experienced the teacher the poorer the performance by his pupils. Since they were not significant it was concluded that there is only a slight relationship between teacher experience and pupil performance.

Multiple correlation seeks to determine the relationship of one set of numbers with two other sets of numbers.[7] In this analysis it was used to determine the relationship between pupil scores on the one hand and class size and teacher experience on the other. Partial correlation determines the relationship of one of the independent variables on the dependent variable. In this analysis partial correlations refer to the relationship between class size and pupil scores and teacher experience and pupil scores computed separately.

The following table further analysed the data on correlations and seemed to lend support to the conclusion that while class size had some influence, teacher experience had very little influence on pupil performance.

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[7] Bruning, J. 1. and Kintz, B. L., Computational Handbook of Statistics; Scott, Foreman and Co., 1968, p. 171.

Table 18

Statistical Analysis of Scores,
Class Size and Teacher Experience

	Class Size		Teacher Experience
Pre-Test (N.W.)			
t-Statistic	1.49		0.91
Partial Correlations	0.049		0.025
Multiple Correlations		0.059	
Pre-Test (L)			
t-Statistic	6.70		4.75
Partial Correlations	0.211		0.133
Multiple Correlations		0.268	
Post-Test (N.W.)			
t-Statistic	7.78		0.54
Partial Correlations	0.269		0.018
Multiple Correlations		0.269	
Post-Test (L)			
t-Statistic	9.36		2.58
Partial Correlations	0.309		0.044
Multiple Correlations		0.321	
Gain Scores (N.W.)			
t-Statistics	6.93		0.35
Partial Correlations	0.245		0.046
Multiple Correlations		0.245	
Gain Scores (L)			
t-Statistics	4.70		0.95
Partial Correlations	0.172		0.057
Multiple Correlations		0.176	

Table 18 shows that except for the pre-test scores in number work the t-Statistic was significant in relation to class size and all the other scores. The level of significance for the t-Statistic adopted in this study is 1.960. In relation to teacher experience, however, the t-Statistic was only significant for the language pre and post tests (4.75 and 2.58 respectively). This seemed to establish the superiority of class size over teacher experience as a contributor to the differences in the scores.

Further proof of this was yielded by partial correlations. These indicated that in the absence of class size teacher experience only correlated with number work pre-test scores at 0.025, with language pre-test scores at 0.133, with post-test number work scores at 0.018 and with post-test language scores at 0.044. It further correlated with the number work gain scores at 0.046 and with language gain scores at 0.057. The corresponding partial correlations between class size and pupil scores were 0.049 for pre-test in number work, 0.211 for pre-test in language, 0.269 for post-test in number work and 0.309 for post-test in language. For the gain scores, class size correlated with number work scores at 0.245 and 0.172 with language scores.

The partial correlations seemed to indicate that class size was the major contributor to the multiple correlations. The most outstanding examples were in the post-tests and the gain scores. In number work, post-test scores correlated with class size at 0.269 and with teacher experience at 0.018 yielding a multiple correlation of 0.269. This showed that class size was the major contributor to the multiple correlation. The same was true of the post-test scores in language and the gain scores in both subjects.

Owing to the low correlations between teacher experience and pupil performance and the rather unexpected finding that teacher experience has a negative effect on pupil performance it was decided to carry out a second analysis, this time grouping the teachers according to their professional qualifications and relating each level of qualification to years

of experience. It was hoped that in this way, the analysis would indicate the effect of experience at the various levels of professional qualification and at the same time point to the level that contributed most to the negative effects of experience on learning. The analysis is presented in the tables below.

The following table summarises an analysis of the number work and language gain scores correlation with class size and teacher experience:-

Table 19

Correlation Between Gain Scores in Number Work and Language, Class Size and Teacher Experience

	Number Work			Language		
	Class Size		Teacher Experience	Class Size		Teacher Experience
Correlation coefficient	-0.20		-0.02	-0.06		-0.02
Multiple Correlation		0.245			0.176	
t-Statistic	-0.93		-0.35	-4.70		-0.95

Table 19 shows a negative correlation between the gain scores in both number work and language in relation to class size so that the scores decreased with a rise in class size. In respect of teacher experience, the correlation was also negative but the t-statistic shows that it was not significant at the 1.960 level. This suggests that teacher experience played an insignificant role in learning by pupils, at least in number work.

This conclusion did not support the basic assumption in this study that exprienced teachers contribute more towards learning than inexperienced ones. Therefore, to further test this conclusion, the experience of the teachers was analysed according to their professional qualification and their mode of training. The following tables summarise the results of the analysis.

