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An Analysis of Factors Influencing Learning Achievement in Grade Six

Harriet Nannyonjo



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Africa Region Human Development Department



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Foreword

Given the global commitment to reaching the Millennium Development Goal of universal primary completion and the increasing demands on Government budgets to achieve other MDGs, better use of education inputs to improve learning outcomes has become more critical than ever before. With increasing pressures on enrollments and consequently on the budgets, there is need to implement strategies focusing on inputs and actions that are most likely to improve student learning. A major impediment to rational decisionmaking in this area is lack of knowledge about what interventions work best and under what circumstances. Short of this, Governments may continue spending scarce resources on inputs that may not directly contribute to student learning achievement.

Strategies to improve education performance have typically emphasized provision of inputs; for example, more funding, teachers, textbooks, furniture, and so forth, with the assumption that the more inputs provided the better students learn. There is however scanty evidence on how effective many of these inputs are. While there have been some studies of particular inputs, for example on textbooks provision in developing countries, most studies looking at the broad impact of inputs on learning outcomes have been undertaken in developed countries, whose contextual environment differs greatly from that in developing countries. This makes applicability of such results to developing country contexts problematic.

This study on effective use of school inputs in Uganda is intended to contribute to the policy debate on how to make the best use of available resources to improve learning outcomes. It comes at an opportune time in Uganda when there are increasing demands on the education budget, yet it is unlikely that substantial increases in the sector budget envelope will be provided given other competing national priorities, as well as the need for additional resources to finance post primary education and training.

This report emphasizes: the need for a balanced focus on resource availability and use, because without appropriate use or management, resources may not lead to improved learning; helping teachers to effectively teach large classes; and the importance of investing more in in-service training focused on pedagogical practices than on training teachers to acquire academic qualifications. The study also points to the need to examine and include teacher effectiveness as key criteria for determining teacher remuneration.

With regard to automatic promotion, this study, and indeed the general literature suggest that repetition tends not to work within the same context and the same teaching styles. However, in tandem with enforcement of automatic promotion, it may be necessary to administer regular tests and homework that would identify pupil's weaknesses, and address them through remedial teaching to ensure acquisition of the desired levels of competency. Varying teaching strategies to suit specific circumstances was identified to be an effective way of ensuring that even slow learners are not left behind. Clearly, enrolling children at the appropriate age and promoting them each year is a good policy measure for Uganda and the findings of this study are particularly striking in this area.

Given these findings and the level of resources required to reach the Education for All and Millennium Development Goals, there is no room for complacency in the current

levels of pupil performance. The findings of this study clearly demonstrate the need to focus on school and classroom processes and better use of education resources focused on improvement of learning.

It is my hope that the results of this study will stimulate debate to increase effective use of inputs to improve learning outcomes.

Dzingai Mutumbuka

Sector Manager

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Acronyms and Abbreviations

ANOVA	Analysis of Variance
BA	Bachelor of Arts
BEd	Bachelor of Education
BSc	Bachelor of Science
EFA	Education For All
FAWE	Forum For Women Educationists
GDP	Gross Domestic Product
GNI	Gross National Income
GNP	Gross National Product
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
MDGs	Millennium Development Goals
NAPE	National Assessment of Progress in Education
PTA	Parent/Teacher Association
PTCs	Primary teacher colleges
TDMS	Teacher development and management system
TIMSS	Third International Mathematics and Science Study
U Sh	Ugandan Shilling
UNEB	Uganda National Examinations Board
UPE	Universal primary education
UPPAP	Uganda Participatory Poverty Assessment Program

Executive Summary

This report is based on a study prompted by the need for improved effectiveness in the use of education resources in Uganda. Uganda's problem with increasing resource constraints for education is common in many developing countries and the lessons learned in this study may be of broad interest. Currently, Uganda allocates over 31 percent of its discretionary recurrent expenditure to education, and 67 percent of this is allocated to primary education. Given increasing pressures on the budgets, there is a need to implement strategies focusing on those inputs most likely to improve student learning. A major impediment to rational decisionmaking in this area is lack of knowledge about what interventions work best and under what circumstances. Without this knowledge, Government may continue spending scarce resources on inputs that may not directly contribute to student learning achievement.

The study used Uganda National Examination Board (UNEB) National Assessment of Progress in Education (NAPE 2003) data collected from a nationally representative sample of grade six pupils in Uganda. A large database of 3,949 pupils from 200 schools (rural and urban) both private and Government-aided, as well as the teachers (388) and head teachers (200) of these pupils was used. This was supplemented by data from the Education Management Information System (EMIS), head teacher and teacher interviews, as well as classroom observation. The Uganda study is unique because of its use of a large sample size and a combination of qualitative and quantitative methods, which make this study different from many studies undertaken in the recent past. It therefore provides insights that can be generalized to primary 6 pupils in Uganda, are likely to apply to other upper primary grades, as well as perhaps providing some lessons for other countries. However, such generalization should be done with caution. For purposes of this report, analysis was limited to a few variables: pupil background characteristics, school-based characteristics, including class size, pupil/textbook ratio, funding per pupil, learning time, pupils per desk; teacher characteristics; and teaching strategies and school administration. Further analysis into factors that influence performance of primary school pupils in Uganda could be undertaken using the same data set.

Results point to some critical areas where improvements could be made in order to improve pupil performance possibly with fewer resources. The results specifically apply to primary 6 pupils in Uganda. This analysis is particularly focused on changes which can be made by the Uganda Ministry of Education and Sports to improve efficiency in use of resources.

Results of this study suggest considerable variation in level of inputs by school ownership and location. There is also a considerable variation in pupil performance. One important finding from this study is that at Primary 6 level in Uganda pupils of the appropriate age for the grade scored better than other pupils in English and mathematics. In addition, repetition was found not to improve pupil's test scores. While Uganda has a policy of automatic promotion this is not being implemented everywhere and many children repeat (13.8 percent in 2004). Clearly, enrolling children at the appropriate age and promoting them each year would be a good policy measure for Uganda, and it would also be cost free.

However, in tandem with enforcement of automatic promotion, it may be necessary to administer regular tests and homework that would identify pupil's weaknesses, and address them through remedial teaching to ensure acquisition of the desired levels of competency.

The study also found a positive relationship between number of books at home, language spoken at home (combination of English and vernacular) and pupil's performance. On the other hand, there was a negative relationship between pupil's age, distance of pupil's home from school, and family size and pupil's test scores. Other pupil background factors associated with higher test scores are pupil's punctuality, regular school attendance, parental interest (reflected in punctuality and attendance) and presence of electricity or reliable lighting at home. It is clear that all these factors lead to extension of learning time in one way or the other, a factor which has been found to be associated with higher pupil performance.

Overall, there were significant variations in textbook availability, class size, funding per pupil as well as in the number of minutes of teaching mathematics and English per week. In most cases private schools had higher levels of inputs than Government-aided and urban schools were better resourced than rural schools. Inputs vary considerably between rural and urban schools, as well as between private and Government-aided schools. The study also found funding per pupil, time spent on teaching a subject, and greater availability of textbooks to be positively correlated with pupil performance in mathematics and English. However, the coefficients were in most cases very low. Further, pupil performance in mathematics and English was negatively correlated with class size, pupils per bench and the number of pupils sharing a textbook.

This study provides some evidence that provision of school inputs alone explains a small proportion of the variation in pupils' performance. Educational processes in individual schools were found to contribute significantly to what is learnt. This study also emphasises the need for a balance between availability and usage of resources, a point clearly demonstrated in the case of textbooks, where textbook availability at the school level has a positive but small correlation with test scores, whereas pupils' use of their own textbooks and the number of textbooks at home have a significant relationship with test scores.

One very important, and perhaps counterintuitive finding, is that teacher qualifications except for university education appear to have little influence on primary 6 pupils' test scores in Uganda. There were substantial differences in pupils' average test scores within and between teacher characteristics. A surprising finding of the Uganda study is that teachers with higher formal qualifications are apparently not any more effective than those with lower qualifications (except for degrees). The study also found that teachers with the same level of qualification are not equally effective in improving pupils' test scores. These results may also be interpreted to mean that teachers with the same qualifications may have different teaching abilities.

Contrary to several earlier studies like that by Cohen and Hill (1997) and that by Wiley and Yoon (1995) who found higher levels of student achievement in mathematics to be associated with mathematics teachers' opportunities to participate in sustained professional development grounded in content-specific pedagogy, in-service training for teachers in Uganda appears to have little influence on pupils' test scores. The possible explanation for this negative relationship is that the training may not have focused on improvement in pedagogical skills, or have been linked to the new curriculum. The findings of this study point to the need to review in-service training to focus more on improvement of pedagogical skills. It appears that, in Uganda, current teacher training is unlikely to be in line with the

current curriculum, particularly since the primary teacher education curriculum was not reviewed when the primary education curriculum was reviewed. Finally, on teacher characteristics, teacher experience and age have a positive, but non-linear relationship with pupils' test scores (test scores increase up to a certain level of experience then decline).

The policy to reduce class size to below 55¹ (at primary 6) may not necessarily improve test scores. This study showed that some schools with large classes performed significantly better than others with smaller ones. Given the scarce financial and human resources, other factors which the Government can address might well have more impact on pupil achievement than reduction in class size to below 55, particularly for the upper grades. Such factors would include: focus on classroom and teaching processes and better use of available inputs: funds, classrooms, teachers, textbooks. Several high performing schools were found to have large class sizes, and this may point to the use of strategies for effectively teaching large classes.

This study also suggest that school inputs, measurable teacher characteristics (education, experience, and age) do not have a strong influence on performance of primary 6 pupils in Uganda, but rather other factors for example the way schools are managed, the mode and level of classroom interaction, teaching strategies, and better use of school inputs may be more strongly related to pupil performance. The importance of this for Ministry policy decisions is clear: support school management, particularly related to pedagogical support and classroom interaction, and improve teaching strategies.

The implications of these findings for policymakers in Uganda are:

- provide support to ensure automatic promotion,
- actively encourage appropriate age enrollment,
- reinforce the policy of getting books into the hands of children, and
- promote strategies for effectively teaching large classes.

Some of these lessons may be appropriate for other countries facing similar problems to those in Uganda. However, country-based research is needed to confirm this.

1. Currently advocating for 40 pupils to 1 teacher.

Introduction

Given increasing pressures on the budgets and expanding enrollment, it is important to implement strategies focusing on inputs that are most likely to improve student learning. However, for many African countries ignorance about what interventions work best and under what circumstances remains a major impediment to rational decisionmaking. Short of this, Governments in many developing countries may continue spending scarce resources on inputs that may not directly contribute to student learning achievement. This study, while more specific to Uganda, may have clear lessons for other developing countries.

The purpose of this study was to review the effectiveness in the use of resources in primary schools in Uganda as measured by student achievement scores.

Uganda has made tremendous progress in increasing access to primary education, since 1997 when the Universal Primary Education (UPE) policy in Uganda was launched. Substantial resources have also been allocated to primary education (67 percent of the discretionary recurrent budget to the education sector) to ensure that the objective of quality education is achieved. However, quality remains a major concern. It is argued that quality has deteriorated as a result of the supply of educational inputs not keeping pace with enrollment. The National Assessment of Progress in Education (NAPE) results for 1996 and 1999, as well as the results of the Uganda Participatory Poverty Assessment show that this is justified concern.

Education quality in Uganda has received a great deal of attention in recent years. In Uganda, there has been tremendous growth in enrollment since 1997 (enrollment of 3.1 million in 1996 to 5.1 million in 1997 and to 6.9 million by 2001). The Universal Primary Education Policy (UPE) has therefore met with considerable success over the last seven years in terms of increasing enrollment. Attention must now be focused on measures to improve learning. Such measures should ensure that children acquire the

necessary competencies and that resources invested in the Universal Primary Education (UPE) Program are used efficiently. This is particularly important given the possibility that primary education may be the only education that many of the children will receive.

Many people in Uganda have argued that compared to pre-UPE years, the quality of learning has gone down as a result of the provision of inputs not keeping pace with the rate of increase in enrollment. However, the relationship between inputs and student learning achievement in Uganda is not well understood. The general assumption is that more and better educational inputs like textbooks; better trained teachers and other inputs will improve student achievement. If improvements in material provision do not translate into improved student achievement, current and future investments in these areas may not be put to effective use. It is not uncommon to find schools with similar levels of inputs producing different results, and those with lower levels of inputs producing better results than those with higher levels of inputs. Thus increasing material resources alone may not necessarily improve student achievement.

Making better use of resources has become an urgent issue given the fiscal constraints, and raising enrollment levels that put pressure on the Government budgets, education being no exception. Substantial resources have been allocated to primary education sub-sector, to realize the objective of Universal Primary Education. In Uganda, the education sector takes 25 percent of the entire Government budget, of which over 65 percent is allocated to primary education in the medium term, and 33 percent of the discretionary recurrent budget is allocated to primary education. There is therefore very little room for increase of the Government budget to education. Not surprisingly the Government is particularly interested in ensuring that the education budget is used in the most cost effective and efficient manner.

Given increasing pressures on the budgets, there is need to implement strategies focusing on inputs that are most likely to improve student learning. A major impediment to rational decisionmaking in this area is lack of knowledge about what interventions work best and under what circumstances. Short of this, Government may continue spending scarce resources on inputs that may not directly contribute to student learning achievement.

Data Sources and Methodology

In order to show that inputs have an influence on pupil performance, the study needed to show that variations in inputs lead to variations in pupil test scores. Comparing test scores was dealt with by using standardised tests. The National Assessment of Progress in Education (NAPE) exercise tested and gathered contextual data (using pupil questionnaires) for about 3,994 grade six pupils from 200 schools, and administered questionnaires to 388 teachers and 200 head teachers. Pupils completed questionnaires about their demographics, home background characteristics, and classroom activities. Mathematics and English teachers were asked questions about their qualifications, demographics, experience and teaching strategies.

Data obtained from NAPE, teacher, head teacher and student questionnaires were used to show school differences and relationship of resources and processes with test

scores. Student specific data on achievement test scores and pupil characteristics was merged with other pupil data, teacher² and school level data to facilitate the analysis. Teacher data gives information on class size, teacher characteristics (teachers' gender, age, years of teaching, qualification, tenure in the same school, distance of residence from school). Processes like frequency of tests, frequency of homework, frequency of checking class work by head teachers, frequency of pupils working in groups, and use of textbooks in classrooms were also analyzed.

The sequence of analysis started with descriptive statistics, followed by a bivariate analysis (for example, correlation analysis), then multivariate analysis. Analysis of variance (ANOVA) was used to establish whether the differences between the variances are statistically significant or due to fluctuations of sampling. T-Test was used to test the significance of differences between two means. Results are grouped under the following headings: pupil background characteristics; school inputs; teacher quality; head teacher characteristics; differential effectiveness; results from the qualitative case study; and other factors.

This study is unique because of its use of a large sample size and a combination of qualitative and quantitative methods, which make this study different from many studies undertaken in the recent past. It therefore provides insights that can be generalized to primary 6 pupils in Uganda, are likely to apply to other upper primary grades, as well as perhaps providing some lessons for other countries. However, such generalization should be done with caution. For purposes of this report, analysis was limited to a few variables. Further analysis into factors that influence performance of primary school pupils in Uganda could be undertaken using the same data set.

Quantitative methods were used to analyze, summarize and present numerical data, while qualitative techniques provided supporting insight to discussions and presentation of data through analytical deduction. The analytical framework took the following form:

$$Outcome = \beta_0 + \beta_1 X_i + \beta_2 P_{i,k,j \neq i} + \beta_3 S_{i,k} + \beta_4 C_{i,l} + \epsilon$$

Where:

$Outcome_i$ = test scores for student i

X_i = vector of individual and family background characteristics for student i

$P_{i,k,j \neq i}$ = vector of measures of peer effects of students i , in school k (or at the class level)

$S_{i,k}$ = vector of inputs in school k where student i attends

$C_{i,l}$ = vector of regional level measures for region l for student i

$\epsilon_{i,k,l}$ = vector of errors for the individual, school, and region measures

Organization of the Report

Chapter 2 summarizes the geographical, historical, and socioeconomic context education in Uganda, outlines factors leading to the adoption of the Universal Primary Education Policy in 1997 and the challenges it faces and describes sources of data and methodology. The findings of the study are presented in: Chapter 3 for pupil background characteristics,

2. Teachers teach both Mathematics and English.

Chapter 4 for school inputs, Chapter 5 for teacher characteristics, Chapter 6 for teaching strategies and school administration, and Chapter 7 for differential effectiveness. Differential effectiveness reviews gender, school location, and ownership. Each chapter is organized as follows: first the descriptive statistics are presented, then the relationship between specific factors or characteristics and test scores, and then a discussion and an analysis of the findings in relation to expectations driven by the international and national literature and in relation to the situation in Uganda. Chapter 7 highlights conclusions, implications of the results for current and possible policies in Uganda, as well as future research.

Background

This Chapter gives an overview of Uganda’s demographic, social, and economic context, describes in detail the factors leading up to the adoption of the Universal Primary Education (UPE) Policy in 1997, the Policy itself, some indications of the challenges being faced in implementing the policy, and the structure of education in Uganda.

Socioeconomic Context

Uganda is currently divided into four statistical (non-administrative) regions: the northern, eastern, western, and central, and 56 administrative districts. Districts are further subdivided into counties, sub-counties, parishes, and villages.

The impact of a combination of Government-led reform and sustained development assistance has been impressive as reflected by sustained real GDP growth of about 6.4 percent annually during the 1990s and 21 percent drop in poverty (headcount index) to 44 percent in the five-year period since 1992. By 2000, Uganda had a GNP per capita of US\$300, still low compared to the average of US\$500 for Sub-Saharan Africa and US\$410 for low-income countries. In addition, it had a heavy debt burden, competing needs for national resources and political instability in some parts of the country remain obstacles to social service provision including education. It is predominantly a rural country with only 14 percent of the population living in urban areas. Life expectancy at birth is 42 years, low compared to Sub-Saharan Africa average of 50. The low life expectancy is partially attributed to the HIV/AIDS epidemic. Table 1 provides a summary of Uganda’s basic data.