Table 20

Means and Standard Deviation of
Class Size and Teacher Experience

	Class Size				Teacher Experience			
	Mean	Standard Deviation	Minimum Value	Maximum Value	Mean	Standard Deviation	Minimum Value	Maximum Value
College Trained Teachers	36.62	4.6	29	42	5.22	2.89	1	10
In-service Trained Teachers	45.77	8.25	35	58	7.18	2.31	4	11
Untrained Teachers	32.75	3.90	26	39	5.19	6.00	1	19

Table 21(a)

Correlation Between Gain Scores,
Class Size and Teacher Experience

Number work

	College Trained Teachers		In-service Trained Teachers		Untrained Teachers	
	Class Size	Teacher Experience	Class Size	Teacher Experience	Class Size	Teacher Experience
Correlation coefficient	-0.20	0.40	-0.39	-0.20	-0.56	-0.18
Multiple correlation	0.171		0.458		0.501	
t-Statistic	-2.04	2.55	-7.74	-1.11	-6.93	-3.38

Table 21(b)

Correlation Between Gain Scores,
Class Size and Teacher Experience

Language

	College Trained Teachers		In-service Trained Teachers		Untrained Teachers	
	Class Size	Teacher Experience	Class Size	Teacher Experience	Class Size	Teacher Experience
Correlation coefficient	0.12	-0.13	-0.12	0.13	-0.24	-0.06
Multiple correlation	0.191		0.396		0.382	
t-Statistic	3.02	-2.04	-5.17	1.54	-5.20	-2.02

Tables 21(a) and 18 above shows that for college trained teachers the correlation between gain scores in number work and teacher experience were higher with increased teacher experience but with decrease in class size. For the in-service trained teachers, however, the scores were not related to teacher experience but increased with a decline in class size. For untrained teachers the gain scores were higher for less experienced teachers and also with decrease in class size.

The findings relating to class size were as had been expected, that the smaller the class the better the performance by the pupils. Therefore the hypothesis that pupils learn equally effectively whether they are in a large or a relatively smaller class was rejected.

The findings with regard to experience, however, seemed to vary according to the professional qualification of the teachers.

While scores rose according to experience for the college trained teachers, they seemed to have no relationship to experience for the in-service trained teachers and actually decreased with experience for the untrained teachers. This finding indicated that the professional qualification of the teachers coupled with their experience had a positive bearing on the performance of their pupils in that pupils taught by college trained teachers benefitted more from their experience; those taught by in-service trained teachers did not benefit at all from their teachers' experience while those taught by un-trained teachers actually lost by their teachers' experience. An explanation for these phenomena is here ventured.

The college trained teacher, having learned the correct methods of teaching improved them with time, thus became more efficient and effective. His pupils therefore benefitted from his experience. The in-service trained teacher having started off as an untrained teacher learned his pedagogical skills through trial and error in the classroom accompanied by correspondence and short crash courses during the school holidays. The lack of continuity and the insufficient time

spent in training made him rely more on his experience in the classroom and less on his training so that the one seemed to counteract the other. For the untrained teacher, the situation was quite the reverse of that of the college trained teacher; while the latter benefitted by experience the former actually lost by it. It seems as if the untrained teacher started with a measure of enthusiasm which made up for his lack of training. Gradually, however, he lost it because of poor prospects and his pupils benefitted less and less as he continued untrained in the profession.

For the language scores the pattern was not as clear or consistent as the number work scores as Tables 21(b) and 18 show. The tables indicate that for the college trained teachers the scores in language rose with an increase in class size but decreased with a rise in teacher experience. For the in-service trained teachers the scores increased with a reduction in class size but increased with a rise in teacher experience. For the untrained teachers the scores rose with a decrease in class size but decreased with increased teacher experience.

The findings that scores in language decreased with a rise in experience for the college trained teachers is out of keeping with the assumption that the experienced college-trained teacher made a greater contribution to learning by his pupils. It is also out of keeping with the finding in number work scores which rose with increased teacher experience. Two explanations are hazarded here.

It is possible that with new methods of language teaching, newly trained teachers were better equipped to teach the English language than their predecessors. But since more experience benefitted the pupils of college trained teachers in number work it is also being suggested here that perhaps as the effects of the academic environment in the teacher training colleges wore out, and as the teachers increasingly participated in local communal activities, not only did they lose touch with the English language but they lost some of the skills of teaching it. For the in-service trained teachers it would

appear that the correspondence and crash courses benefitted their pupils in language learning since the scores rose with increased experience

As in number work, for the untrained teachers, scores in language decreased with increase in experience. It was therefore concluded that while lack of training led to the use of inappropriate teaching methods, lack of motivation had dulled enthusiasm so that the more years that an untrained teacher stayed in the profession the less he contributed to learning by his pupils.

Summary of Findings
of Part One

1. That teacher professional qualification was important as a determinant of pupil academic performance.
2. That there was an inverse relationship between pupil academic performance and the size of the class in which they learned, suggesting that the larger the class the poorer the performance.
3. That performance by pupils taught by in-service trained teachers improved slightly with the experience of the teachers, both in number work and language, but was lower in language than in number work.
4. That pupils taught by experienced, college trained teachers benefitted more than those taught by the other categories of experienced teachers, but benefitted more in number work than in language.
5. That pupils taught by untrained teachers performed much worse under experienced teachers in both subjects but more so in number work.

PART TWO

The purpose of this part of the study was to draw attention to the multiplicity and varying nature of the factors that came into play in the experiment. This was done through

an analysis of four factors, peripheral to the three central to the study. These additional factors were:-

(a) The location of the school and its environment.

(b) The streams into which the classes were divided.

(c) The sex of the pupils.

(d) The sex of the relevant teachers.

These factors were hypothesised as follows:-

1. The location and environment of the school has no bearing on pupil academic performance.
2. There is no difference in academic performance between pupils in different streams.
3. There is no difference in academic performance between pupils of different sexes.
4. There is no difference in performance between pupils taught by teachers of different sexes.