Table 1. Uganda Basic Data, 2004

Total Population*	26 million
GNI per capita	US\$270
Population growth rate	2.8 %
Labor force growth rate	2.7 %
Proportion of urban population	14 %
Life expectancy at birth	43 years
Under five malnutrition	26 %
Access to improved water	50 %
Adult literacy rate (above 15 years of age)	67.1 %
Total fertility rate (births per woman)	6.0

* From 2002 preliminary census results (World Development Indicators database, April 2004).

(2001) found that this expansion in non-farm incomes in rural Uganda was significantly enhanced through education attainment.

Uganda's population was estimated at 26 million by 2004, with 52 percent women and 48 percent men. The mean household size is 4.8. However, about 10 percent of households have nine or more persons. In urban areas, 33 percent of the households have one or two members compared with 21 percent in rural areas. Fertility rate is 6.0, but varies across women sub-groups (7.4 for rural women and 4 for urban, 5.7 for women in central and 7.9 for those in northern, women with secondary education 3.9 and no education 7.8). Uganda's high population growth rate of 2.8 percent per year (the third highest in the world) poses a significant challenge in reducing poverty and inequality.

Uganda's demographic structure indicates a relatively young population, with almost half (47 percent) aged below 15 years. The primary school starting age is six years of age and the length of primary cycle is seven years. A total of 29 percent of the population is of primary school age.

Data from the Household Survey and Demographic Survey indicates that 63.4 percent of the men and 47.5 percent of the women are literate. There are regional, district as well as rural/urban differences in the literacy levels. Differences in literacy parallel those of education attainment. Literacy levels are higher in urban areas than in rural areas, with the gap between men and women being wider in rural areas where 60 percent of men are literate compared with 42 percent of women with a significant gap across regions. In the northern region for example, the literacy level for men is 69 percent compared to 24 percent for women.

Overall, 58 percent of the children below 18 years of age live with both their parents, while 18 percent live with neither their natural father nor natural mother.³ About 14 percent of children below 18 years are orphans. Among these, 3 percent have lost both their parents, 8 percent have lost their fathers and 3 percent have lost their mothers. There are however no statistically significant differences in orphan hood by rural/urban location, although fewer children in urban areas live with both their natural parents.

There are considerable levels of social and economic disparities in regions, districts, and rural/urban. According to the 2001 Household Survey, 35 percent of the population cannot meet their basic needs. An increasing number of these are found in the north. While crop agriculture remains the major source of income, non-farm activities have become more important source of livelihood in rural areas. Canagarajah

3. Demographic and Health Survey 2000/2001.

There is increasing evidence that domestic work has a considerable impact on education in Uganda (Munene and others 1997, Mwaka and Tumushabe 1996). Other studies (for example, Barnet and others 1995, Tumushabe, Bantebya, and Ssebuliba 1994) also found that girls are more often required to do more domestic labor than boys and, in case of loss of one or both parents, girls' education is more severely affected. According to the results of the demographic survey, 83 percent of boys and 88 percent of girls are likely to help with household work.

Overall, less than 5 percent of the children aged 5–17 years work for someone who is not a member of the household. Proportions do not vary with residence (rural/urban). However, old boys and children in the eastern region are more likely to work than other children. Children in the lowest family income quintile are also more likely to be working.

The proportion of the population living below the poverty line in Uganda declined from 56 percent in 1992 to 34 percent in 2000. However, data from the 2002/03 Uganda National Household Survey, suggest that the proportion of Ugandans with income below the poverty line increased from 34 percent in 1999/00 to 38 percent in 2002/03 (Table 1). According to this and other macroeconomic data, the pace of decline in poverty rates may be slowing, while inequality is increasing. Most of the deterioration arose from a rise in income poverty in rural areas, where the proportion of people living below the poverty line rose from 37 percent to 42 percent. Poverty is often transitory for those with incomes outside of crop agriculture, but chronic for those who rely primarily on crop agriculture for their livelihood. The conflict-affected north remained the poorest region (with 63 percent of the population living in poverty).

Only 9 percent of the households have access to electricity, ranging from 44 percent for urban areas to 2.4 percent for rural areas. While 77.7 percent of the urban population have access to radio, the proportion is 47 percent for rural areas. Television ownership was 26.6 percent for urban areas and 1.9 percent for rural areas.

The socioeconomic and demographic context influences demand, supply and quality of education in Uganda. They do not negatively influence the number of children requiring educational services, but also the ability of the system to provide children in the country with good quality education. Although Uganda has made substantial progress towards achieving the Millennium Development Goals (MDGs), more needs to be done if all are to be met. Special efforts will be needed to improve the quality of education services to ensure that children complete primary education and that gender disparity in education is eliminated.

The government, however, continues to be concerned that large fiscal deficits associated with high levels of aid will increase donor dependency and have adverse macroeconomic effects. Its priority is to use existing resources more efficiently and to target additional external resources (consistent with Uganda's macroeconomic framework) on investment in support of growth and physical infrastructure. The government is also giving priority to measures that will improve the effectiveness of existing public expenditure.

Overview of Education in Uganda

In 1990, Uganda participated in the World Conference on Education for All that was held in Jomtien, Thailand, and it was a signatory to the multi-nation EFA Declaration.

This Declaration promised the action needed to achieve universal primary education (UPE) in all countries by the year 2000, a goal on which most countries fell short but which focused the world's attention on the problem of children not in school (and on the problem of learning achievement for those children in school). Uganda reiterated its commitment to UPE in a Government White Paper of 1991 and again in the new (1995) Constitution, which states, "All persons have a right to education" and promised free and compulsory education for all. Government reiterated the goal in its antipoverty eradication action plan of 1996.

Universal Primary Education (UPE)

President Museveni announced the bold government initiative to achieve universal primary education in Uganda in December 1996. Under this initiative, from the following (1997) school year, *all Parent Teacher Association (PTA) fees* were abolished (except in urban schools), as were *all school tuition fees for up to four children from each family, two of whom should be girls*. In addition, there were no restrictions on the number of orphans in a family to benefit from UPE.

Impact of UPE on Enrollment. The impact of the UPE initiative on the private demand for education was extraordinary. The number of children enrolled in primary schools in 1996 was about 3.1 million.⁴ The number enrolled in 1997, the first year of the UPE initiative, is estimated to have been 5.2 million, a one-year increase of nearly 70 percent. Of these, 2.3 million or 45 percent of the enrollment were girls. In 2003, enrollment was 7.6 million, of whom 3.7 were girls.⁵

Equitable Access. Available evidence strongly suggests that the wealth bias that had characterized access to primary education prior to UPE had been eliminated by 1999. Despite efforts to improve access and retention, inequities persist because of poverty, gender (although the national average indicates parity), geographical isolation or other factors relating to negative cultural attitudes or particular local circumstances. While nationally, enrollment level between boys and girls are not very different, within regions girls' enrollment is still very poor (for example, Northern region). Gains made in access to education by girls in urban schools (53 percent in Kampala) are off set by low enrollments in a number of rural districts (Kitgum, Kotido, and so forth). While tuition fees are paid by Government, other costs to parents like uniforms, writing materials, teachers' welfare, and lunch, etc. can prove prohibitive for some children.

Impact of UPE Initiative on Learning environment. Not surprisingly, the explosion of enrollments since 1997 has placed enormous strain on an education system already widely regarded as uneven in terms of output quality. Until more classrooms can be built, more

4. This is an estimate only. Enrollment statistics before the launching of the UPE initiative were unreliable (see Ablo and Reinikka 1998). "Head counts" conducted in 1997 and 1999 have resulted in better information.

5. The figure for 2003 may not be quite comparable with those given here for 1996 and 1997. There is reason to believe that 1998 was the first year that private schools were included in the annual school census exercise in Uganda. Private school enrollments seem to be increasing as a share of total (private plus public) enrollments and may be as high as 8 percent by 2003

teachers hired and trained, and more instructional materials produced and distributed (factors to be discussed in detail below), the effect in the short run of higher enrollment has been to spread the available inputs more thinly. Given the absence of significant increases in the efficiency of input use, it is reasonable to assume that it has contributed to lower learning achievement levels.

The system was disrupted by a massive influx of pupils in schools after announcement of UPE, making delivery of education difficult. There have been a lot of investments in the sector since 1997 (the UPE year).

Classes were overcrowded, with none or inadequate furniture. In 2003, the stock of 71,478 completed classrooms was available yielding a pupil-classroom ratio of 95:1, down from 146:1 in 1999. The pupil-teacher ratio was 55:1 by 2003 with a target of 40:1 by 2005. The difficulties facing Government in recruiting and deploying teachers stem from the limited availability of trained teachers, the high attrition rate (currently 9 percent per annum) and the lack of willingness of teachers to serve in remote areas.

Instructional Materials. A recent study (Read and others 1999) estimated that the ratio of pupils to books in 1999 ranged from a high of 11:1 for English to a low of 18:1 for natural science. The national pupil:textbook ratio for the four “core” subjects (English, mathematics, social science and natural science) was 3:1 by 2003.

Pupil Background Characteristics in Uganda

This chapter provides descriptive statistics on pupil background, including parental education, number of books at home, distance of pupil's residence from school, language spoken at home, and number of people in pupil's home, pupil gender and age. The impact of the characteristic on pupil learning outcomes is then presented. Finally, the findings are discussed and some tentative conclusions drawn.

Parental Education

Levels of Parental Education in Uganda

The study found that about 29.8 percent of the pupils had mothers who had completed primary education, 27 percent did not finish primary education, and 15.6 percent did not attend school, while 14.5 percent completed senior 4, and 5.5 percent had university education. Almost a similar proportion of fathers had finished primary education (27.3 percent), 19.5 did not finish primary education, 8 percent did not attend school, while 22.5 percent finished senior 4, and 9.5 percent had university education. A higher proportion of pupils reported that their mothers had not completed primary (25.0 percent) compared to 17.9 percent of fathers with the same education level. Overall, fathers had more education with 40.7 percent having completed senior 4 and above, compared to 29.7 percent of the mothers in this category.

Pupil Performance and Parental Education

An examination of the relationship between pupils' performance and parents' education level was undertaken. Relative to pupils with parents who did not finish primary or just

finished primary, pupils with parents who finished senior 4, senior 6, or university performed considerably better. As indicates in Table 2, the mean English test scores of pupils increased from 18.89 with no father's schooling to 37.26 when the father had university education. Similarly, with mother's education test scores increased from 21.04 with no mothers schooling to 33.67 when mother had university education.

Level of parental education	Quantity (percentage of total in brackets)	Mean English test score (standard error in brackets)	Range
<i>Father's educational attainment</i>			
No schooling	299 (7.5)	18.89 (0.88)	0–76
Not finished primary education	716 (17.9)	21.10 (0.59)	0–80
Finished primary education	1002 (25.1)	21.54 (0.50)	0–84
Finished senior 4	831 (20.8)	26.04 (0.63)	0–82
Finished senior 6	473 (11.8)	27.61 (0.87)	0–81
University	349 (8.7)	37.26 (1.28)	0–89
Parental education missing	325 (8.1)	21.10	0–87
<i>Mother's education attainment</i>			
No schooling	577 (14.4)	21.04 (0.68)	0–78
Not finished primary education	1001 (25.0)	21.01 (0.48)	0–80
Finished primary education	1106 (27.7)	24.36 (0.53)	0–84
Finished senior 4	541 (13.5)	29.05 (0.86)	0–82
Finished senior 6	279 (7.0)	29.31 (1.25)	0–83
University	206 (5.1)	33.67 (1.76)	0–89
Parental education missing	286 (7.1)	20.95	0–87

N = 3995. Standard errors were not calculated where parental education was missing.

For mathematics, test scores increased from 24.44 with father who had no schooling to 34.19 with father who had a university degree (Table 3). For mothers, mathematics test scores increased from 26.91 with mothers who had no schooling to 31.28 with mothers who had a university degree. The increase in test scores was higher for English than for mathematics. However, for each level of parental education, there were some pupils with very high scores and those with very low scores. There was no difference between mean pupils' mathematics and English test scores for pupils whose mothers had no schooling and those who did not finish primary education. For father's education, there is a difference of about two percentage points in test scores for these two education levels. Not much difference was noted between mean test scores of pupils whose parents had finished senior 4 and those who had finished senior 6.

For both mathematics and English, the results show that the higher the level of parent's education, the higher the pupil's test scores. The analysis of variance statistics indicate F ratio of ($F = 6.68$, $df = 3679$) and ($F = 21.82$, $df = 3640$), which indicates that there were significant differences in the mean of the pupil's mathematics test scores across mother and

Level of parental education	Quantity (percentages in brackets)	Mean mathematics test scores (standard error in brackets)	Range
<i>Father's educational attainment</i>			
No schooling	299 (7.5)	24.44 (0.69)	1–67
Not finished primary education	715 (17.9)	26.66 (0.51)	0–76
Finished primary education	1002 (25.1)	27.05 (0.42)	0–82
Finished Senior 4	831 (20.8)	29.31 (0.50)	0–83
Finished Senior 6	474 (11.9)	29.20 (0.62)	0–72
University	349 (8.7)	34.19 (0.83)	1–80
Parents education missing	312 (7.8)	24.11	
<i>Mother's education attainment</i>			
No schooling	577 (14.5)	26.91 (0.57)	0–70
Not finished primary education	1002 (25.2)	26.72 (0.41)	0–76
Finished primary education	1106 (27.8)	28.63 (0.41)	0–83
Finished senior 4	541 (13.6)	29.72 (0.65)	2–79
Finished senior 6	279 (7.0)	29.10 (0.89)	0–72
University	204 (5.1)	31.28 (1.09)	0–80
Parental education missing	273 (6.8)	24.07	0–85

N = 3982. Standard errors were not calculated where parental education was missing.

father's education levels respectively beyond the 0.01 level. Similarly, for English analysis of variance ($F = 33.43$, $df = 3672$) and ($F = 56.45$, $df = 3672$) indicate that there are significant differences in the mean of the pupil's English test scores across mother and father's education levels respectively beyond the 0.01 level.

Analysis of the Findings on Parental Education

Earlier research, for example by Hanushek, found mother's education to have a significant influence on pupil's test scores. In this study, both Mathematics and English test scores increased with the education attainment of parents. Father's education had a stronger influence on both subjects than mother's education, and a stronger influence on mathematics than English. However, it should be noted that relatively few fathers had a degree. The highest increase in test scores was for pupils whose fathers had a university degree. These results are consistent with Hanushek's (2001) conclusion that pupils with families where parents have less education tend to systematically perform worse than pupils whose parents have more education.

These results possibly reflect the ability of parents to support the pupil's schoolwork, and likely interaction of literate parents with their children in school-related or literacy-nurturing activities, as well as their ability to support their children with homework or help with difficult homework questions. However, the conclusion that father's education has a stronger influence than mother's education is not consistent with some of the previous findings for example by Hanushek (2001) that found mother's education to have a higher

influence. The father's higher influence on both mathematics and English achievement is interesting in that fathers are more likely to help with homework (23.39 percent of pupils are supported by fathers in their homework compared to 16.83 by mothers). Culturally mothers are likely to be more occupied with household cores, and therefore have less time to spend helping with their children's homework.

Family Size

Pupils were asked "altogether how many people live in their home, including themselves." The number of people in a family ranged from 2 to 30, with an average family size of eight people.

Pupil Performance and Family Size

An examination of the relationship between family size and pupils' performance was undertaken. Results from this study indicate that pupils with smaller families had higher test scores for both mathematics and English. For English, the correlation results show that there is a negative and significant correlation (-0.072 ; $p = 0.05$) between pupils' literacy score and the pupil's family size. Similarly for mathematics, the correlation results show that there is a negative and significant correlation (-0.040 ; $p = 0.05$) between pupils mathematics score and family size of the pupil. However, the correlation coefficients for both mathematics and English are low. Overall, the correlations suggest that in general, pupils from larger families tend to do somewhat less well in mathematics and English than pupils from smaller families.

Analysis of the Findings on Family Size

For both mathematics and English, test scores decrease with an increase in the number of people living at home. However, the decrease is greater for English than for mathematics. It is possible that a larger number of people at home may not provide a conducive environment for pupils to study at home. Besides, attention is likely to be divided among many people. As suggested by Harbison and Hanushek's study of North East Brazil, it is possible that this is because of children's competition for parent's time, which reduces attention required for practice. Further, based on earlier analysis of household survey data, large family sizes are more likely to be those with lower levels of education, in which case it would not be surprising, because such families might be less able to support their children's academic work.

Distance of School from Pupil's Home

Out of the 3,833 pupils who responded to this question, about 39 percent of the pupils stay within a distance of less than one kilometer from school, 33.7 percent stay one to two kilometers, and 27.3 percent stay more than two kilometers from school.

Pupil Performance and Distance from School

An analysis of the relationship between test scores and distance of pupils' home from the school was undertaken. As indicated in Table 4, results of this study indicate that pupils resid-

Table 4. Distance of School from Pupil's Home and Mean Scores

Distance of school from pupil's home	Percentage of pupils by distance (N = 3833)	English mean score	Mathematics mean scores
Less than 1 km.	39 %	26.74	29.59
One to two km.	33.7 %	23.09	27.35
More than two km.	27.3 %	23.48	27.85

and mathematics, pupils residing far away from the school performed worse than those residing near the school. However, correlation analysis indicated that distance of school from pupil's home was found to be negative, but not significant (except for mathematics) and the quantitative values were small

Analysis of the Findings on Distance from School

The study found that pupils living further away from school performed worse than those living nearer the school. The direction is the same for both mathematics and English. The influence of distance from home is greater for English, with a difference of 2.46 points between pupils living less than one kilometer and those living more than two kilometers, compared to only 0.83 for mathematics. This finding is not surprising, as pupils who live further away from school are likely to arrive late at school, a factor identified by teachers as likely to lead to poor performance. Besides, these pupils spend more time walking to and from school and thus reducing the time available for study. They are also likely to be more exhausted as a result of the longer journey and therefore their level of concentration is reduced. It might also be that pupils who live further away from school are less likely to have reliable lighting at home, a prevalent factor in rural areas, which was also mentioned by teachers interviewed as one of the factors that influence pupil performance.