The simple analysis of variance was used to analyse the data relating to these four hypotheses. In both number work and language scores the F-test showed that all four variables, school and its environment, stream, sex of teachers and sex of pupils contributed to the differences in the mean scores of the pupils. Table 22(a) and 22(b) show the F-ratios obtained for different schools while Tables 27(a) and 27(b) show the F-ratios obtained for the different streams. These tables indicate that there were differences in the mean scores for the different schools as well as for the different streams. Consequently, t-tests were used to determine the degree of significance of these differences. As in the main body of the study the level of significance was an F-value of 3.890 and a t-value of 1.960. The t-value obtained for the different schools are shown on Tables 23 and 24.

Table 22(a)

F-Ratios Obtained for Various Schools

Number Work

Source	Sum of Sq.	D. of F.	Mean Sq.	Sum of Sq.	D. of F.	Mean Sq.	Sum of Sq.	D. of F	Mean Sq.
Between	5080.97	10	508.0968	13782.73	10	1378.2726	11744.69	10	1174.4688
Within	27525.16	765	35.9806	27567.00	765	36.0482	22762.65	765	29.7551
Total	32606.13	775	42.0724	41359.63	775	53.3673	34507.34	775	44.5256
	F(10/756 = 14.121			F(10/765 = 38.234			F(10/765 = 39.471		

Table 22(b)

Language

Source	Sum of Sq.	D. of F.	Mean Sq.	Sum of Sq.	D. of F.	Mean Sq.	Sum of Sq.	D. of F	Mean Sq.
Between	1403.10	10	140.3099	3256.40	10	325.6402	1500.09	10	150.0087
Within	3787.54	765	4.9510	4883.40	764	6.3919	5163.39	765	6.7495
Total	5190.64	775	6.6976	8139.80	774	10.5165	6663.48	775	8.5980
	F(3/772 = 22.102			F(3/771 = 54.959			F(10/765 = 22.225		

Table 23

t-Values Obtained from Differences
Between Means in Various Schools

Number Work

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{11}	X_{12}
X_1		4.0683	3.5302	6.8526	0.2365	5.9416	12.0262	9.1210	1.6770	4.7456	00.1599
X_2	4.0683		0.2474	3.1819	4.4962	2.9576	8.8063	5.8500	6.2339	0.8646	3.6411
X_3	3.5302	0.2474		3.1490	3.8927	2.0224	8.2609	6.1067	5.1116	1.0311	3.1795
X_4	6.8526	3.1819	3.1490		7.3762	1.3967	5.3577	2.8000	9.1563	2.2482	4.6996
X_5	0.2365	4.4962	3.8927	7.3762		6.4392	12.7449	9.6521	1.4866	5.1703	0.3842
X_6	5.9416	2.9576	2.0224	1.3967	6.4392		7.1697	4.2575	8.3576	0.9958	5.3283
X_7	12.0262	8.8063	8.2609	5.3577	12.7449	7.1697		2.1445	14.8159	7.6658	11.0267
X_8	9.1210	5.8500	6.1067	2.8000	9.6521	4.2575	2.1445		11.4235	4.9183	8.4341
X_9	1.6770	6.2329	5.116	9.1563	1.4866	8.3576	14.8159	11.5235		6.9164	1.7375
X_{11}	4.7456	0.8646	1.0311	2.2482	5.1703	0.9958	7.6658	4.9183	6.9164		4.2784
X_{12}	0.1599	3.6411	3.1795	4.6996	0.3842	5.3284	11.0267	8.4341	1.7375	4.3784	

Note: The schools have been designated X_1 - X_{12}. School X_{10} was not used due to inaccurate data.

Table 24

t-Values Obtained from Differences
Between Means in Various Schools

Language

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{11}	X_{12}
X_1		5.3063	0.0754	4.3291	0.9701	0.5414	4.2440	8.7711	1.4705	1.9026	2.0687
X_2	5.3063		5.4137	0.9183	6.5886	5.4731	1.1523	4.2312	4.1039	1.0816	7.2021
X_3	0.0754	5.4137		4.4310	0.8961	0.6289	4.3490	8.8850	1.5579	4.2818	2.0059
X_4	4.3291	0.9183	4.4310		5.5323	4.3370	0.2013	4.9527	3.0833	0.1583	6.6016
X_5	0.9701	6.5886	0.8961	5.5323		1.6573	5.4672	10.0246	2.5608	5.3619	1.5489
X_6	0.5414	5.4731	0.6289	4.3370	1.6573		5.2435	9.2555	1.0847	2.9536	3.1356
X_7	4.2440	1.1523	4.3490	0.2013	5.4672	4.2435		5.2591	2.9640	0.0387	6.5628
X_8	8.7711	4.2312	8.8850	4.9527	10.0246	9.2555	5.2591		7.8750	5.1012	10.7038
X_9	1.4705	4.1039	1.5579	3.0833	2.5608	1.0847	2.9640	7.8750		2.9237	3.9237
X_{11}	1.9026	1.0816	4.2818	0.1583	5.3619	2.9536	0.0387	5.1012	2.9237		6.4618
X_{12}	2.0687	7.2021	2.0059	6.6016	1.5489	3.1356	6.5628	10.7038	3.9237	6.4618	

Hypothesis One

'The location and environment of the school has no bearing on pupil academic performance.'