Table 5. Mean Mathematics and English Test Scores by Location

Location	English N = 3949 (Standard Error)	Mathematics N = 3956 (Standard Error)
Central Region	27.6 (0.06)	28.9 (0.04)
Eastern Region	20.1 (0.05)	25.7 (0.05)
Northern Region	19.2 (0.06)	27.3 (0.06)
Western Region	26.3 (0.06)	31.4 (0.05)
Uganda	24.6 (0.03)	27.8 (0.03)
Rural	20.2 (0.05) N = 2863	26.2 (0.04) N = 2883
Urban	40.3(0.04) N = 1050	36.8 (0.06) N = 1054

Regional Pupil Performance

Table 5 gives mean test scores by school location. These results indicate that for English the central region had the highest mean test scores, with a mean test score of 27.6 percent, followed by Western region with a mean test score of 26.3 percent and Northern region had the lowest mean test score at 19.2 percent.

For mathematics, the Western region had the highest mean test scores, 31.4 percent, followed by Central region with 28.9 percent, and Eastern region has the lowest at 25.7 percent.

Analysis of variance results indicate significant differences in test scores by location with ($F = 419$, $df = 3915$) for mathematics and ($F = 824.24$, $df = 3,906$) for English, both at $p = 0.01$.

Analysis relating test scores and location of a school indicates that pupils in rural schools were likely to score on average 9.7 percent less in English and 6 percent in mathematics compared to their counterparts in urban schools. Regression analysis between school location and test scores indicates a negative and significant relationship, -0.460 ($p < 0.01$) and -0.320 ($p < 0.01$) for English and mathematics respectively, both in favour of urban schools. The dummy variable representing school location shows that pupil's mathematics test score was 7 points higher when a pupil was in an urban school as compared to those in a rural school. Pupils in urban schools were found to differ significantly from those in rural schools $p = 0.05$. For English, the dummy variable representing school location indicated that a pupil's English test score was 16 points higher when a pupil was in an urban school as compared to when a pupil was in a rural school. Pupils in urban schools were found to differ significantly from those in rural schools at $p = 0.05$.

Further analysis on a regional basis indicates that pupils in Western Region scored 5 and 2.5 points higher in mathematics and English respectively compared to the central region (Table 6). Both these coefficients were significant at 1 percent.

The coefficients for pupil test scores in Eastern region were negative and significant at 1 percent level of significance. This study shows that pupils in the Eastern region scored 9.4 percent and 4.1 percent less in English and mathematics compared to those in the Central region.

Location	School level Scores		Pupil Level Scores		Social Economic Indicator ⁶
	English	Math.	English	Maths.	
Rural	-9.695***	-6.080**	-15.947***	-7.803***	42.7 rural; (urban = 14.4)
Eastern	-7.765***	-3.038*	-9.453***	-4.146***	46
Northern	-8.227***	-0.856	-3.407***	2.165**	63
Western	-0.780	2.634	2.518***	5.078***	32.9
Central					22.3

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

The relative ranking of regions based on test scores was not the same as that based on the socioeconomic indicators. If this had been the case, the Eastern Region would have had higher test scores than the Northern Region.

This study indicates marked differences in pupils' test scores between and within regions, as well as between and within rural/urban location. Analysis indicates that schools

6. Percentage of individuals estimated to be living in a household with private consumption per adult equivalent or below the poverty line (Uganda House Hold Survey 2002).

in rural areas are likely to score on average lower in English and mathematics compared to their counterparts in urban schools. This is not surprising as pupils from rural areas in Uganda are likely to be from families that have less education, and are more likely to be involved in household help for example fetching water, and collecting firewood. Besides, they are less likely to have reliable lighting, which helps to increase hours of academic focus. Analysis on a regional⁷ basis indicates that pupils in Western Region scored higher in mathematics and English compared to the central region.

Overall, pupils in the central region had higher mean English test scores than other regions, while the West had higher mathematics test scores than any other region. In addition, urban schools performed better than rural schools.

Number of Books at Home

Pupils were asked how many books there are at their home. Responses ranged from none, one to five, six to ten, and more than ten. Analysis of responses to this question indicate that 32 percent had no books at home, 31.2 percent had 1-5 books at home, 13.2 percent had 6-10 books at home, and 23.6 had more than 10 books at home.

A further investigation asked pupils whose English textbooks they use, and 15.4 percent indicated that they use their own, 78 percent use school textbooks, 3.4 percent use their friends' and 3.3 percent use none. For mathematics, the levels are almost the same.

Pupil Performance and Number of Books at Home

An examination of the relationship between the number of books at home and pupils' performance was examined. The results show that pupils who had more than ten books at home had a higher mathematics score compared to those who had 6-10 books at home, 1-5 books at home, and no books at home (Table 7). A similar pattern was obtained for English (Table 8).

Number of books	Pupil's Mathematics Score					
	N	Mean	SD	Min	Max	Range
None	778	27.56	14.41	0	85	85
One to five	777	29.14	14.49	0	84	84
Six to ten	321	26.56	13.66	1	77	76
More than ten	560	34.01	14.73	2	87	85
Total	2436	29.42	14.65	0	87	87

Note: 1520 cases dropped from the analysis.

The analysis of variance indicates that mean pupil mathematics scores for the number of books at home ($F = 27.55$; $df = 24.35$) are significantly at ($p = 0.01$). A similar relationship was observed for English ($F = 40.55$; $df = 2423$) at $p = 0.01$.

7. Uganda is divided into five geographical regions (northern, southern, eastern, western, and central).

Table 8. Number of Books at Home and English Test Scores

Number of books	Pupils' English Score					
	N	Mean	SD	Min	Max	Range
None	777	22.45	17.89	0	86	86
One to five	775	26.07	19.07	0	84	84
Six to ten	315	24.19	19.21	0	84	84
More than ten	557	33.93	21.43	0	91	91
Total	2424	26.47	19.76	0	91	91

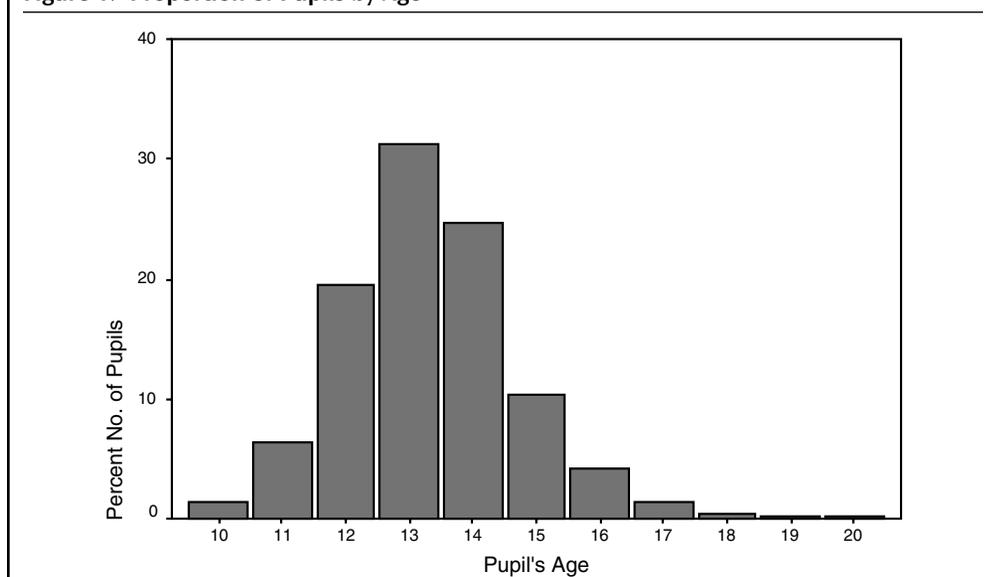
Note: 1523 cases dropped from the analysis

Analysis of Findings on Number of Books at Home

Books at home which proxies for educational and social background of the family, was found to have a strong positive relationship with pupil test scores. The level of performance increases with the number of books at home. The greater influence on English is interesting. It is likely that the higher number of books gives a chance for pupils to read more and therefore master the language. This conclusion is in line with the views of the teachers interviewed, who emphasized reading more magazines and books in order to do better, especially in English. In addition, pupils who have more books at home also have parents with higher education attainment, a variable that has been found to have a positive influence on test scores.

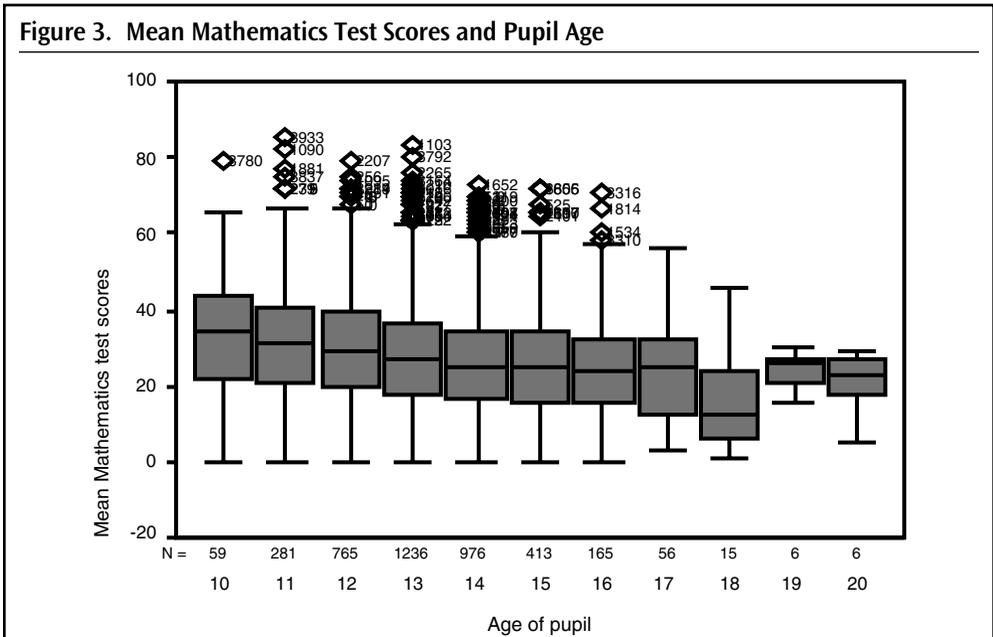
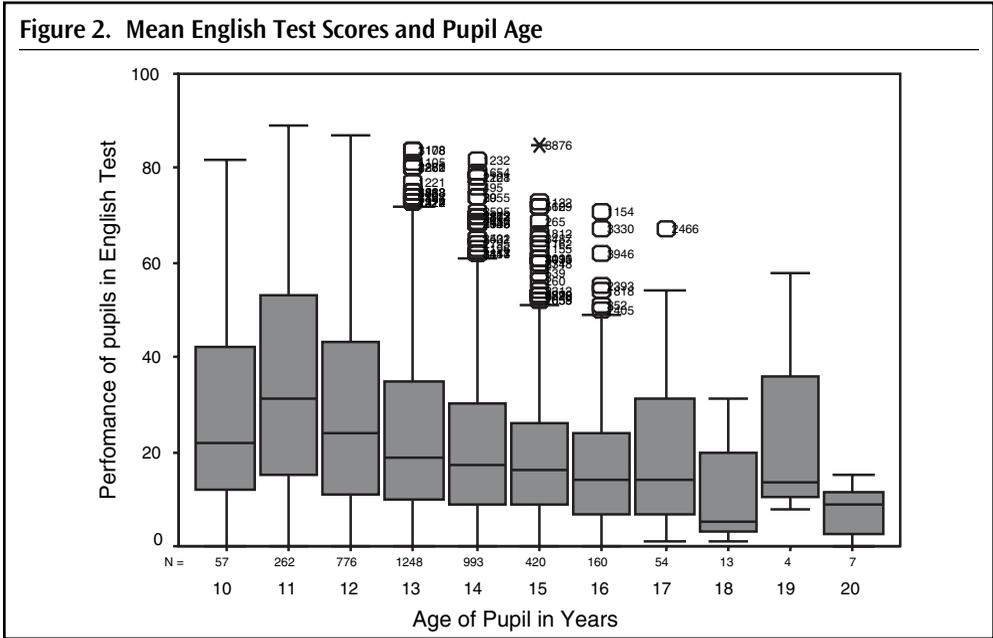
Pupil's Age

The pupil questionnaire asked for their age. Analysis of results found that the mean age was 13.2 years with minimum at 10 and maximum 20 years. Figure 1 indicates that most pupils were in the age range of 12–14 years.

Figure 1. Proportion of Pupils by Age

Test Scores and Pupil's Age

Figures 2 and 3 are a graphic presentation of pupil mean scores against their age. These figures indicate that pupils' test scores fall with increase in age. This study indicates that younger pupils (10–12 years) attained higher scores than older ones (13–20). Those below 12 years scored an average of 30.4 percent, while those of 15 years and above scored 19.8 percent.



Analysis of Findings on Pupil Age

Younger pupils scored significantly higher than older pupils in both mathematics and English. The correlation for age with test scores is negative and significant for both mathematics (-0.153 , $p < 0.01$) and English (-0.188 , $p < 0.01$). These results indicate that older pupils are likely to have lower scores than younger ones. The influence of age is higher for English than for mathematics. Indeed, the study found that pupils of the appropriate age (11 years for grade 6) for the grade performed better.⁸ Older pupils are likely to be repeaters (discussed later), are more likely to be working and therefore have less time to devote to out-of-school study, are likely to be irregular in attendance due to the need to participate in other household activities or work on market days, and might be receiving less parental support on academic work due to inability of parents, or may simply be slow learners. Clearly, enrolling children at the appropriate age and promoting them each year is a good policy measure for Uganda. This is further discussed later under repetition.

Language Spoken at Home

Home Language of Pupils in Uganda

Pupils were asked what language they speak at home most of the time. Options for answers were: (1) “English only”; (2) “Vernacular only”; (3) “Both English and vernacular.” Out of 3916 pupils who responded to this question 64.2 percent spoke vernacular at home, a very small proportion 3.9 percent speak English only at home, while 31.9 percent speak both English and vernacular.

Pupil Performance and Home Language

An examination of the relationship between language spoken at home and pupils’ test scores indicates that pupils who spoke “English only” attained lower mean test scores in both Mathematics (20.71 percent) and English (16.75 percent). Mathematics test scores were higher in all cases. Pupils who spoke both English and vernacular at home scored almost double (28.34 percent) the English test scores of those who spoke English only (16.34 percent). For mathematics, pupils who spoke both English and vernacular at home scored almost ten points higher (30.63 percent) than those who spoke English only (20.71 percent). However, the finding that those who speak English only scored less than the other two categories should be taken with caution given the small number of pupils in this category and the relatively higher standard error.

Analysis of Findings on Language Spoken at Home

An interesting finding of this study is that pupils who spoke both English and vernacular at home scored higher (31.58 percent) compared to 28.11 percent for those who spoke vernacular only. Pupils who spoke “English only” had significantly lower mean test scores in both mathematics and English. Mathematics test scores were higher in all cases. The higher

8. In Uganda the official age of entry into primary one is six years.

test scores for pupils who spoke both English and vernacular at home is possibly because such pupils are likely to be coming from families of more educated parents, a factor which this study has found to be associated with higher test scores. As indicated by teachers interviewed, perhaps speaking English and vernacular at home provides opportunity for pupils to practice English, the language of instruction, and vernacular helps them to relate what they learn in English into their real life context.

Overall Results for Background Characteristics and Pupil Test Scores

Overall, these results are not consistent with those of earlier studies in developed countries that came out with strong influence of pupil background characteristics, but are consistent with the findings of earlier studies in developing countries like that of Heyneman and Loxley's (1983) that concluded that family characteristics exert less influence on pupil performance. An earlier study in Uganda by Heyneman (1976), found a weak correlation between academic achievement for primary school pupils and a summary index of socio-economic status consisting of paternal schooling, maternal schooling, and number of modern possessions at home. Similar studies in developing countries also found weak influence of pupil's home background characteristics. This study found a positive relationship between number of books at home, language spoken at home (combination of English and vernacular), and pupil's performance. On the other hand, there was a negative relationship between pupil's age, distance of pupil's home from school, and family size to have a negative influence on pupil's test scores.

Other factors considered important are pupil's punctuality, regular attendance, parental interest (reflected in punctuality and attendance), and presence of electricity or reliable lighting at home are associated with higher test scores. It is clear that all these factors lead to extension of learning time in one way or the other, a factor which has been found to be associated with higher pupil performance.

Availability of School Inputs and Pupil Performance in Uganda

This chapter provides descriptive statistics on school inputs, particularly those that can be influenced by government policy in the best educational interest of Ugandan children. Variables such as class size, pupil/teacher ratio, per pupil expenditure, number of textbooks, and pupils per desk are examined. Descriptive statistics were worked out to establish the level of availability of inputs. This was followed by analysis of variance (ANOVA) to establish the significance of the differences in the level of availability of inputs between and within different school locations and type of ownership. Further, the relationship between availability of inputs and pupil performance is examined followed by a discussion of these results. The chapter ends with a summary of results.

Class Size

Table 9 shows class size by school ownership. Average class sizes in this study are large with numbers ranging from 53 pupils for private schools, 75 pupils in Government-aided schools, 85 pupils in urban schools, and 69 pupils in rural schools. Government-aided urban schools had the highest average class size (95 pupils) compared to 48 pupils in urban private schools. Similarly, Government-aided rural schools had higher average class sizes (70 pupils) compared to 61 pupils for private rural schools. In Government-aided primary schools class sizes range from a minimum of 10 pupils to a maximum of 198 pupils,⁹ while those in private schools range from a minimum of 10 to a maximum of 137 pupils. An interesting aspect of class size in this study is that the majority of primary 6 pupils (63 percent) were in classes of over 60 pupils, 23 percent in classes of 41-60 and only 13 percent

9. There is a possibility of more than one stream in some of these classes.

are in classes of less than 40 pupils. Such large class sizes are not comparable to those in many other studies where class sizes were around 40 pupils. This study also found significant differences in class sizes between and within school location and school ownership.

Table 9. Class Size by School Ownership

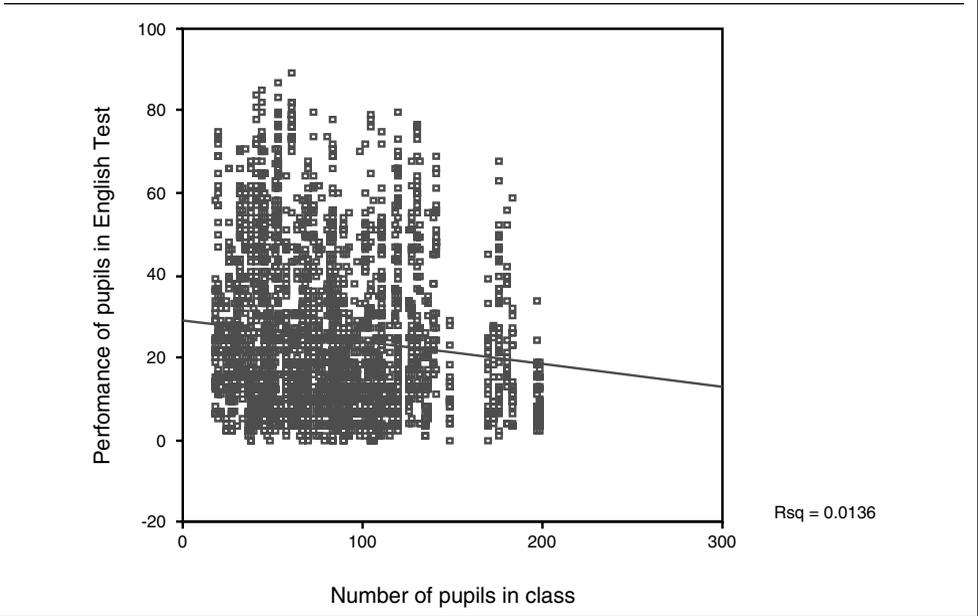
School Ownership	Class size						
	N	Mean	Standard Error	SD	Min	Max	Range
Government	171	75.32	3.09	40.42	9.5	198	188.5
Private	18	53.53	7.03	29.81	9.5	137	127.5
Total	189	73.25	2.91	39.98	9.5	198	188.5

Note: 12 cases dropped from the analysis due to missing information.

Pupil Performance and Class Size

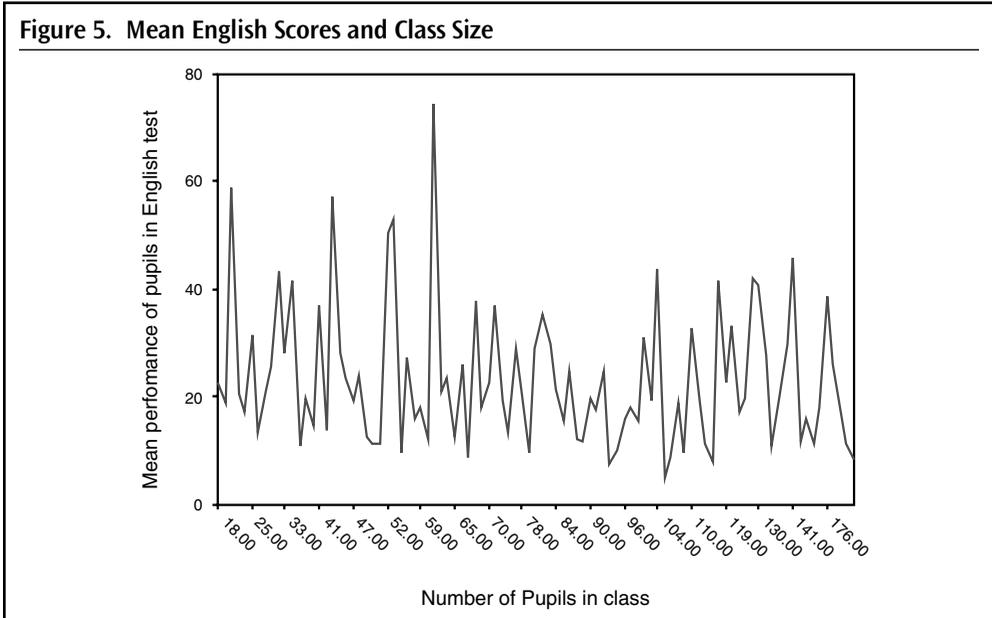
A relationship between pupils’ performance and class size was examined. Figures 4, 5, 6, and 7 indicate scatter plots and line graphs of test scores in English and mathematics against class size. The scatter plots for test scores against class size demonstrate that English test scores decrease slightly with increase in class size (R-squared of 0.0136).

Figure 4. English Test Scores and Class size



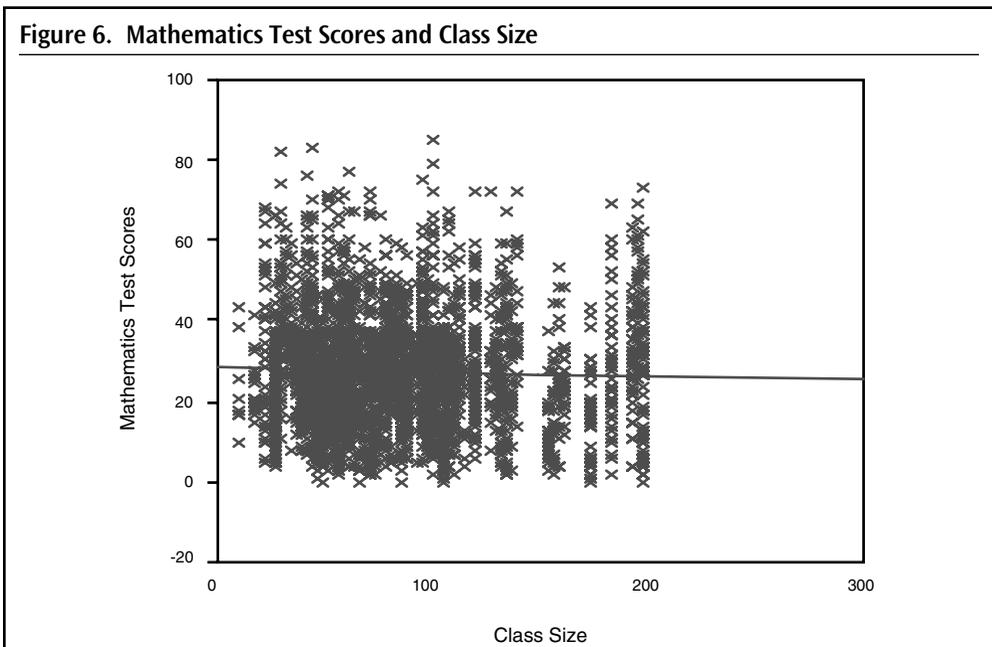
The scatter plot for mathematics indicates no discernible change in test scores with increase in class size (R-squared is 0.0005; this is so small that it is clearly not significant).

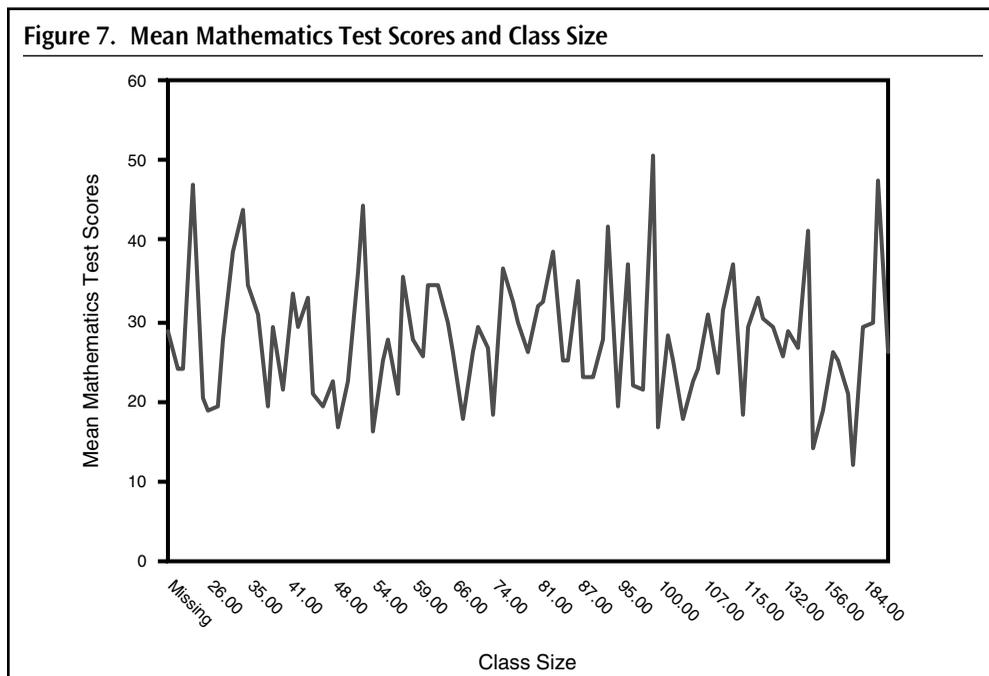
It is clear from Figures 4, 5, 6, and 7 which for both mathematics and English, pupils in large classes can score as high as those in smaller classes. However, for English, there



is indication that class sizes of about 60 pupils have the highest mean scores. For mathematics, the highest scores are between class sizes of about 50 and about 60.

The correlation coefficients for class size with mathematics (-0.121 ; $p = 0.05$) and English test scores (-0.063 ; $p = 0.05$) are negative and significant. This shows that pupils in schools with a large class size have lower mathematics and English test score compared to those from schools with a small class size. However, the coefficients are





rather low. These correlation results are in line with those of the regression analysis (Appendix A).

Analysis of Findings on Class Size

Earlier studies by Fuller (1987) found the presence of fewer students per class had no consistent effect on achievement.¹⁰ While Fuller (1987), Lockheed and Hanushek (1988), Schiefelbein and Simmons (1981) did not find significant impact of class size on pupil's scholastic achievement, others like Hanushek and others (2001) concluded that class size effect is different at different ages and grades. Glass, McGaw, and Smith (1981) argue that the effect of class size is likely to be small if average class sizes are outside those where marginal changes in class size have been observed to have positive and significant effect. Indeed, while many of the previous studies in developed countries worked with class sizes of 30 or less, this study deals with a range from 10 to 198. TIMSS data also indicates that countries with the highest test scores (Korea and Japan) had the largest Grade 8 class sizes.

This study found large class sizes to be somewhat related to lower pupil test scores. However, in some cases, pupils in large classes scored as high as those in smaller classes. Further scrutiny using graphic presentation indicates no explicit relationship between class size and test scores. It is surprising that for English, pupils in classes as large as 141 had a mean score of 46.10 percent, an average score much higher than those of several sample schools with class sizes of below 40.

10. Although the numbers considered in the Fuller study referred to a normal range of between 20–30 pupils.

Although the correlation coefficient for pupil scores is negative and significant for both mathematics (-0.121 , $p < 0.05$) and English (-0.063 , $p < 0.01$), these coefficients are rather small. For English, the best performing school had a class size of 61 pupils and a mean score of 74.65 percent, with scores ranging from 47 to 89 percent, which is much better than the results of pupils in smaller class sizes in other schools. The influence of class size is greater for mathematics than for English. However, for English, there were indications that class sizes of about 60 pupils have the highest mean scores. For mathematics, the highest scores are at class sizes of about 50 and about 100. These results are surprising, and are not strongly supportive of the popular policy on reducing class size to 40 pupils per teacher.

There are several explanations for this pattern of results. First, the current staff establishment formula for primary school teachers allocates a teacher for every 54 pupils regardless of availability of classrooms. It is also a common practice to have more than one teacher attending to pupils in the same classroom at the same time, thus allowing more teacher attention for each individual pupil. However, in other situations, while an extra teacher may be available, teachers put all pupils in one classroom and organize themselves to teach in turns so that while one teacher attends to a large class, the other runs other, including personal, errands outside class. Thus, the actual pupil:teacher ratio is much higher than the calculated one and individual teacher attention to pupils remains low.

Second, some schools attract many pupils because of their historically good performance, and therefore end up with large class sizes.

Third, those schools with smaller class sizes, but with poor performance are likely to be located in rural areas, are under resourced, pupils and teachers stay further away from school, are more likely to have untrained teachers (who either did not complete secondary education or completed secondary education without teacher training) all of which were associated with lower test scores. Are you saying this earlier? Isn't teacher training irrelevant?

Head teachers interviewed under this study highlighted availability of adequate numbers of motivated teachers who have interest in the subject as one of the major factors that influence achievement. Teachers interviewed also highlighted the difficulty in controlling pupils in large classes as being a major problem that makes regular monitoring of pupil progress difficult.

Schiefelbein and Simmons (1981) in their review of 26 studies concluded that achievement is not significantly boosted by reducing class size. Moreover, since achievement can be high in classes of fifty or more (for instance in Korea) effective teaching strategies do exist for large classes. Farrell (1993) also noted that instructional techniques (depending on cultural values and attitudes) and instructional materials, as well as the issues of physical class size and furniture arrangements, can affect how larger class numbers are best served.

Hanushek and Luque (2001) concluded that class size effect is different at different ages and grades. While Elmore (1995) also cautions that reform in class size must move beyond a structural fix that may only be weakly related to changes in teaching practices. The problem is that when large class sizes are reduced, sometimes there is no gain in learning achievement, as teachers often do not change their teaching styles to adjust to the new situation.

From the foregoing analysis, it is clear that smaller class sizes do not necessarily lead to higher test scores, and other factors besides class size could help to explain performance of primary 6 pupils in Uganda. Other factors highlighted in earlier studies include effective teaching strategies (Schiefelbein and Simmons, 1981); physical class size, furniture arrange-

ment, and instructional techniques (Farrell, 1993); age and grade of pupils (Hanushek and others 2001). Farrell (1993) also concluded that there are effective teaching strategies for large classes. Therefore, it might be reasonable to conclude that class reduction should be accompanied by other changes, for example, in teaching practices in order to lead to improved learning. For upper grades, class size could be maintained at about 55 pupils, and if accompanied by better teaching strategies can be effective in raising test scores. Clearly, the relationship between class size and pupils' test scores is complex and warrants more study.

Textbooks

Table 10 indicates that urban schools had a higher number of mathematics textbooks available as demonstrated by the lower pupil to textbook ratio (6) compared to rural schools (14). In urban schools on average six pupils shared a mathematics textbook, while in rural schools an average of fourteen pupils shared a mathematics textbook.

School location	Level of Text Books Availability						Range
	N	Mean	Standard Error	SD	Min	Max	
Urban	33	6.40	1.09	6.26	0.1	27.8	27.7
Rural	126	14.14	1.89	21.26	0.7	158	157.3
Total	159	12.54	1.54	19.38	0.1	158	157.9

Note: 42 cases dropped from the analysis due to missing information

This study indicates that there were no significant differences in availability of textbooks between Government-aided and private schools. There was however a significant difference in availability of textbooks between rural/urban location. Further, results of this study indicate that Government-aided urban schools have the best pupil to textbook ratios (about six pupils sharing one mathematics textbook), although still inadequate, compared to 15.86 in private urban schools.¹¹

In order to explore the issue of the extent of availability of textbooks to pupils, they were asked a question as to whose textbooks they use. Responses ranged from: (1) "My own"; (2) "Of the school"; (3) "My friends"; (4) "None." Analysis indicates that for English 78 percent of the pupils depend on school textbooks, while 15.4 percent have their own textbooks. For Mathematics 76.6 percent depend on school textbooks, 15.5 percent on their own books, 3.38 percent on friend's books and 3.16 none. Most pupils therefore relied on school textbooks.

11. Such high levels were recorded because data for this study was collected before a large consignment of books for Grade 5-7 was delivered to school. Ratios in Government-aided schools have since improved to 3: 1.

Pupil Performance and Textbook Availability

This study examined the relationship between textbook availability and pupils' performance. The correlation coefficients for textbook availability (ratio of class size to the number of textbooks available) and mathematics (-0.083 ; $p = 0.05$) and English (-0.126 ; $p = 0.05$) test scores are negative and significant. This indicates that pupils who are in schools with a high ratio of pupils to the number of textbooks (fewer textbooks) available have lower mathematics and English test score compared to those who are in schools with a low ratio of pupils to textbooks. Although significant, the correlation coefficients are low. These results are in line with those of the regression analysis (Appendix A).

Analysis of Relationship between Pupil Performance and Textbook Availability

Earlier studies like those by Heyneman and others (1981), Heyneman and Loxley (1983), Purves (1973), Heyneman and Loxley (1983), Schiefelbein and Clavel (1977), and Fuller and Chanta Vanish (1977) found that textbooks and other instructional materials had a consistently positive effect on student achievement. Farrell (1993) in reviewing cost effective inputs that result in improved student achievement described greater availability of textbooks and reading materials as the best bet. Results of this study are not entirely in line with this finding.

It is not surprising that in Uganda, a high pupil to textbook ratio (meaning that more pupils share fewer textbooks) has a very small but negative correlation with test scores for both English and mathematics (-0.126 ; $p = 0.05$ for English) and (-0.083 ; $p = 0.05$ for mathematics). Although the coefficients are small, this may imply that the higher the number of pupils sharing a book, the lower the test score. However, all eight teachers and six out of eight head teachers interviewed in the case study highlighted availability of textbooks for pupils and teachers as one of the major factors that enhance learning. Teachers believe that if textbooks are available and put to use, the time that would have otherwise been used for copying work from the teacher's copy to the blackboard is saved. Textbooks availability would also allow for more personal study by pupils.

However, when data is aggregated at the school or classroom level, what may be captured may not be the effect of the individual pupil's access to textbooks on that pupil's learning achievement, but the effect of a teacher's use of the textbook. This study found that more than 75 percent of pupils depend on school textbooks for both mathematics and English. In all except one of the eight schools in which classroom teaching was observed, textbooks were kept in the head teacher's office, and were hardly used during the lesson. Even teachers who brought textbooks to the lesson did not refer to them. The most common use of textbooks by teachers was to extract and copy work on the blackboard for the pupils. Clearly, pupils had limited access to textbooks. Teachers indicated that the reason why textbooks were not used was because they were not available in sufficient numbers.

Based on findings from this study, it might be reasonable to conclude that provision of textbooks should be accompanied by increased access to them by pupils. In this regard, the new policy of "books in the hands of children" which allows pupils to take school textbooks to their homes is a step in the right direction. This may increase the influence of school textbooks on pupil's test scores. Where textbooks are available, this frees the teacher

to engage in other teaching practices. Textbooks may therefore be important learning aids for students, but also as a necessary condition for teachers to use more effective teaching techniques. For this reason, it is important that access to school textbooks by pupils is monitored and evaluated.