Number Work
Performance

Table 25 reveals three discernible clusters of schools within which differences in the mean scores were not significant. School X_9, X_5, X_1 and X_{12} formed one cluster designated cluster (a). Schools X_3, X_2 and X_{11} formed a second cluster, designated cluster (b), while schools X_4 and X_6 formed a third cluster, cluster (c). Schools X_7 and X_8 were dissimilar to each other and to the other schools in the clusters. Although the schools in each cluster had different means, the differences were small and the schools were therefore considered to be homogenous. These clusters are shown below in a numerically descending order of mean scores:-

Table 25

	Clusters	means
		13.50
(e)	X_7	11.50
(d)	X_8	8.82
(c)	X_6	7.65
	X_4	6.81
(b)	X_{11}	6.06
	X_2	5.83
	X_3	2.45
(a)	X_{12}	2.28
	X_1	2.04
	X_5	0.68
	X_9	

It is seen in the table above that clusters (e) and (d) had the highest means and therefore the highest achievement measured in terms of the difference between the post-

and the pre-tests. Information on the possible explanation for these clusters was obtained in a questionnarie to heads of schools (see Appendix C). The questionnaire sought information regarding the headmaster himself (his professional qualification and experience as school head, the school and teachers in the school. In number work the clusters were analysed as follows:

Table 26

Additional Factors Influencing Pupil Performance: Unmber Work

Headmaster's Professional Qualification	Headmaster's Experience in Years			School Size	Number of Teachers	Pupil/ Teacher Ratio	Mean Scores
	In this School	Elsewhere	Total				
Cluster (a)							
X_9 P_2	11	9	20	412	11	37:1	0.6842
X_5 P_2	3	13	16	379	10	38:1	2.0448
X_1 P_1	4	14	18	418	9	46:1	2.2759
X_{12} P_2	10	7	17	402	13	30:1	2.4468
Cluster (b)							
X_3 P_2	4	12	16	322	12	27:1	5.8305
X_2 P_2	25	1	26	594	16	37:1	6.0595
X_{11} P_2	4	10	14	455	10	46:1	6.8108
Cluster (c)							
X_6 P_2	0.25	-	0.25	767	16	48:1	7.6495
X_4 P_2	6	1	7	484	12	40:1	8.8243
Cluster (d)							
X_7 P_1	-	10	10	494	12	41:1	13.5000
Cluster (e)							
X_8 P_3	10	5	15	421	11	38:1	11.5000

A look at the clusters shows one or more common factors among the schools in each cluster. In cluster (a) the school size and the number of teachers in the schools were similar enough to explain the lack of difference in the mean scores between the schools. It is important to note, however, that in this particular cluster school $\bar{X}_{12}$ had the lowest pupil/teacher ratio (30:1) and the highest mean score. Nevertheless, School $\bar{X}_1$ with the highest pupil/teacher ratio (46:1) had the next highest score, thus suggesting that pupil/teacher ratio was not the sole determinant of achievement.

In cluster (b) the only factor that was common to all the schools was the professional qualification of the headmasters. Here the lowest achievement was in school X_3, the school with the lowest pupil/teacher ratio while school X_{11} had the highest pupil/teacher ratio and the highest achievement. This not only supported cluster (a) in discounting pupil/teacher ratio as a major determinant of pupil achievement but seemed to negate the assumed inverse relationship between this ratio and pupil achievement. This, however, could be misleading since the study looked at the pupil/teacher ratio in the whole school which was different from the pupil/teacher ratio in a specific class.

Cluster (c) was particularly interesting because it was formed of the only two schools that were not co-educational, X_4 being an all-boys school headed by a male teacher and X_6 an all girls school headed by a female teacher. Both heads had P_2 professional qualification and the schools were close together and co-operated on many extra-curricular activities. Therefore, despite the differences in the heads' experience, school sizes, number of teachers and the pupil/teacher ratio this cluster was natural.

The schools with the highest means did not fall within any of the clusters. The highest mean score was in school X_7 with a P_1 headmaster. The school is located in a relatively progressive coffee growing area, where parents took a great deal of interest in the school activities. On two occasions during the research there were what amounted to parent/teacher

meetings. School X_8 on the other hand is located in a relatively inaccessible hilly area. The headmaster, though of P_3 professional qualification, had very good rapport with his members of staff. During the research he expressed great concern over the fact that his Standard Two trained teachers had had no promotion and the untrained ones had not been called for training.

It seemed, therefore, that mere statistics in the form of pupil/teacher ratios, teacher professional qualifications were not enough to ensure a high level of performance. Other important factors appear to be the interest taken by the community and the working relationship between the school head and his staff.

Hypothesis Two

'There is no difference in academic performance between pupils in different streams.'

This hypothesis was based on the belief that despite attempts by educational authorities to introduce a non-ability based system of streaming, pupils continued to be grouped according to their academic ability. Were this not so then the hypothesis that there is no difference in academic performance between pupils in different streams within the same class would hold true. The F-test showed that there were differences in the mean scores of pupils in different streams both in number work and language as shown in Tables 27(a) and 27(b).