Limited use of textbooks by teachers may also point to the need for guidance to teachers on use of textbooks in order to enhance the impact of textbooks on pupils' learning. McGinn, 1993, highlights the effectiveness of teacher guides in giving pedagogical suggestions, recommending activities for classroom use and offering diagnostic tests to help teachers monitor student learning and to modify lessons accordingly. He argues that availability of such materials allows teachers to "diversify their teaching repertoire" affords students the opportunity to work in both groups and individually, enables the teacher to divide a class into smaller units, where most students can be productively occupied while the teacher works with others, and allows homework assignments that extend learning time.¹² Farrell (1989) also notes that a well designed teachers' manual or guide accompanying textbooks is a very effective form of in-service teacher training.

A study by Glawe, Kremer and Slviemoulin (2001) found little evidence of the impact of textbooks on the average test scores of students in Nigeria, contrary to results found in Nicaragua and the Philippines. The possible explanation was lack of training for teachers in the use of textbooks, extensive training was provided in the Philippines and minimal training in Nicaragua.

In line with what was highlighted by McGraw and others (1992) teachers interviewed also considered the match between the curriculum and textbooks as another important factor. Some teachers interviewed highlighted the mismatch between the new curriculum and primary 6 textbooks as limiting the use of these textbooks, thus having a negative influence on pupil performance. The mismatch between the new curriculum and textbooks was an issue because of the time lag between introduction of the new curriculum and provision of accompanying textbooks. This may be something to avoid in future by ensuring adequate planning and synchronization of delivery of resources to deliver the curriculum with the introduction of a new curriculum.

Funding Per Pupil¹³

Table 11 indicates funding per pupil by school location. Urban schools had higher mean funding per pupil U Sh 37,772. compared to rural schools with U Sh 12,093.

The results of this study indicate that government schools had lower mean funding per pupil U Sh 12,956 compared to private schools with U Sh 66,406. Results also indicate a high level of variation as demonstrated by the high range as well as high standard deviation. Per pupil funding in Government-aided schools ranged between U Sh 673 to U Sh 141,983 while that of private schools ranged from U Sh 2,839 to U Sh 195,312.

12. McGinn notes that instructional resources can provide teachers assistance in the pacing of lessons, sequencing of material, and regulation of time on task. Such direction for teachers can increase the amount of time actually devoted to the curriculum and thus improve student learning.

13. This funding does not include teachers' salaries and head teacher's salary.

Table 11. Funding Per Pupil by School Location
(in Ugandan Shillings)

School location	Funding per pupil						
	N	Mean	Standard Error	SD	Min	Max	Range
Urban	36	37772.26	8750.63	52503.78	2272.72	195312.50	193039.80
Rural	133	12093.28	1363.08	15719.80	673.40	95312.50	94639.10
Total	169	17563.36	2281.47	29659.12	673.40	195312.50	194639.10

Note: 32 cases dropped from the analysis due to missing information.

Mean funding per pupil for Government-aided rural schools (U Sh 10,707) is less than half that for corresponding urban schools (U Sh 22,811), and that for urban private schools (U Sh 99,752) is about three times that for corresponding rural schools (U Sh 31,182). Private urban schools have the highest mean funding per pupil at U Sh 99,752 compared to U Sh 31,182 in private rural schools, U Sh 22,811 for Government-aided urban schools, and U Sh 10,707 for Government-aided rural schools.

The results indicate that urban schools had higher funding per pupil compared to rural schools and government schools had lower funding per pupil compared to private schools. Further, government schools in urban and rural areas had lower funding per pupil compared to the private urban and rural schools respectively.

About 68.4 percent of the pupils are in schools where per pupil expenditure is between U Sh 20,000 and U Sh 50,000, 15.8 percent in schools of below U Sh 20,000, while 15.8 percent are in schools where per pupil funding is above U Sh 50,000.

Pupil Test Scores and Funding Per Pupil

The relationship between funding per pupil and pupil's test scores was examined. Scatter plots in Figures 8 and 9 show pupil's test scores against funding per pupil (with dots characterizing each school in the sample). These graphs indicate that most schools are clustered around the points below per pupil expenditure of U Sh 50,000. In addition, at any level of per pupil funding, a wide variation exists in the pupil's test scores. At any level of per pupil expenditure, there is a range of schools with low mean scores and those with high mean scores. Some schools are able to get high mean test scores with a certain level of funding, whereas others score significantly less.

Most schools fall within a range of mean scores of 10-30 percent with funding per pupil of U Sh 5,000 to U Sh 45,000. However, there are a few outlier schools. Further, the relationship between per pupil expenditure and test scores is relatively weak as demonstrated in a very small gradient of the line of best fit for both mathematics and English. This means that increase in per pupil expenditure only explains about 0.007 and 0.002 of the increase in mathematics and English test scores respectively. Therefore, funding per pupil does not help to explain much of the variation in mathematics and English test scores.

The correlation coefficients for funding per pupil and mathematics (0.237; $p = 0.05$) and English (0.374; $p = 0.05$) test scores are positive and significant. This shows that pupils who attend schools with high funding per pupil have higher mathematics and English test

Figure 8. Funding Per Pupil and Mathematics Test Scores
(in Ugandan Shillings)

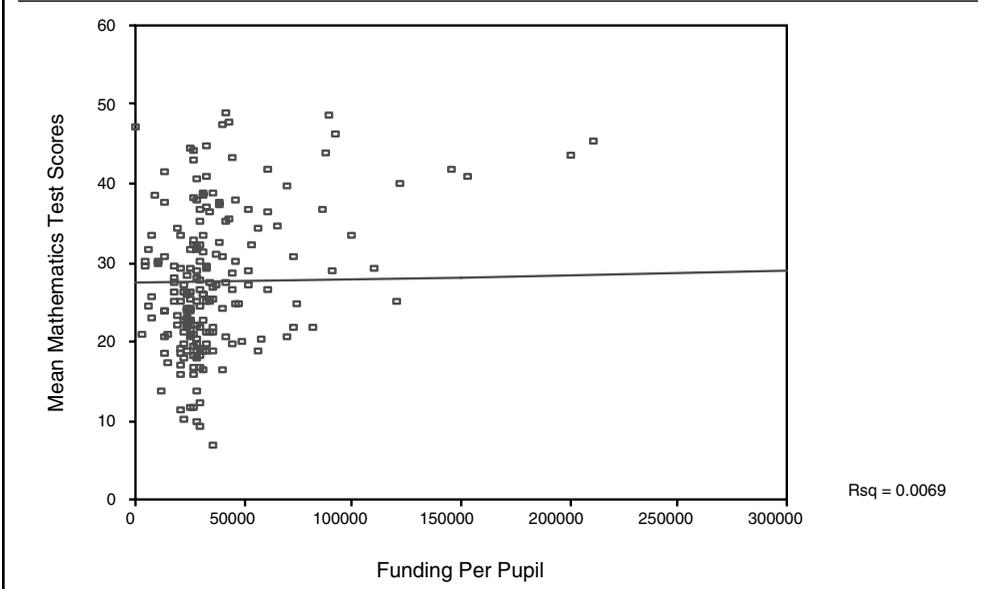
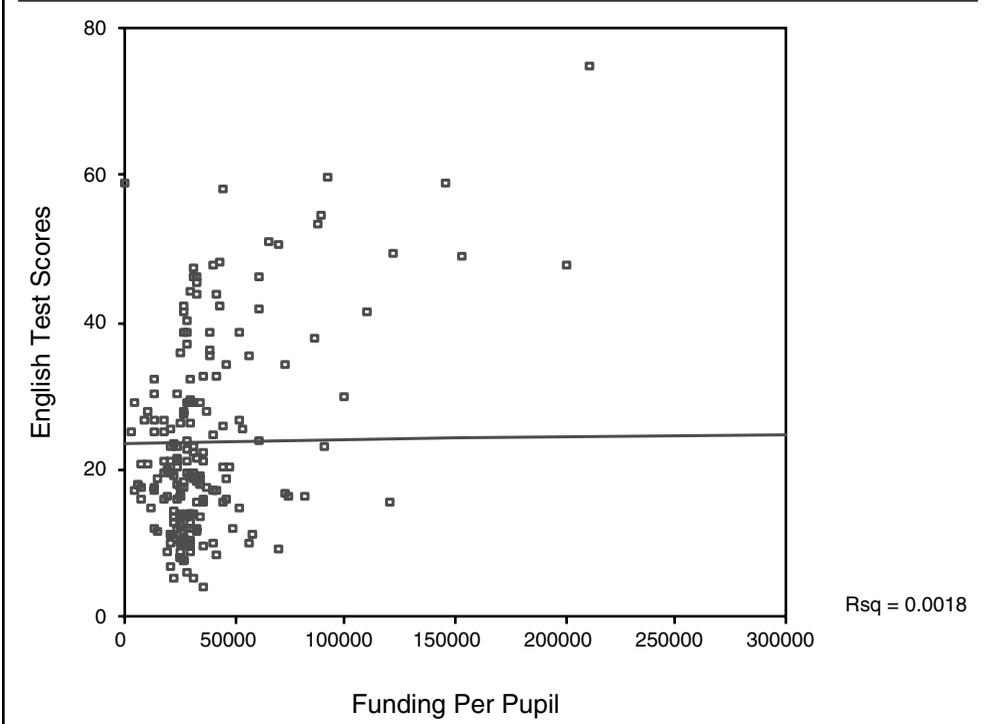


Figure 9. Funding Per Pupil and English Test Scores
(in Ugandan Shillings)



scores compared to those who attend schools with low funding per pupil. These correlation results are in line with those of the regression analysis (Appendix A).

Analysis of the Relationship between Funding Per Pupil and Pupils' Test Scores

The results of this study are consistent with those of earlier studies, including Hanushek's (1991) review of 187 studies, Alderman and others (1996) who found no systematic relationship between school expenditures and student performance. Interestingly, at any level of per pupil expenditure, there are several schools with low mean scores and those with high mean scores, meaning that while some schools are able to attain high mean test scores at a certain level of funding, others score significantly lower. Although statistically significant, the correlation between per-pupil expenditure and mathematics ($r = 0.24$; $p < 0.05$) and English ($r = 0.37$; $p < 0.05$) test scores are positive but rather low. This means that the relationship between per pupil expenditure and test scores is relatively weak.

From this analysis, one can conclude that per pupil funding helps to explain only a small proportion of the variation in test scores. This may be as a result of how available funds are used. For example, some schools might be spending more on administrative costs like travel to district headquarters, while others spend more on materials and activities that directly focus on improvement of pupils' learning.

Time Spent on a Subject

This study indicates that urban schools spent more minutes per week on teaching mathematics (301 minutes) compared to rural schools (227). Government-aided schools spent fewer minutes per week on teaching mathematics (238 minutes) compared to private schools (293 minutes). For private schools, time spent on teaching mathematics ranged between 200 to 720 minutes per week, while Government-aided schools spent between 10 to 760 minutes per week on teaching mathematics.

A cross tabulation of minutes per week spent on teaching mathematics by school location and school ownership indicates that private urban schools spent more minutes per week on teaching mathematics (360 minutes) compared to Government-aided urban schools (290 minutes). Further, government-aided schools in urban and rural areas spent fewer minutes per week on teaching mathematics compared to private urban and rural schools respectively. Further analysis found a significant difference in the amount of time spent teaching mathematics by school location but not by school ownership.

Time Sent Teaching English

This study indicates that urban schools spent more minutes per week on teaching English (273) compared to rural schools (230), and Government-aided schools spent fewer minutes per week on teaching English (234) compared to private schools (286). Private urban schools spent on average more minutes per week on teaching English (377) compared to Government-aided urban schools (245). Government-aided rural schools spent more minutes per week on teaching English (230) compared to private rural schools (219).

Pupil's Test Scores and Time Spent on Teaching

A relationship between minutes per week spent on teaching mathematics and English was examined. The correlation coefficient for minutes per week spent on teaching mathematics and English to primary 6 pupils was positive and significant (0.173; $p = 0.05$), and that for minutes spent teaching English to primary 6 pupils is also (0.154; $p = 0.05$). This shows that primary 6 pupils who attend schools where more time is spent on teaching mathematics and English attain higher mathematics and English test scores compared to those who attend schools that spend less time on teaching mathematics and English.

Analysis of Time Spent Teaching a Subject and Pupil Performance

Earlier studies, for example by Psacharopoulos and others (1994), Heyneman and Loxley (1983), and Rutter and others (1979), found the amount of available time for instruction and how well it is used by students and teachers to be consistently related to how much children learn. Stallings (1980) also found that simply making the school day longer did not lead to better student performance, but what was important is how effectively that time is used. This study found a positive and significant relationship between test scores for both mathematics and English with minutes per week spent on teaching these subjects.

Developing countries like Uganda where student absenteeism and the relatively short length school day may be a problem. Therefore, "time-on-task" is crucial. A considerable body of international research has documented the positive relationship between the amount of classroom time actually used for instruction and the amount students actually learn (Psacharopoulos and others 1994; Avalos and Haddad 1987; Fuller 1987; Wang, Haertel, and Walberg 1993; Fuller and Holsinger 1993).

Suryadi, Green, and Windham (1981) in a study of factors related to ninth grade mathematics achievement in Indonesia found that the time spent on classroom assignments was the most significant predictor of achievement for poor rural students, and the second most important predictor for poor, urban students. Stallings (1980) found that in-school learning time is especially valuable for students from impoverished families, who usually work and spend relatively few of their out-of-school hours on learning.

Pupil-to-Desk Ratio

Information on pupils per desk was obtained from the teachers' questionnaire. Results from this study indicate that on average four pupils share a desk in both rural and urban schools as well as in Government-aided and private schools. The number of pupils sharing a desk ranges between three to six in urban schools and one to six in rural schools, one to six in Government-aided schools and three to six in private schools. However, further analysis indicated no significant differences in pupils per desk between rural/urban schools ($F = 0.06$, $df = 180$, $p = 0.10$) and Government-aided/private schools ($F = 0.13$, $df = 182$, $p = 0.10$).

Pupil Performance and Pupil-to-Desk Ratio

The relationship between pupils per desk and pupil performance was reviewed using correlation analysis. Correlation coefficients for pupil:desk ratio and pupil performance were

−0.136 ($p = 0.05$) and −0.079 ($p = 0.05$) for mathematics and English respectively. This means that the bigger the number of pupils who share a desk, the lower the pupil's test scores in both mathematics and English. The influence is bigger for mathematics than for English.

Analysis of Results on Pupil-to-Desk Ratio

Results of this study indicate that there were no significant differences in the number of pupils per desk between rural/urban schools and Government-aided/private schools. Results of the correlation analysis indicate that mathematics and English test scores decrease with an increase in the number of pupils sharing a desk. Classroom observations found that in two of the poorly performing schools, some pupils sat on the floor, and wrote from their palms and laps, while others had to fold their books to create space for others to write from. Clearly, such an environment is not conducive for pupil's learning. Such an environment leads to time wastage as pupils try to find a convenient position; inhibits use of textbooks; pupils are also continuously disrupted by their colleagues as they try to find a comfortable sitting position.

Summary Results on Availability of Inputs

Overall, there were significant variations in textbook availability, class size, funding per pupil as well as minutes of teaching mathematics and English per week. In most cases private schools had higher levels of inputs than Government-aided and urban schools were better resourced than rural schools. Inputs vary considerably between rural and urban schools, as well as between private and Government-aided schools. This study also found funding per pupil, time spent on teaching a subject, and greater availability of textbooks to be positively correlated with pupil performance in mathematics and English. However, the coefficients were in most cases very low. Further, pupil performance in mathematics and English was negatively correlated with class size, pupils per bench and the number of pupils sharing a textbook. School inputs influence mathematics test scores by about 7 percent and English test scores by about 15 percent. Such a low level of influence points to a possibility of the importance of other factors, in addition to school inputs, in explaining the differences in pupils' test scores. Some earlier studies like Heneveld (1994) also advised that the assumption that selecting the right mix of inputs will necessarily lead to changes in student performance must make room for the realization that the unique educational process in individual schools contributes significantly to what is learned.

Teacher Characteristics

This chapter examines teacher variables traditionally used in relating teacher characteristics and achievement: teacher's education qualification, years of teaching experience, and in-service training. Other teacher related variables considered for this study include teacher gender, teacher's age, distance of teacher's residence from school, and tenure in that particular school. The impact of each characteristic on pupil test scores is then presented. Finally, the findings are discussed and some tentative conclusions drawn. Data used in this analysis is based on responses of teachers to the Teacher Questionnaire. All 392 primary 6 teachers who participated in the NAPE study returned the questionnaires. Responses to the Teacher Questionnaires were linked to their pupils.

Teacher Qualifications

As indicated in Table 12, out of the 388 teachers who responded to this question, 60.1 percent had secondary education plus two years of teacher training, 28.1 percent had secondary education plus three years of teacher training, 6.70 percent with secondary only, 3.09 percent with teacher training without completing secondary, while 1.55 percent had BEd or BSc with teacher training, 0.52 percent with BA/BSc with no teacher training. Teachers with BA/BSc were only found in urban areas. A higher proportion of teachers who completed "secondary education only" were found in rural areas (8.1 percent) compared to 2.2 percent in urban areas. Further, teachers with BSc/BA with teacher training were only found in urban areas. The results show that teacher qualification is more likely to be secondary plus one or two years of teacher training in both urban and rural schools. Urban schools had more teachers in this category (61.1 percent) compared to 59.73 percent in rural schools.

Teacher Qualification		School location		
		Urban	Rural	Total
Teacher training without completing Secondary	N	4	8	12
	Percent	4.44	2.68	3.09
Secondary only	N	2	24	26
	Percent	2.22	8.05	6.70
Secondary plus 1 or 2 year-teacher training	N	55	178	233
	Percent	61.11	59.73	60.05
Secondary plus 3 year-teacher training	N	23	86	109
	Percent	25.56	28.86	28.09
BA/BSc with no teacher training	N	2	0	2
	Percent	2.22	0.00	0.52
BA/BSc with teacher training	N	4	2	6
	Percent	4.44	0.67	1.55
Total	N	90	298	388
	Percent	100.00	100.00	100.00

Analysis of teacher qualification based on school ownership indicates that teacher qualification is more likely to be secondary plus one or two years of teacher training in both government and private schools. About 67.6 percent of teachers in private schools completed secondary education plus one or two years of teacher training, compared to 59.4 percent in Government-aided schools. While Government-aided schools had 29.3 percent of teachers with secondary education plus three years of teacher training, private schools had 16.2 percent in this category.