Table 27(a)

F-Ratios Obtained for Different Streams

Number Work

Source	Pre-Test Scores			Post-Test Scores			Gain Scores		
Source	Sum of Sq.	D. of F.	Mean Sq.	Sum of Sq.	D. of F.	Mean Sq.	Sum of Sq.	D. of F	Mean Sq.
Between	827.34	3	275.7793	410.56	3	1593.9533	4835.52	3	1611.8402
Within	31776	772	41.1642	4780.08	772	47.3805	29671.81	772	38.4350
Total	32606.13	775	42.0724	5190.64	775	53.3673	34507.34	775	44.5256
	F(3/772) = 6.699			F(3/772) = 33.642			F(3/772) = 0.801		

Table 27(b)

F-Ratios Obtained for Different Streams

Language

	Pre-Test Scores			Post-Test Scores			Gain Scores		
Source	Sum of Sq.	D. of F.	Mean Sq.	Sum of Sq.	D. of F.	Mean Sq.	Sum of Sq.	D. of F	Mean Sq.
Between	410.56	3	136.8525	1434.03	3	478.0085	538.67	3	179.5551
Within	4780.08	772	6.1918	6705.77	771	8.6975	6124.81	772	7.9337
Total	5190.64	775	6.6976	8139.80	774	10.5165	6663.48	775	8.5980
	(F(3/772) = 22.102			F(3/771) = 54.959			F(3/772) = 22.632		

The mean scores for the different streams in number work in descending numerical order are as follows:-

Table 28

Means Scores for Different Streams: Number Work

Streams	Mean Score
B	9.17
A	5.25
C	3.50
Unstreamed	2.35

The t-tests yielded the following values:

Table 29

t-Values Obtained from Differenc Between Means in Different Streams

Number Work

	$\bar{X}_0$	$\bar{X}_1$	$\bar{X}_2$	$\bar{X}_3$
$\bar{X}_0$		4.18	9.76	0.90
$\bar{X}_1$	4.18		8.04	1.48
$\bar{X}_2$	9.76	8.04		3.40
$\bar{X}_3$	0.90	1.48	3.40	

where
$\bar{X}_0$ = unstreamed class (+50)
$\bar{X}_1$ = A streams
$\bar{X}_2$ = B streams
$\bar{X}_3$ = C streams

Table 29 (t-values in number work) shows that there was quite a great difference in performance by pupils in the different streams. The t-value between the mean scores of the unstreamed (X_0) groups and the A streams $\bar{X}_1$ was 4.18 while it was 9.76 between scores of the same groups and those of the B streams($\bar{X}_2$). These were both significant at the 1.960 level adopted in this study. There was, however, little difference in mean scores between pupils in the unstreamed classes and those in the C streams t = 0.90. The differences in the mean scores of pupils in the A streams (X_1) and those in the B

streams ($\bar{X}_2$) yielded a t-value of 8.04. The differences in mean scores of pupils in A stream and those in the C streams $\bar{X}_3$ yielded a t-value of 1.48 while those of pupils in the B stream and in the C streams yeilded a t-value of 3.40.

This analysis shows that the difference in the mean scores of pupils in the over large (+50) classes and those of pupils in the C streams was not significant, (t = 0.90) which was as anticipated. Nevertheless, the insignificant difference in the mean scores of the pupils in the A streams and those in the C streams (t = 1.48) was not anticipated.

To summarise, the t-values show that in number work the B streams had the highest mean scores followed closely by the A and C streams with the unstreamed, over large classes trailing far behind. Although the t-values were strong enough to reject the hypothesis that there was no difference in performance between pupils in different streams, if the model used was correct, such performance in number work did not follow the conventional ability-based streaming.

Language Performance

In language, as in number work the schools exhibited a considerable degree of heterogeneity as is seen in Table 24. The table reveals clusters of schools within which the mean scores were not different. The interesting point is that the clusters in language were different from the clusters in number work suggesting that different factors were important in influencing performance in number work from those that influenced performance in language. The three clusters were formed of schools X_1, X_3, X_5 and X_6, which were designated cluster f. Schools X_2, X_4, X_7 and X_{11} formed a second cluster (g) while schools X_8, X_9 and X_{12} were dissimilar to each other and to any cluster. This was consistent with performance in number work where school X_8 did not fit into any of the clusters. These clusters are shown below in numerically descending order of mean scores:

Table 30

Clusters Formed of Different Schools (Language)

Cluster		Mean Scores
	X_8	5.3631
	X_2	3.4881
(g)	X_4	3.1081
	X_{11}	3.0405
	X_7	3.0244
	X_9	1.8026
	X_6	1.3711
(f)	X_1	1.1379
	X_3	1.1017
	X_5	0.6866
	X_{12}	-0.0851

These clusters were further analysed to try and find out the factors that might explain their apparent homogeneity.

Additional Factors Influencing Performance: Language

Table 31

Clusters		Headmaster's Professional Qualification	Headmaster's Experience: In this school	Headmaster's Experience: Elsewhere	Headmaster's Experience: Total	School Size	Number of Teachers	Pupil/Teacher Ratio	Mean Scores
	X_{12}	P_2	10	7	17	402	13	30:1	-0.0851
(f)	X_5	P_2	3	13	16	379	10	38:1	0.6866
	X_3	P_2	4	12	16	322	12	27:1	1.1017
	X_6	P_2	0.25	-	0.25	767	16	48:1	1.3711
	X_1	P_1	4	14	18	418	9	46:1	1.1379
	X_9	P_2	11	9	20	412	11	37:1	1.8026
(g)	X_7	P_1	-	10	10	494	12	41:1	3.0244
	X_{11}	P_2	4	10	14	455	10	46:1	3.0405
	X_4	P_2	6	1	7	484	12	40:1	3.1081
	X_2	P_2	25	1	26	594	16	37:1	3.4881
			10	5	15	421	11	38:1	5.3631

A look at these clusters shows that schools in each cluster had one or more things in common which could explain their homogeneity. But more important was their diversity suggesting that still other factors were involved. For instance school X_6 was the largest in cluster f (767 pupils and 16 teachers; the pupil teacher ratio was highest (48:1), the school head had little experience (0.25 years) and yet it had the second highest mean score in the cluster. This was consistent with the performance by this school in number work where it had the second highest mean score, 11.50. Another consistency in performance was exhibited by school X_8 which had the highest mean score in language and second highest in number work. The only explanation for this good performance was advanced as the community interest in school activities and the headmaster's concern over his teachers and pupils. School X_{12} on the other hand showed negative achievement in language while in number work it had the third highest mean score but in the bottom cluster.

In concluding the analysis on school location and its environment one can only say that all the factors considered in this part of the study were influential to pupil performance. Having looked at the school heads professional qualification, his experience, the size of the school, the number of teachers and the pupil/teacher ratios there still seemed to be other residual factors that influenced performance particularly in the light of the schools' tendency to cluster in terms of mean scores while the other factors differed.

As in number work the hypothesis that there is no difference in academic performance between pupils in different streams was rejected on the basis of the following mean scores. The scores are in descending numerical order:-

Table 32

Mean Scores in Different Streams

Streams	Mean Scores
A	2.71
B	2.56
Unstreamed	0.59
C	0.00

Unlike performance in number work, however, the performance in language seems to have followed the conventional concept of streaming by ability. The t-test yielded the following values:-

Table 33

t-Values Obtained from Differences Between Means in Different Streams

Language

	$\bar{X}_0$	$\bar{X}_1$	$\bar{X}_2$	$\bar{X}_3$
$\bar{X}_0$		6.72	6.23	1.01
$\bar{X}_1$	6.72		0.66	5.04
$\bar{X}_2$	6.23	0.66		4.77
$\bar{X}_3$	1.01	5.04	4.77	

where

$\bar{X}_0$ = Unstreamed Class.

$\bar{X}_1$ = A streams.

$\bar{X}_2$ = B streams.

$\bar{X}_3$ = C streams.

This analysis seemed to support the subjective observation that the English language is given the pride of place in our curriculum and the possibility exists that at least in the schools under study streaming was done on the basis of performance in language. In considering both teacher qualification and class size in the main body of the study it was seen that performance in number work did not seem to be so much a function of either the teacher/or the class/pupil ratio but that other factors were at play. Performance in language seemed to be influenced by most of the factors considered in this study.

In as far as the sex of the pupils is concerned boys performed better in language with a mean score of 2.60 as against 1.94 for girls. This finding seemed to disprove the widely held theory that girls are better at languages than boys. But this need not be necessary the case. It must be taken into account that the subjects in this study had barely been introduced to English as a foreign language. The learning of a foreign language requires a certain amount of confidence and aggressiveness which the girls lacked in view of their home backgrounds.

The final factor considered here was the sex of the teachers who taught the selected classes. There were 353 pupils taught by male teachers and 423 pupils taught by female teachers. The analysis showed that the pupils taught by female teachers performed better with a mean score of 2.74 as against 1.68 for those taught by male teachers. The t-test showed that this difference was significant, $t = 5.15$ as against $t = 1.960$, adopted in this study.

After consideration of nine factors that could be expected to influence academic performance, and having not exhausted the list, one was impressed by the multiplicity and varying nature of influences that came into play in the different learning situations considered in this study. The only suggestion that one can make at this stage is that further research is needed locally to clarify these influences and their direction.

Summary of Findings
(Part II)

1. School environment played a major role in determining pupil academic performance. In this study environment can be subdivided as:-
   (a) Rapport between the school head and the teachers.
   (b) Community interest and active involvement in school activities.
2. Streaming was an important determinant of performance

in language, but not so in number work.

3. Performance in number work did not indicate streaming by ability while performance in language supported it.

4. Male pupils performed slightly better than their female counterparts in both subjects.

5. Pupils taught by female teachers performed better both in number work and language.

CHAPTER FOUR

SUMMARY, CONCLUSION AND RECOMMENDATIONS

At the beginning of this study it was stated that the purpose of the study was to look into certain factors that can be said to have a bearing on the quality of education. These were the qualification and experience of the teachers and the size of the class in which the pupils learned. It was stated that these factors would be measured against pupil performance. It was also suggested that there could be many more factors that determined quality in education such as the personality of the teacher, the capability of the head teacher, the location of the school and its environment and the community's attitude towards the school. An analysis of all these factors could not be undertaken within the scope of one study. The main body of this study, thus confined itself to a consideration of teacher qualification, teacher experience and class size as they related to pupil performance. In an additional section school location, class streams, sex of pupils and teachers were also considered in relation to pupil performance.