Teacher Qualification and Pupil Test Scores

The relationship between pupils' performance and teacher qualifications was reviewed. For English, relative to pupils of teachers who did not complete secondary education, students of teachers who completed secondary education scored 2.52 points higher. Those who completed secondary plus one or two years of teacher training performed even better (over 10 points higher). The lowest mean English score was 16.33 percent for pupils with teachers who completed teacher training without completing secondary education, and the highest was 58.15 percent for pupils with teachers having BA/BSc with no teacher training. For mathematics, the lowest test score was 27.12 percent with teachers who completed secondary education plus three years of teacher training and the highest was 44.15 percent with teachers who have BA/BSc with no teacher training respectively. However, while pupils with teachers who have much higher qualifications (BA/BSc with or without teacher training) have higher mean tests scores, these results should be interpreted with caution due to higher standard errors.

This study also indicates that at every level of teacher qualification there is considerable variation in pupil performance. For example for English, with teachers who have teacher training without completing secondary education the highest score was 75 percent, while

the lowest test score was 0. Further, the range of mathematics and English test scores was 79 and 75 respectively for teachers with teacher training without completing secondary education. While the range for mathematics and English test scores for BEd or BSc /BA with teacher training was 70 and 81 respectively. Some pupils with teachers having lower qualifications scored as high as those with teachers of higher qualifications.

In all scenarios, pupils taught by teachers with BA/BSc with no teacher training performed much better than those with teachers who had BA/BSc with teacher training. Further, pupils with teachers who had secondary plus one or two years of teacher training had higher scores than those with teachers who had secondary plus three years of teacher training.

Analysis of variance indicates that there were significant differences in test scores within and between teachers' level of qualification.

Analysis of the Relationship between Teacher Qualifications and Pupil Test Scores

The academic and professional training of teachers has been found to have a direct and positive bearing on the quality of their performance and consequently on the achievement of students (Avalos and Haddad 1981; Husen, Saha, and Noonan 1978; Schiefelbein and Simmons 1981; Avalos and Haddad 1979; Fuller 1986). However, Farrell and others (1993) found that there is a limit after which additional teacher training contributes no visible gain in pupil's learning achievement.

Results of this study are not entirely in line with those of an earlier study on science in Uganda by Heyneman and Loxley (1983), who found that years of teachers' schooling are positively correlated with student performance. The study notes substantial differences in pupils' average test scores within and between teacher characteristics. Relative to pupils of teachers who did not complete secondary education, pupils of teachers who completed secondary education scored slightly better. Surprisingly, those who completed secondary with one or two years of teacher training performed better than those who completed secondary with three years of teacher training. This finding puts to question the rationale for an additional year of teacher training.

For both mathematics and English significant positive influence on test scores was only found for teachers with university education. Coefficients for other teacher qualification levels were negative. Results also indicate a high level of variation in test scores at every level of qualification. The study found that the higher the qualification, the greater the variation in test scores. It is therefore reasonable to conclude that teachers with the same level of qualification are not equally effective in improving pupils' test scores. These results may also be interpreted to mean that teachers with the same qualifications may have different teaching abilities.

The findings of this study do not support the view that increasing primary teachers' qualification beyond secondary education plus two years of teacher training is an effective way of using educational funds. This is possibly due to changes that have taken place in the education system over time, as a result of the civil war, economic decline and more recently the declaration of the UPE policy that led to almost doubling of enrollment in primary schools, and substantially increasing class size.

Another interesting finding of this study in all scenarios of analysis is that pupils taught by teachers with BA/BSc with no teacher training performed much better than those with teachers who had BA/BSc with teacher training.

A surprising finding of this study is that pupils with teachers of lower qualifications (secondary education only) performed better than those with secondary education plus three years of teacher training. Further, teachers with higher formal qualifications are apparently not any more effective than those with lower qualifications (except for degrees). A possible explanation for this is that teachers with lower qualifications may see this as the best available employment opportunity and have fewer options, and therefore spend more of their time teaching. The findings of this study are in line with Farrell and others, 1993 assertion noting the importance of teachers having achieved a formal level of schooling at least just above the students they teach.

In-service Teacher Training

In the teacher questionnaire, teachers were asked whether they have attended in-service training over the last three years. The answers were either “Yes” or “No.” Results indicate that 52.2 percent of the teachers who were part of the study had attended in-service training, and 47.8 percent had not. Results of this study also indicate that 52.6 percent of the teachers in Government-aided schools had attended in-service training, compared to 48.6 percent in private schools. While 59.8 percent of teachers in urban schools had attended in-service training, the corresponding proportion in rural schools was 50 percent.

Pupils’ Performance and In-service Teacher Training

This study examined the relationship between attendance at in-service training and pupils’ performance (mathematics and English test scores). Results from this study indicate that pupils taught by teachers who had attended in-service training scored 26.15 percent in English (standard deviation 19.92), while those with teachers who had not attended in-service training scored 24.60 percent (standard deviation 17.66). For mathematics, pupils taught by teachers who had attended in-service teacher training had a mean score of 27.87 percent, while those with teachers who had not attended teacher training had 30.04 percent. Results of this study indicate that teachers who had not received any in-service training in the last three years had higher pupil mathematics scores compared to those who had training. For English, teachers who had received training had pupils with higher English test scores compared to those who had not received any training. Further analysis indicates no significant differences in the mean pupil test scores for teachers who had not received in-service training in the last three years.

Analysis of In-service Teacher Training and Pupil Performance

Some earlier studies (for example, Fuller 1989; Farrell 1989; and Levin 1991), found that in-service teacher training particularly that focused on pedagogical skills is a key determinant of teacher mastery of materials they are supposed to teach and student achievement. Several other studies, such as Dulin and others (1992) and Cohen and Hill (1997) also found higher levels of achievement to be associated with teachers’ opportunities to participate in sustained professional development grounded in content-specific pedagogy linked to the new curriculum they are learning to teach. The study by Byrne (1983)

showed mixed results, and Harbison and Hanushek (1992) and Warwick (1991) showed negative results.

The study found that the relationship between in-service teacher training and test scores is positive and significant for English, but negative and significant for mathematics. All teachers interviewed during the case study cited proper training of teachers, to scrutinize the curriculum, syllabus and to teach them properly as being important for better performance. Teachers in two of the schools cited refresher courses as being particularly important for improvement of pupil performance in mathematics. The findings of the study on the relationship between in-service teacher training and mathematics test scores are interesting in that teacher in-service training was not related to improvement in pupil performance. This is contrary to several earlier studies like that by Cohen and Hill (1997) and that by Wiley and Yoon (1995) who found higher levels of student achievement in mathematics to be associated with mathematics teachers' opportunities to participate in sustained professional development grounded in content-specific pedagogy. The possible explanation for this negative relationship is that the training may not have focused on improvement in pedagogical skills, or have been linked to the new curriculum. The findings of this study point to the need to review in-service training to focus more on improvement of pedagogical skills. The current teacher training is unlikely to be in line with the current curriculum, particularly since the primary teacher education curriculum was not reviewed when the primary education curriculum was reviewed. It would also be important to ensure that in-service training focuses on the new curriculum once the ongoing curriculum review process is finalized. For future curriculum reviews, it would be important to review the primary teacher education curriculum to ensure that it is in line with the primary education curriculum.

Results of this study point to the need to hire teachers with at least secondary education two years of teacher training and supporting them through in-service teacher training focused on improvement of pedagogical skills.

Teacher's Age

This study found that a higher proportion of teachers were between 21 and 30 years old, rural schools had a higher proportion of younger teachers (30 years and below), while urban schools had a higher proportion of older (30 years and above) teachers. Further, private schools had a higher proportion of younger teachers, while Government-aided schools had a higher proportion of older teachers. Private schools have no teachers below 20 years and above 50 years, compared to 1.69 percent and 0.85 percent in Government-aided schools. The proportion of teachers between 21-30 years was higher in private schools (75.6 percent) compared to 45.2 percent in Government-aided schools. Private schools have no teachers below 20 years and above 50 years, compared to 1.69 percent and 0.85 percent in Government-aided schools respectively.

Teacher's Age and Pupils' Test Scores

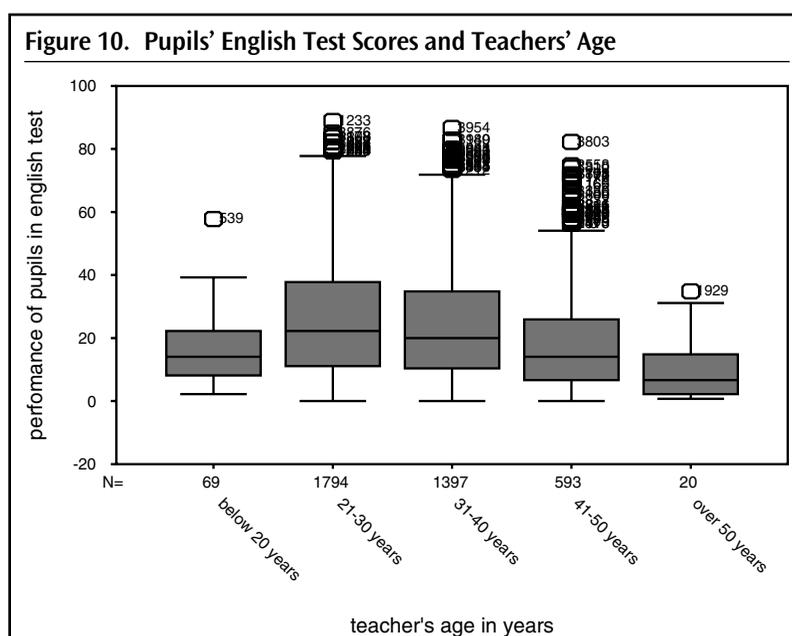
This study reviewed the relationship between pupils' performance and teachers' age category. For mathematics pupils with teachers in the over-50-years age category had the highest test

scores (31.63)¹⁴ followed by those taught by teachers in the 21–30 age category (29.04) as indicated in Table 13. Overall, pupils' mathematics mean test scores declined from 30 with the 21–30 age category to 25.8 with age category 41–50 years. Similarly, for English, pupils' mean test scores decline from 27.4 with the 21–30 age category to 19.6 with teachers' age category 41–50. For English, pupils taught by teachers who were over 50 years old had the lowest mean test scores (10.35), while pupils taught by teachers in the 21–30 age category had the highest mean test scores (26.67). However, results of analysis for the age category of over 50 years had higher standard errors, therefore should be interpreted with caution. Figure 10 gives a graphical presentation of pupil mean test scores in English against teacher's age. Overall, the mean, ranges and standard deviation suggest that there is high variation in test scores in mathematics test scores between and within teacher age groups for both mathematics and English.

Table 13. Mean Test Scores and Teachers' Age Range

Teacher's Age Category	Percentage No. of Pupils (No. = 3872)	Mean Eng. (SE)	Mean Maths. (SE)	Range (Eng.)	Range (Math)	SD (Eng.)	SD (Math)
Below 20 yrs.	1.1	16.54 (1.30)	27.52 (1.76)	56	63	10.78	11.39
21–30 yrs.	50.2	26.67 (0.45)	29.04 (0.32)	89	83	19.13	14
31–40 yrs.	38.9	24.76 (0.49)	26.77 (0.36)	87	85	18.32	13.92
41–50 yrs.	8.8	19.17 (0.69)	25.11 (0.76)	82	70	16.81	14
Over 50 yrs.	1	10.35 (2.35)	31.63 (2.28)	34	61	10.49	14.4

Note: Standard error in parentheses.



14. These results should be interpreted with caution because of the relatively high standard error.

Analysis of Pupil Performance and Teacher's Age

A surprising finding of this study is an overall decline in pupils' test scores with increase in a teacher's age. Pupil's test scores are at their peak when teachers are between 21 and 30 years old, and decline thereafter. Overall, the mean, range and standard variation suggests that there is high variation in test scores for each age category and subject area. Government-aided schools may have a higher proportion of older teachers possibly because teachers may stay in Government service longer since they are pensionable. Further, there may be less stringent supervision in Government-aided schools, and teachers can easily take off time to explore other sources of income. In addition, older teachers may also be in position to negotiate their way to urban schools where there are better facilities including better schools for their children.

A surprising finding of this study is an overall decline in pupils' test scores with increase in a teacher's age. Pupil's test scores are at their peak when teachers are between 21 and 30 years old, and decline thereafter. Overall, the mean, range and standard variation suggests that there is high variation in test scores for each age category and subject area. It is possible that as teachers grow older, they have more family responsibility or otherwise, more financial demands that force them to look for alternative sources of income, and thus spend less time on school academic activities.

Teaching Experience

The study found considerable variation in teaching experience with Government-aided schools having more experienced teachers (over six years of experience) than private schools. Further, urban schools had more experienced teachers than rural schools. On the other hand, private schools had more teachers with one-to-five years of experience. Teachers were asked what their teaching experience was in years. As indicated in Table 14, results of the analysis of answers to this question indicate that private schools had a higher pro-

Teacher Experience		School Ownership		Total
		Government	Private	
Under 1 year	N	8	2	10
	Percent	2.47	5.41	2.77
1–5 years	N	121	21	142
	Percent	37.35	56.76	39.34
6–10 years	N	104	10	114
	Percent	32.10	27.03	31.58
Over 10 years	N	91	4	95
	Percent	28.09	10.81	26.32
Total	N	324	37	361
	Percent	100.00	100.00	100.00

Note: 36 cases dropped from the analysis due to missing responses.

portion of teachers with less than one year of teaching experience (5.41 percent), and those with one-to-five years of teaching experience (56.76 percent), compared to 2.47 percent and 37.35 percent in Government-aided schools respectively. On the other hand, Government-aided schools had a higher proportion of teachers with six-to-ten years of teaching experience (32.10 percent) compared to 27.03 percent in private schools. Table 14 shows details of teacher experience by school ownership.

Table 15 indicates teacher experience by location. Results of this study indicate that rural schools have a higher proportion of teachers with one-to-five years of teaching experience (41.91 percent) compared to 31.76 percent for urban schools. On the other hand, urban schools had a higher proportion of teachers with six-to-ten years of teaching experience (40 percent) compared to 29.04 percent in rural schools.

Teacher Experience		School location		Total
		Urban	Rural	
Under 1 year	N	2	8	10
	Percent	2.35	2.94	2.80
1–5 years	N	27	114	141
	Percent	31.76	41.91	39.50
6–10 years	N	34	79	113
	Percent	40.00	29.04	31.65
Over 10 years	N	22	71	93
	Percent	25.88	26.10	26.05
Total	N	85	272	357
	Percent	100.00	100.00	100.00

Note: 40 cases dropped from the analysis.

Teacher Experience and Pupils' Test Scores

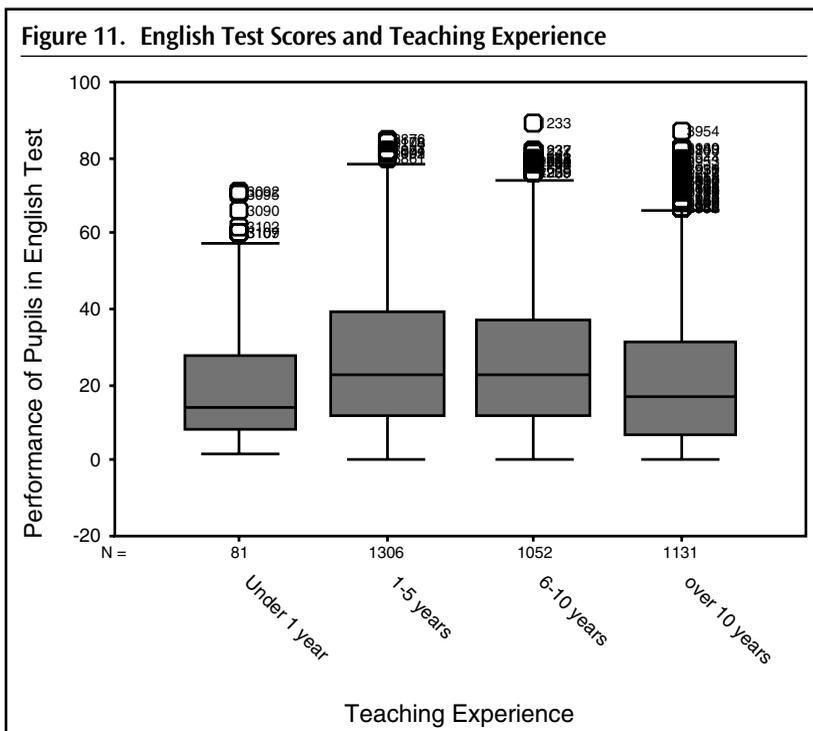
This study examined the relationship between pupils' performance and teacher experience. As indicated in Table 16, results of this study show that mean mathematics test scores are highest for teachers with six-to-ten years of experience (29.34), and lowest with teachers with less than one year of teaching experience at 25.36. For English, the highest mean test score was with teachers of one-to-five years and lowest with teachers with less than one year of teaching experience at 21.14.

As indicated in Figures 11 and 12, a graphical presentation indicates that test scores level off after five years of teaching experience, and decline after ten years of experience. For English, there is no discernible difference between the mean performance of pupils taught by teachers with teaching experience of between one-to-five years and those with six-to-ten years. The mean test scores are 26.94 and 26.46 with Standard Deviations of 18.90 and 18.43 respectively.