Summary of Research Findings

There were three major research findings in this study.

1. Teacher professional qualification had a positive effect on pupil performance. The analysis of the data showed that particularly in number work, pupils taught by teachers professionally trained in teacher training institutions made the greatest gain in scores between the pre- and the post-test. Those taught by untrained teachers performed the worst while those taught by the in-service trained teachers came in the middle. This was the pattern that was expected and led to the rejection of the hypothesis that pupils learn equally well whether they are taught by professionally qualified or unqualified teachers.

2. Pupils in smaller classes gain more in learning than pupils in relatively larger classes.
3. Teacher experience had some effect on pupil academic performance.

The third conclusion was arrived at after a double analysis. In the first multiple correlation analysis experience was not matched with professional qualification. Consequently, it was not possible to determine which group of teachers contributed more to the low correlation in both number work and in language. Moreover, the analysis showed an inverse relationship between the scores, both in language and number work and teacher experience, indicating that the more experienced the teacher the poorer the performance by their pupils. Although this negative correleations between test scores and teacher experience were not significant, a second multiple analysis was decided on to try and find out the level of professional qualification at which they were lowest and therefore the group of teachers that contributed most to the negative correlation. Consequently, the teachers were grouped according to their professional qualification and a correlation analysis conducted within each group. It was subsequently found that the mean scores of pupils taught by untrained teachers declined significantly with a rise in teacher experience. This is the case both in number work and language.

Further, it was found that in language, scores of pupils taught by college trained teachers also declined with teacher experience while in number work they rose with teacher experience. Both the number work and language scores for pupils taught by in-service trained teachers showed positive but low correlation with teacher experience while scores by pupils taught by untrained teachers showed significant negative correlation with teacher experience. This second analysis pointed to the pupils taught by untrained teachers as the major contributors to the negative correlation between performance and teacher experience but also strengthened the correlation so that while in the first analysis they were negative but insignificant, in the second

one they are significantly negative. The following three conclusions are based on the second analysis:-

(a) Pupils taught by college trained teachers benefitted from the experience of their teachers.

(b) Pupils taught by teachers trained through the in-service training scheme did not benefit appreciably from the experience of their teachers.

(c) Pupils taught by untrained teachers lost by the experience of their teachers.

RECOMMENDATIONS

The following recommendations are based on the research findings in the study:-

1. That the ideal of a full college trained teaching force should be pursued. However, owing to the physical and human resources constraints, it would be a difficult ideal to achieve. It is therefore recommended that the in-service training scheme should be intensified and made more effective.

2. That untrained teachers should be utilized only as a last resort and then only for a short period of time. The finding that experienced untrained teachers had negative effects on their pupils was a disturbing one.

3. That the Kenyan educational system should strive to achieve a low pupil/teacher and class/pupil ratio. In this study there were classes that had close to sixty (60) pupils. Perhaps it is this wide range in class sizes that enabled this study, unlike many others in the same field, to conclusively relate class size to pupil academic performance.

This study did not seek to determine the ideal class size. It was clear, however, that those pupils in classes with forty pupils and above had lowest gain scores. The problem is one of striking a balance between maintaining a reasonable class size and the cost involved. A small class size means higher costs. If the decision to maintain small classes is coupled

with the social demand for education and the desire by the government to increase the participation rates in education, then the cost would be phenomenal.

Suggestions for Further Research

During the course of this investigation a number of difficulties were encountered and the following suggestions are made in the light of those difficulties:-

1. This study barely scratched the surface both in the evolution of research tools that are applicable to the Kenyan educational system and research into the qualitative aspects of education. It was suggested that further extensive and intensive research was necessary if this country was to evolve a system of education based on empirical research findings. It was further suggested that those educationists in the field of psychology and research undertake to develop research instruments which were relevant to Kenya and could be applied in the country as a whole.
2. Secondly, it was suggested that the affective aspects of education in Kenya should be more clearly defined so as to enable researchers to quantify and measure them.
3. Another suggestion related specifically to research in the role of teacher experience in pupil performance. In the treatment of this variable in this study the probability of sampling error is greater than in any other part of the study. In sampling, the teachers were divided into two categories of experience; those with three or less years and those with five or more years of experience. The range in experience between those two categories was found to be too wide for conclusive analysis. The range was found to be -1 to +3 for the relatively inexperienced and +5 to +19 for the experienced teachers with an intermediate group with four years of experience. It was for this reason that the actual number of years of

experience for the individual teachers were used in the analysis.

It was recommended that future researchers in this field should divide the sample into smaller and better-defined groups. It was also recommended that the point at which training took place, that is, whether it was pre-service or in-service, and if the latter, then the years of experience before commencement of training should be taken into consideration.

4. A further suggestion related to the teaching of the two subjects covered in this study. The analysis of variance showed that there was no significant difference in gain scores in language by pupils taught by the different categories of teachers. This was contrary to expectations and also contrary to the finding in number work where the difference in performance in number work was clear between pupils taught by the different categories of teachers; those taught by college-trained teachers made the highest gain and those taught by the untrained teachers made the lowest. It seemed, therefore, that either the college trained teachers did not put into practice the language teaching skills they had learned or that they had not learnt enough of these skills to make a permanent difference in their teaching. It was therefore recommended that further research be undertaken in the field of language teaching in the primary schools.