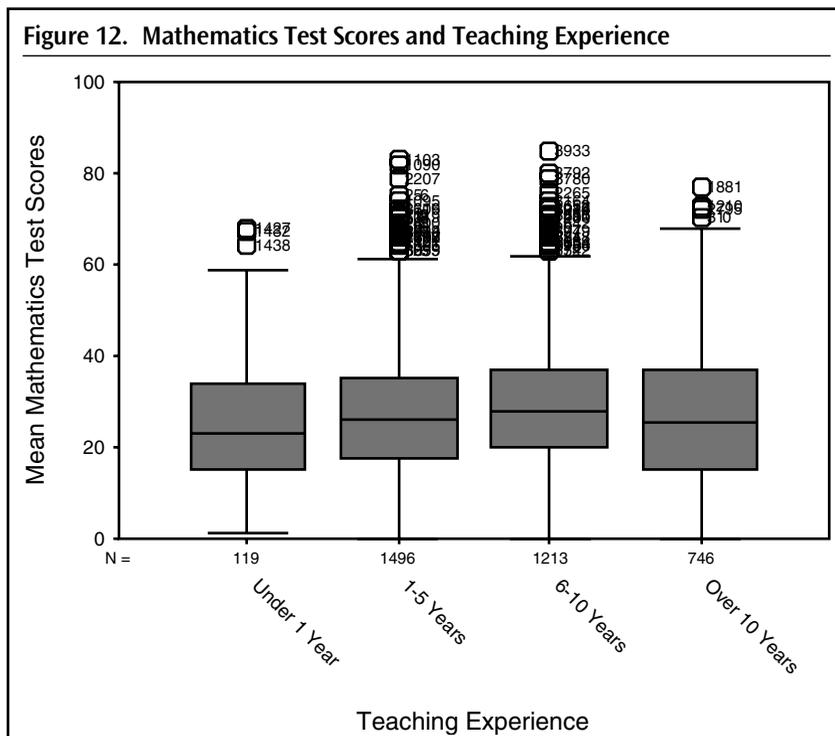
For mathematics, mean test scores reach the peak with teachers having six-to-ten years of teaching experience at a mean test score of 29.34 percent.

Teachers Experience	Percentage No. of pupils (English teacher) No. = 3570	Mean English Score	Standard Deviation (English)	Mean Maths Scores	Standard Deviation	% No. of pupils (for Mathematics teacher) No. = 3574
Under 1 year	9.9	21.14 (2.11)	18.95	25.36 (1.39)	15.14	10.8
1–5 years	38.8	26.94 (0.52)	18.90	27.74 (0.36)	13.77	38.6
6– 10 years	27.2	26.46 (0.57)	18.43	29.34 (0.40)	14.02	31.3
Over 10 years	29.2	21.98 (0.56)	18.80	26.71 (0.53)	14.49	19.3

Note: Standard errors in parentheses.



Analysis of results using teachers’ experience indicate that pupils’ mathematics test score was about 14 points higher when the teachers experience was one-to-five years, 10 points higher when the teachers’ experience was six-to-ten years, and 10 higher when the teachers’ experience was over 10 years compared to when the teachers’ experience was less than one year. When the teachers’ experience was one-to-five years, teachers experience was six-to-ten years and teachers’ experience was over 10 years was found to differ significantly at $p = 0.05$ from when the teachers’ experience was under one year.



Analysis of Results of Teacher Experience and Pupil Test Scores

Previous studies of the effects of teacher experience on student learning (Murnane and Phillips 1981; Klitgaard and Hall 1974; Rosenholtz 1986) found that the relationship was not always significant or an entirely linear one.

The results of the study are interesting in that pupil performance increases with increase in teacher experience only up to a certain level (six-to-ten years), and thereafter begins to decline. These results are consistent with those of Murnane and Phillips (1981) who also found a relationship, but not an entirely linear one. Similarly, Rosenholtz (1986) also found that the benefits of experience tend to level off after about five years of experience. It is possible that teachers get tired of teaching or do not get new skills as changes take place in education. For example, teachers may have been used to teaching smaller class sizes before UPE, a situation that dramatically changed with UPE, a change that may not have been accompanied by in-service training to equip teachers with skills to handle large classes.

The results of this study call into question the widely held view that employing more experienced teachers improves pupil performance. It may also call for a more clear understanding of what contributes to continued teacher effectiveness, or what leads to reduced teacher effectiveness over time.

Teacher Tenure

Teachers were asked how long they have been in the same school. In analyzing this variable, the following tenure categories were created: (1) Under one year; (2) one-to-five years; (3) six-

to-ten years; (4) over ten years. Analysis of responses to this question indicates that a higher proportion of teachers (60.62 percent) had stayed in the same school for one-to-five years, 35 percent had stayed for six-to-ten years, while a smaller proportion (5.18 percent) had spent over ten years in the same school.

Pupils' Performance and Teacher Tenure

Relating these responses to pupil performance indicates that pupils taught mathematics by teachers who had six-to-ten years at the same school had higher mean test scores (31.26), while those with teacher with tenure of over ten years had the lowest mean scores (20.70). For English, pupils with teachers who had been in the school for less than one year had higher average test scores (26.58), while those with teachers with tenure of six-to-ten years in the same school scored lowest (21.53). Overall, there is no clear relationship between teacher tenure and pupils' mathematics test scores. For English, test scores tend to decrease with increase in teacher tenure, while there is no clear pattern for mathematics test scores.

Analysis of variance was carried out to find out if test scores differed significantly for different tenure. This analysis shows that there are significant differences in the mean pupil English score ($F = 27.33$; $df = 3778$, $p = 0.01$) and ($F = 12.19$, $df = 3,826$, $p = 0.01$) for mathematics and teacher tenure.

Distance of Teachers' Residence from School

Teachers were asked how far from the school their residence was. Answers ranged from: (1) Less than a kilometer; (2) One to two kilometers; (3) More than two kilometers. Analysis of responses to these questions indicates that almost half (49.1 percent) of the teachers reside less than one kilometer from school, compared to 22.5 percent and 28.4 percent who stay between one-to-two kilometers and over two kilometers respectively. A larger proportion of teachers in urban schools (64.9 percent) reside less than one kilometer from the school, compared to less than half (49.1 percent) of teachers in rural schools. Rural schools also have a higher proportion of teachers (30.6 percent) who reside over two kilometers from the school. About 60 percent of teachers in urban schools are accommodated by the school, while corresponding percentage is 32.5 percent for rural schools. In addition, this study found that private schools accommodate 67.6 percent of their teachers, while Government-aided schools accommodate only 36.1 percent.

Pupil Performance and Distance of Teacher's Residence from School

The relationship between pupils' performance and distance of teacher's residence from school was examined. For mathematics, pupils who were taught by teachers who reside less than one kilometer from the school scored 29.16 percent compared to 26.97 percent and 26.5 for teachers who reside one-to-two kilometers and more than 2 kilometers from the school respectively. For English, mean test scores ranged from 27.4 percent for distances of less than 1 km to 23.45 and 20.73 percent for distances of 1-2 km and more than 2 km respectively. Overall, pupils' performance declined with increase in distance of teacher's residence from school.

Summary Results on Teacher Characteristics

Results for pupil performance and teacher qualifications appear to be mixed, in particular for mathematics, where scores appear to clearly decrease with increase in teacher qualifications except for teachers with university education. For English, test scores appear to increase with increase in teacher qualifications. For both mathematics and English, there is a negative relationship between teachers' age, tenure in the same school, and pupils' test scores. Further, pupil performance improves with teacher experience, peaks between six-to-ten years and declines thereafter. While attendance at in-service teacher training has a positive relationship with pupils' English performance, the relationship with mathematics is negative.

Teaching Strategies and School Administration

This chapter reviews teaching strategies, including frequency of tests, frequency and mode of handling of homework, classroom organization, classroom interaction, and repetition. This study examined the relationship between tests, homework, classroom organization, pupil-teacher interaction, repetition, and pupil performance. Further, head teacher qualification, age category, experience, tenure in the same school, and gender and head teacher involvement in teaching were analyzed.

Teaching Strategies

Studies on school effectiveness have in the past not paid much attention to the importance of classroom processes and use of inputs. Instead, focus has been on provision of resources, including supply of inputs (for example, teachers and their quality, instructional materials, per pupil expenditure, desks, and so forth), most of which have small or no significant influence on pupil test scores. This study considered both inputs and classroom processes. Riddell and Brown (1991) concluded that teaching not teachers is the critical factor. Lockheed and Komenan (1988) and Glewwe and others (1995) also support the notion that pedagogical processes are more significantly related to student achievement than are physical and pedagogical input variables and school organization. Previous research (for example, Lezotte and Brancroft 1985; Arriagada 1981) emphasized regular assessment, working together in groups, giving pupils regular and timely feedback.

Research on effective schools offers a reminder that what matters in education is the quality of teaching not just the number of teachers. A lot of factors are related to achievement, although only some of these factors can be altered by policy changes. Factors highlighted in earlier studies include effective teaching strategies, (Schiefelbein and Simmons 1981);

physical class size, and instructional techniques, (Farrell 1993). This section reviews teaching strategies, including frequency of tests, frequency and mode of handling of homework, classroom organization, and some aspects of classroom interaction.

Tests

Teachers were asked how often they gave mathematics and English tests. The range of answers included: (1) “weekly,” (2) “bi-monthly,” (3) “monthly,” and (4) “once a term.” Analysis of responses indicates that 52.7 percent of the pupils were given English tests weekly, 35.2 percent monthly and 12.1 percent once a term. In the case of mathematics, 49 percent of the pupils were given tests weekly, 37.8 percent monthly and 13.2 percent once a term. Therefore, for both mathematics and English, a higher percentage of pupils were given tests weekly.

Pupil Performance and Frequency of Tests

Relating frequency of tests with test scores, pupils’ mean mathematics test scores were highest for pupils who were given mathematics tests monthly (29.77 percent) and lowest for pupils who were given mathematics tests once a term (19.07 percent). For English, results of this study indicate that pupil’s test scores were highest for pupils who were given English tests monthly (28.06 percent) and lowest for pupils who were given English tests once a term (18.97 percent). The analysis of variance results for mathematics and English ($F = 15.29$; $df = 3806$) and ($F = 39.03$; $df = 3826$) indicate that there were significant differences in the mean pupil mathematics and English test score for the different frequencies of testing at $p = 0.01$.

In this study, regular tests administered to pupils, at least once a month, have been considered to be associated with higher test scores. According to the teachers and head teachers interviewed, tests help teachers to:

- Assess pupil progress;
- Determine who should be promoted or not;
- Discuss pupil performance with parents;
- Identify and attend to weak pupils;
- Discover what students already know and what they need to learn;
- Provide students with an opportunity to revise; and
- Identify areas that need emphasis and changing of pedagogy.

Based on both the qualitative and quantitative analysis, high performing schools gave tests on a regular basis (at least monthly). All head teachers interviewed also emphasized the importance of monitoring pupil performance. However, while tests improve pupil performance, there was no significant difference between scores for pupils who do mathematics tests once a week and those who do tests once a month.

Teachers found the following strategies to improve pupils’ performance:

- Providing feedback when giving test results and going through the work;
- Revising with pupils after marking;

- Using feedback to put more emphasis on poorly done topics;
- Giving feedback by displaying marks in class; and
- Doing corrections together in class.

While tests improve pupils' performance, very frequent tests (for example, weekly) were not found to improve test scores. It is possible that this does not allow enough time for pupils to cover new topics. Further, handling of tests for example going through tests with pupils as tests are returned significantly improves test scores compared to situations where this does not happen.

Homework

Teachers were asked how often they assign mathematics and English homework. The range of answers included: (1) never, (2) once or twice a month, (3) once or twice a week, (4) three or four times a week, and (5) everyday. All the pupils except a small percentage (0.5 percent for English) were assigned homework. A large proportion of pupils, 44.5 and 43.9 percent are assigned English and mathematics homework respectively once or twice a week.

Handling of Homework

Pupils were asked if their teachers go over homework with them in class. The answers were either Yes or No. Analysis of these responses indicates that 83 percent and 84.6 percent of the pupils go over English and mathematics homework respectively, with the teacher in class.

Pupils' Performance and Homework

The results of relating frequency of homework to pupils' English test scores show that test scores were highest for pupils who were given English homework everyday (32.50 points) and lowest for pupils who were never given English homework (6 points) those given homework once or twice a month scored 18.60, once or twice a week 23.4, three or four times a week 25.83. The analysis of variance results indicates significant differences in the mean pupil literacy score for the different frequencies of English homework.

Pupils' mathematics test scores were highest for pupils' who were given mathematics homework everyday (30.67 points) and lowest for pupils who were given mathematics homework once or twice a month (24.63 points). Further analysis indicates significant differences in the mean pupil mathematics test score for the different frequency of mathematics homework, with mean test scores increasing with frequency of homework. For example, mathematics test scores increased from 24.63 with homework given once or twice a month to 30.67 with homework given everyday. English test scores increased from 6.00 with no homework to 32.50 with daily homework.

In addition, relating results to pupil performance indicates that pupils who go over homework with the teacher scored 25.18 and 28.63 for English and mathematics respectively. For English and mathematics, pupils who did not go over homework with teachers in class scored 20.64 and 25.06 respectively.

Analysis of Results of Home Work and Pupil Test Scores

These findings are consistent with Fuller's (1987) in his study of factors that raise achievement in the Third World, and those of Purves (1973) and McGinn, Warwick, and Reimers (1989) in Pakistan, who found that the number of exercises assigned was one of the best predictors of mathematics achievement. The findings for both tests and homework are also in line with those of Kulik and Kulik (1988) who also found that pupils who receive immediate feedback on their quizzes outperform those who receive delayed feedback.

Just as for tests, pupils who go over homework with the teacher scored 3 points higher than those who did not. This is consistent with classroom observations, where it was observed that pupils in high performing schools referred to and reviewed previous homework in class. It is possible that going over homework in class enables pupils to revise as the teacher makes them think through the answers. Further, homework helps pupils to practice what has been learned.

Classroom Organization

Teachers were asked about the frequency of pupils working individually, working together as a class, working in pairs or small groups, and in each of these situations with or without assistance from a teacher. Answers ranged from (1) never, (2) some lessons, (3) most lessons, and (4) every lesson.

In general, working together as a class with the teacher teaching the whole class is the most commonly used approach, with 56 percent of the teachers teaching this way during every lesson and 30 percent for most lessons. The next commonly used approach is pupils working individually with assistance from the teacher. The least used approach is working in pairs or small groups without assistance from the teacher, with 2.8 percent of the teachers using this approach every lesson and 10.6 percent most lessons. Overall, working without assistance from a teacher is not a common approach. Within each of these approaches, there is a high level of variation in frequency of use.

Teachers were also asked how often pupils work on mathematics problems in small groups, and answers were: (1) none of the time, (2) some of the time, (3) everyday. Analysis of responses indicates that for mathematics, 82.2 percent of the pupils worked in groups some of the time, 15.1 percent every day and 2.7 percent none of the time. For English, the trend is the same, but with a smaller proportion of pupils (79 percent) working in groups some of the time, 15.3 percent every day, and 5.7 percent none of the time.

Pupil Performance and Classroom Organization

Pupils who worked together in pairs or in small groups (with or without assistance from a teacher) had higher scores than those who did not.

In mathematics, the mean test score for pupils who work in groups everyday is 28.39, compared to 19.71 for those who work in groups none of the time. The trend is the same for English, with a mean score for working in groups being 28.04 compared to 22.94 for those who work in groups none of the time.

Earlier studies for example by Lockheed, Fonancier, and Bianchi's (1989) work in the Philippines found that group work led to higher levels of achievement in science. Results

of this study also indicate that for both mathematics and English, pupils who work in groups more often have higher scores than those who do not. This study also found that pupils who worked together in pairs or in small groups (with or without assistance from a teacher) had higher scores than those who did not. From this study, we can conclude that pupils can benefit from learning that occurs with effective use of small groups. Teachers interviewed indicate that when pupils work in groups, they can help each other, and can handle challenging situations beyond their individual capacity. These results also indicate that learning is further enhanced when a teacher monitors and guides a group.

Pupil-Teacher Interaction and Pupil Performance

The relationship between pupil teacher interaction and pupil's test scores was analyzed using as a proxy the extent of asking and answering questions. For both mathematics and English, pupils who asked or answered questions in class scored higher than those who did not. The possible relationship between answering or asking questions in mathematics and English is indicated in Table 17.

Class interaction	English			Mathematics			
		Number of pupils	Mean Score*	SE	Number of pupils	Mean Score*	SE
Pupils Asking Questions	Yes	2526 (67.7)	25.88 [18.53]	0.28	2599 (68.6)	29.17 [14.04]	0.26
	No	1207 (32.3)	21.90 [18.35]	0.40	1190 (31.4)	23.57 [13.94]	0.48
Pupils Answering questions	Yes	3129 (82.4)	26.07 [18.92]	0.26	3056 (80.3)	29.17 [14.28]	0.26
	No	667 (17.5)	17.55 [14.89]	0.47	749 (19.7)	23.57 [12.04]	0.48

Note: Percentages in parentheses. Numbers in brackets are Standard Deviation.

This study found that asking or answering questions by pupils led to significantly higher test scores, particularly for English. It is possible that asking or answering questions is an indication of the level of mastery of the English language, which in turn leads to a better understanding of what is taught and therefore better performance.

Consistent with earlier studies like Doyle (1985), teachers in high performing schools adjusted their teaching to fit needs of different students and the demands of different instructional goals. Use of a variety of strategies, particularly those that encourage pupils to participate, make pupils active and learn by practicing, and help teachers to get a quick feedback from pupils were found to be associated with higher test scores. Teachers in such schools also gave immediate feedback to pupils, praised pupils when they gave correct answers, used alternative strategies and helped weaker pupils individually. Peer learning was also observed, with pupils supporting each other on several tasks. However, teachers emphasized that for any combination of strategies to work well, adequate planning is required.

For English, spending more time on preparation or marking pupils' tests or exams, reading and marking pupils' work, meeting with pupils outside of classroom time, for example for remedial teaching, or guidance have a positive influence on pupil's test scores. Results of this analysis may also reflect the fact that the level of scrutiny with which teachers observe and emphasize pupil achievement is associated with improved performance. Interviews with both teachers and head teachers in the case study highlighted the need for academic emphasis as being of particular importance.

The findings of the Lockheed & Komenan (1988) study also support the notion that teaching quality (actual teaching practice) is more important than teacher quality (education, experience and certification) in terms of determining student outcomes. Glawwe and others (1995) in their study of primary schools in Jamaica concluded that pedagogical processes are more often significantly related to student achievement than are physical and pedagogical input variables and school organizational variables.

This study found that in general, pupil achievement was facilitated by teachers who make frequent presentations and demonstrations, accompanied with enthusiasm, ask clear and appropriate questions, provide clear feedback, provide guidance after students answer incorrectly, circulate among students during independent work, and prepare students for assignments. It was also noted that effective teachers tend to adjust their teaching to fit the needs of different students and the demands of different instructional goals, topics and methods. This finding was consistent with that of Hamachek (1969) who also concluded that successful teachers are those who are able to use a range of teaching strategies and who use a range of interaction styles, rather than a single rigid approach.