5. Finally, it was suggested that more research should be undertaken on the various factors that influence the quality of education in Kenya. Such questions as the role of the head teachers, the academic qualification of the teachers and many others need to be looked into.

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APPENDIX A

NUMBER WORK

1. Addition

   (a) 0 + 9 =
   (b) 9 + 2 =
   (c) 6 + 4 =
   (d) 7 + 7 =
   (e) 5 + 6 =

2. Write in tens and ones

   (a) 14 = _____ ten and _____ ones.
   (b) 40 = _____ tens and _____ ones.
   (c) 7 = _____ ten and _____ ones.
   (d) 4 hundreds 6 tens and 5 ones = _____
   (e) 80 = _____ tens.

3. Multiplication

   (a) 1 x 3 = _____
   (b) 3 x 5 = _____
   (c) 3 | 1 3 2 4 6 5
       | 3 9 18
   (d) 5 x _____ = 10
   (e) _____ x 4 = 12

4. Division

   (a) 2 ÷ 2 = _____
   (b) 6 ÷ 2 = _____
   (c) 6 ÷ 3 = _____
   (d) 10 ÷ 2 = _____
   (e) 8 ÷ 4 = _____

5. > = <

(a) 12 - 5 ____ 8 - 2

(b) 2 tens ____ 20

(c) 50 _____ 40

(d) $\frac{1}{2}$ 1/4

(e) 1/3 + 1/3 $\frac{1}{2}$

6. Find the difference:

(a)	(b)	(c)	(d)	(e)
64	83	97	287	340
- 15	- 60	- 45	- 147	- 30

APPENDIX B

LANGUAGE TEST

UNDERSTANDING

THE LION AND THE MOUSE

There was once a big lion. He lived in a hot land. A little mouse lived near the lion. Every afternoon the big lion slept in the sun. Every afternoon the mouse went for a walk. The lion's name was Simba. The mouse's name was Suri.

One day the little mouse said, "I will run over Simba's back. He will not see me. He is asleep." So she ran over the lion's back and over his big paws. Suddenly the little mouse was under Simba's big paw. 'Let me go! Let me go! cried the little mouse. "Let me go and I will help you one day."

QUESTIONS ON UNDERSTANDING

1. The lion's name was .....
2. The mouse's name was.....
3. The lion lived in a hot .....
4. Every afternoon the big lion.....
5. The mouse ran over the .....back.
6. Suddenly the little mouse was under Simba's .....
7. 'Let me .....' cried the little mouse.
8. "Let me go and I will .....
9. A lion has ..... legs.
10. A mouse has ..... eyes.

APPENDIX C

STATISTICAL INFORMATION REQUIRED FROM HEADMASTERS

1. School Size — 1973 — 1974

   (a) Number of pupils .....
   (b) Number of streams .....
   (c) Number of classrooms .....

2. Staffing — 1973 — 1974

   (a) Number of teachers .....
   (b) Teacher qualification

	Trained					Untrained			
Gr.	SI	PI	P2	P3	P4	EAACE	EACE	KJSE	CPE

   (c) How many teachers do you actually require?
   (d) Are all your teachers resident?
   (e) Is there adequate accommodation for your resident teachers?
   (f) If not, has this had any effect on your teacher recruitment e.g. have you lost, or failed to attract teachers because of lack of accommodation?
   (g) What is the teaching load of teachers i.e. how many lessons per week?
      (i) Upper primary.
      (ii) Lower primary.
   (h) Do they all undertake school duties after school hours?
   (i) What is the length of the school day?

Class and Classroom Size

(a) What is the size of your classrooms? Are they adequate for the size of the classes?
(b) Is there any difference in size between classrooms for upper and lower primary?

(c) If yes, what is the difference?

(d) How many pupils are the classrooms designed to hold in

(i) Upper primary

(ii) Lower primary

APPENDIX D

QUESTIONNAIRE TO TEACHERS OF STANDARD TWO CLASSES

Name of school .....

Sex of teacher: M or F .....

Trained or untrained .....

If trained, method of training:

(i) In-service

(ii) Through college

1. How long have you been teaching? .....
2. How many periods do you teach per week? .....
3. How long is each period? .....
4. Do you have any other duties in the school? .....
5. Do you know all the pupils in your class? .....
6. Do you know most of the pupils in your class? ...
7. Do you know most of their parents and family backgrounds? .....
8. In your opinion what is the effect on learning in a large class?
   (a) They learn better and faster.
   (b) They learn more slowly.
   (c) There is no difference.
9. Do you feel that you teach better in
   (a) A large class
   (b) A small class
   (c) The class size does not matter
10. Do you find the time to help slower learners? When?
   (a) During class.
   (b) Outside class time.
   (c) I cannot fit in the extra time.
11. In your opinion has there been a noticeable change in class discipline as a result of enlarged class size?
12. Which, in your opinion, is easier to control
   (a) A large class.

(b) A smaller class.

(c) It makes no difference.

13. What would you recommend as the ideal class size for most effective teaching?

14. What would you say the academic performance in your class was in 1974 as compared to 1975?

(a) Better

(b) Worse

(c) The same