Good (1983) also noted that no single strategy has been found to be unvaryingly successful. Instead, teachers who are able to use a broad repertoire of strategies in the context of "active learning" that is purposeful, diagnostic and responds to students' needs as well as curriculum goals have been found to be more successful in improving student achievement.

Class Repetition

Pupils were asked whether they had repeated a class, and the answers were yes or no. An analysis of pupil's response to this question indicates that out of 3,286 pupils who responded to this question, 79.3 percent had repeated a class, while 20.7 had not (Table 18). The repetition rate is almost the same for boys (78 percent) and girls (80.6 percent). In addition 28.5 percent of the pupils had repeated primary 6 compared to 21.9 percent who repeated primary 5, and 7 percent who had repeated primary 1. Overall, the repetition rate is higher for the higher classes. Fewer girls repeat lower grade (1 and 2), with a similar proportion at primary 3, after which girls repeat more although by a difference of less than 3 percent in all cases.

Table 18. Mean Scores and Repetition

Class repetition	No. of pupils = 3286	English mean score	Maths mean score
Yes	79.3%	22.49	27.08
No	20.7%	29.18	30.27

Repetition and Pupil's Test Scores

Relating repetition to pupils' test scores, results of this study indicate that for both mathematics and English, test scores decline with repetition. Pupils who had repeated a Grade recorded lower test scores by 6.69 percent and 3.19 percent for English and mathematics respectively. T-test indicates that there was a significant difference between test scores of repeaters and those of non-repeaters.

Analysis of Results Findings on Repetition

The findings of this study are consistent with those of earlier studies for example Hertley and Swanson's (1984) study of primary school pupils in Egypt. Repetition parallels age, possibly reflecting the fact that older pupils are likely to have repeated a grade (pupils are expected to enrol at age six and should be eleven years old in Grade 6). The study also found that children who repeat do less well than children who do not repeat. Pupils who had repeated a grade recorded lower test scores by 6.69 percent and 3.19 percent for English and mathematics respectively. T-test indicates that there was a significant difference between test scores of repeaters and those of non-repeaters. While Uganda has a policy of automatic promotion this is not being implemented everywhere and many children repeat (13.8 percent in 2004). Clearly, enrolling children at the appropriate age and promoting them each year is a good policy measure for Uganda. However, in tandem with enforcement of automatic promotion, it may be necessary to administer regular tests and homework that would identify pupil's weaknesses, and address them through remedial teaching to ensure acquisition of the desired levels of competency.

It is therefore clear from this study that repetition has significant cost implications and is therefore an inefficient way of managing school resources, since it does not lead to improved performance. However, remedial teaching was found to have a positive and significant influence on test scores. It would therefore appear that, because promotion to the next grade is based on performance in a specific grade, remedial teaching would help reduce repetition. It might be reasonable to encourage head teachers and teachers to provide remedial teaching to weaker pupils, and not just leave this responsibility to parents as many parents may not be in position to support their children.

Overall, this study indicates that regular tests (at least monthly), regular homework (at least daily), going over homework with the teacher in class, working together in small groups, and active pupil participation were related to higher pupil test scores. Further, pupils who had repeated a class had lower test scores than those who had not repeated.

In summary, there is significant variation in frequency of testing and homework with about 50 percent of the pupils given tests weekly and about 43 percent assigned homework twice a week. Over 80 percent of the pupils go over homework with their teachers in class. Working together as a class was the most commonly used method of classroom organization.

School Administration

Overall, there is significant variation in head teacher qualification, experience, age, and residence. Government-aided schools have more qualified, more experienced, older and more

head teachers residing at the school than private schools. Urban schools had more qualified, more experienced, and older head teachers.

Head Teacher Qualification

Head teachers were asked about their highest level of qualification. Responses included: (1) teacher training without completing secondary education; (2) O-level with one or two years of teacher training; (3) O-level with three years of teacher training; (4) A-level with one or two years of teacher training; and (5) BEd or BSc/BA plus teacher training. A higher proportion of head teachers (38.9 percent) had O-level with teacher training, followed by those with BEd or B.Sc. with teacher training (20.2 percent), while a smaller proportion (10.10 percent) had A-level with teacher training. About one third (30.43 percent) of head teachers in urban areas have BEd or BSc with teacher training, compared to only 17.11 percent in the rural areas. The results of this study indicate that head teacher qualification was more likely to be O-level with three years of teacher training in Government-aided schools (40.88 percent), while in the private schools the head teacher qualification was more likely to be O-level with one or two years of teacher training (52.63 percent). Government-aided schools have 22.10 percent of the head teachers with BEd/BSc plus teacher training, while private schools had 10.53 percent in this category.

Head Teacher Qualification and Pupils' Test Scores

The relationship between pupil performance in mathematics and English and head teacher qualification was reviewed. The results of this study indicate that pupil's mathematics test scores were highest for head teacher qualification, BEd or BSc/BA plus teacher training (27.89 points) followed by O-level with one or two year teacher training (26.68 points) then A-level plus one or two years of teacher training and least for the head teacher qualification, O-level with three years of teacher training (24.45 points). Further, pupils' English test scores were highest for head teacher qualification, BEd or BSc/BA plus teacher training (28.91 points) followed by O-level with one or two years of teacher training and least for the head teacher qualification of teacher training without completing secondary (22.04 points). For both mathematics and English, pupils in schools with head teachers who have O-level with one or two years of teacher training had higher test scores than other categories except for head teachers with university education.

The analysis of variance results indicate that there are significant differences at $p = 0.01$, in the pupils' mean mathematics and English test scores for different head teacher professional qualifications attained.

The results obtained from this analysis were rather mixed. A regression analysis with pupil performance as the dependant variable and head teacher qualification as the independent variable was carried out to find out the extent of the relationship between head teacher qualification and pupil performance.

A regression analysis for head teacher qualification and pupils' performance indicates that pupils' mathematics score is 1.9 points higher when the head teachers qualification is O-level with one or two year teacher training, 3.9 points higher when the head teacher's qualification is BEd or BSc/BA plus teacher training compared to when

the head teachers qualification is teacher training without completing secondary. Other education levels were positive but not significant. Table 19 shows a regression analysis of the results.

Table 19. Regression for Head Teacher Qualification and Pupil Test Scores

Head teacher qualification	Coefficients for English	Coefficients for mathematics
O-level with one or two years teacher training	5.575 (4.80)***	1.907 (2.38)**
O-level with three or four years teacher training	1.671 (1.77)*	0.187 (0.29)
A-level with one or two years of teacher training	2.897 (2.38)**	0.977 (1.16)
BEd or BSc/BA plus teacher training	8.558 (8.31)***	3.929 (5.50)***

Note: Absolute value of t statistic is in parentheses.

*Significant at 10%; **Significant at 5%; ***Significant at 1%.

For English, results of analysis indicate that pupils' English test scores were 5.5 points higher when the head teacher's qualification was O-level with one or two years of teacher training, 1.6 points higher when the head teacher's qualification is O-level with three years of teacher training, 2.8 points higher when the head teachers' qualification is A level with one or two years of teacher training and 8.6 points higher when the head teacher's qualification is BEd or BSc/BA plus teacher training as compared to when the head teacher's qualification is teacher training without completing secondary. It should be noted that while head teacher qualification with university education had higher test scores for both mathematics and English, these results should be taken with caution given the higher standard errors for this level.

An interesting finding by this study is that relative to pupils in schools with a head teacher with O-level with three years of teacher training, or A-level with one or two years of teacher training, pupils with head teachers with O-level with one or two years of teacher training scored higher. The influence of head teacher qualifications on pupils' performance appears rather weak, with an increase of only 2 and 3 points for mathematics and English respectively, if a head teacher had university education as opposed to O-level with one or two years of teacher training.

Head Teacher's Experience

Head teachers were asked a question about the length of their experience. Answers to this question ranged from (1) less than one year; (2) one to five years; (3) six to ten years; and (4) over ten years. Analysis of responses to this question indicate that the highest number of pupils, 43.9 percent, were in schools with head teachers having over ten years of experience, while 4 percent were in schools with head teachers having less than one year of experience. Schools in rural areas had a higher proportion of teachers with over 10 years (45.10 percent) compared to 39.10 in urban areas. The study also found that urban areas have a higher proportion of head teachers with one-to-five years experience (32.61 percent) compared to 24.84 in rural areas (Table 20).

Head teacher experience		School Location		Total
		Urban	Rural	
Less than a year	N	1	7	8
	Percent	2.17	4.58	4.02
One to five years	N	15	38	53
	Percent	32.61	24.84	26.63
Six to ten years	N	12	39	51
	Percent	26.09	25.49	25.63
Over ten years	N	18	69	87
	Percent	39.13	45.10	43.72
Total	N	46	153	199
	Percent	100.00	100.00	100.00

Note: 2 cases dropped from the analysis.

A higher proportion of head teachers in Government-aided schools had over ten years of experience (46.16 percent) compared to 21.05 percent in private schools. Private schools had a higher proportion of head teachers in the one-to-five year category (52.63 percent), compared to 24.18 percent in Government-aided schools as shown in Table 21.

Head teacher experience		School Owner		Total
		Government	Private	
Less than a year	N	8	0	8
	Percent	4.40	0.00	3.98
One to five years	N	44	10	54
	Percent	24.18	52.63	26.87
Six to ten years	N	46	5	51
	Percent	25.27	26.32	25.37
Over ten years	N	84	4	88
	Percent	46.15	21.05	43.78
Total	N	182	19	201
	Percent	100.00	100.00	100.00

Head Teacher Age

Head teachers were asked which age category they belonged to. Responses included: (1) Under 30 years; (2) 30–39 years; (3) 40–49 years; and (4) 50–59 year. Responses to this question were analyzed and related to pupil's test scores in mathematics and English. Results from this study indicate that a higher proportion of head teachers were in the 40–49 age category (51 percent), while only 0.5 percent are under 30 years of age. Rural schools had a

higher proportion of head teachers in the 40–49 age category (53.29 percent) compared to 43.48 percent in urban schools. Almost the same proportion (15.22 percent and 15.79 percent) of head teachers were in the 50–59 age category for both urban and rural areas respectively. Government-aided schools have almost double the percentage share of head teachers in the 40–49 age category (54.2 percent) compared to 27.7 percent for private schools. Overall, private schools have younger head teachers with about 35 percent of their head teachers in the 30–39 age category. Both Government and private schools have similar proportions of head teachers in the 50–59 age range.

It is surprising that older head teachers do not have a strong influence on pupil test scores. Pupils in schools with younger head teachers performed considerably better than those with older ones. Mean scores decline after one-to-five years experience. It therefore appears that the relationship between mean scores and head teacher experience is not linear. It appears that the head teacher tends to grow tired of the job with age. It is also possible that older head teachers have more family obligations and therefore have to find other alternative sources of income outside school, and therefore might spend less time at school to focus on academic matters. Experience as a head teacher does not have a clear relationship with pupil performance. There is an increase in pupil performance reaching its peak within the one-to-five year experience category and declines thereafter. This is a similar trend with teacher experience.

Other Key Factors

Head Teacher Supervision of Teaching

Relating pupils' test scores to frequency of head teacher supervision indicates that the majority of head teachers (51.7 percent) supervise teaching of mathematics weekly, 26.02 percent supervise every two weeks, and 3.9 percent supervise once a term. Pupils whose head teachers supervise mathematics teaching weekly or every two weeks scored much higher than other categories, with differences in test scores for these two categories not being significant.

Observations and interviews identified the following strategies that enhance learning in mathematics and English:

- Guidance and counselling of pupils, when they perform badly or when they are found to be having problems,
- Teachers' lesson preparation,
- Use of local materials, and
- Adopting practice to particulars of the classroom.

Overall, from the results of this study, frequency of homework, going over homework with teacher in class, tests, mode of handling of tests, grouping, out-of-school time spent by the teacher focusing on academic issues of the pupil, pupil-teacher interaction in the classroom, have a positive relationship with test scores. This study also found the use of a range of teaching strategies and interaction styles rather than a single approach to be more effective in increasing test scores. These call for strong attention in the effort to improve learning outcomes.

Teacher Motivation

A common feature identified from discussion with head teachers of schools with higher pupil scores is acknowledging teacher's good work or effort by thanking them or paying them for extra work done resources permitting. This is through provision of breakfast, lunch, monthly allowance, special yearly awards, recognition of teacher of the week, payment of teachers when they teach on Saturday, and acknowledging what teachers do. Most of the private schools provide incentives to teachers, while only 50 percent of Government-aided schools do. Incentives may not be affordable in Government-aided schools given the resource constraints and competing demands in the sector.

Speaking and Practicing English

Teachers indicated that speaking and practicing English is important for good performance. This observation was raised in five out of eight schools. Teachers emphasized speaking English at all times for various activities, and the need to introduce debating clubs and drama. Pupils in urban areas were thought to be at an advantage in this respect.

Lack of Security

For schools in the northern region, teachers cited lack of security as leading to absenteeism, late coming and consequently failing to complete the syllabus. This is not surprising since this region has been under insurgency for over 18 years. Teachers also indicated that with insecurity, pupils sleep in camps and therefore cannot do homework.

Others

Interviews with teachers and head teachers also identified other factors like academic emphasis, involvement of parents in academic matters of their children, head teacher giving feedback to teachers, head teacher being at school most of the time, involving teachers in discussions on how to improve performance, regular meetings to review performance, teacher's interest in a subject, collegiality among teachers, remedial teaching for weaker pupils and practicing English.

Differential Effectiveness

This chapter explores differences in pupils' performance with differences in school, pupil, teacher and head teacher characteristics, in particular gender. Analysis of school differences is based on school ownership (Government-aided and private) and location (rural, urban and by region—Northern, Eastern, Central, Western).

School Ownership

The relationship between pupil performance and school ownership was analyzed. Results of this study indicate that private schools had significantly higher mean scores, 53.2 percent for English and 47.38 percent for mathematics, compared to 22.2 percent for English and 26.5 percent for mathematics in Government-aided schools respectively. Government rural schools scored lowest at 18.8 percent and 26 percent for English and mathematics respectively. Private schools performed better in English compared to mathematics, while Government-aided schools performed better in mathematics compared to English (Table 22). For both private and Government-aided schools, rural schools performed worse than urban schools.

Standard deviation was another measure used to identify the level of variation of achievement scores between schools. Overall, for English, there was a higher variation in test scores (as reflected in a higher standard deviation) between private schools (17.8) and Government-aided schools (16.9). The standard deviation was 12.4 for mathematics in private schools and 8.3 for Government-aided schools.

Analysis of variance results indicate significant differences between private and Government-aided schools with ($F = 271.76$, $df = 3,955$, $p = 0.01$) for mathematics and ($F = 590.56$, $df = 3946$, $p = 0.01$) for English.

Table 22. Mean Test Scores by School Ownership and Location

School Ownership	Mean achievement		Standard Deviation	
	English.	Mathematics	English	Mathematics
Total Govt.	22.2	26.5	16.9	8.3
Government-aided urban	44	34.0	19.9	14.4
Government-aided rural	18.8	26.0	14.0	13.4
Total Private	53.2	47.38	17.8	12.4
Urban Private	58.7	38.5	17.5	17.2
Rural Private	50.1	39.7	13.7	15.1

The dummy variables representing ownership show that pupil's literacy score was 13 points lower when a pupil was in a Government-aided school as compared to those in a private school. Pupils in Government-aided schools were found to differ significantly from pupils in private school at $p = 0.005$. For mathematics, dummy variables representing ownership show that a pupil's mathematics test score was about 8 points lower when a pupil was in a Government-aided school as compared to when in a private school. Pupils in government-aided schools were found to differ significantly from those in private schools at $p = 0.05$.

Overall, pupils in private schools had higher mean test scores than those in Government-aided schools.

Pupil Gender

Pupil's test scores were analyzed by gender. Results of this study indicate that in mathematics, on average boys scored about 4 points higher than girls. The T-tests indicate that the two mean scores were significantly different with t-statistic of 9.08 at $p = 0.01$. For English, boys scored on average about one point higher than girls. T-test carried out to establish whether boys scored significantly better than girls, indicate that the test scores are not significantly different with a t-statistic of 0.64 at $p = 0.05$. There is therefore no overall significant difference between Ugandan boys and girls in their primary 6 English test scores.

The differences between mean English scores for girls or boys in urban schools and those for boys or girls in rural schools were significant (over 10 percent). However, for boys, the standard deviation for urban and rural schools were the same, while there was an almost 2 point difference between the standard deviation for girls in urban schools and those in rural schools.

Analysis of Results of Gender and Test Scores

These results for mathematics performance are generally consistent with the stereotype that girls do not perform as well as boys in mathematics. Although boys had slightly higher test scores in English, these differences in test scores were not statistically significant. There is therefore no overall significant difference between Ugandan boys and girls in their pri-

mary 6 English test scores. The mean scores for girls in urban schools were not much different from the mean score for boys in urban schools. Likewise, there are no discernable differences in the mean scores for boys and girls in rural schools.

Overall, boys had higher mean mathematics test scores than girls. While the difference in mean test scores between boys and girls was significant for mathematics, it was not significant for English. Girls in urban schools had higher mean mathematics test scores than boys in the same schools. Although higher, the mean mathematics test score for girls in urban schools, 47.5, was not significantly different from the mean score for boys in urban schools, 46.6. Likewise, there was no discernible difference in the mean scores for boys and girls in rural schools. Both boys and girls in urban schools had higher mean scores in mathematics than for English. The dummy variable representing pupil gender indicates that the pupils' mathematics test score was 3.948 points higher when the pupil was a boy as compared to when a pupil was a girl. Boys were found to differ significantly from girls at $p = 0.05$.

Teacher Gender

Pupils taught by female teachers had higher scores in English, while those taught by male teacher had higher mathematics scores. For English, pupils taught by female teachers scored an average of 29.95 percent compared to 23.56 percent for pupils taught by male teachers. The t-test indicates that at $p = 0.01$ there were significant differences in the mean literacy test scores for male and female teachers. On the other hand, for mathematics, pupils taught by male teachers had higher mean test scores (28.84) compared to (27.50) by female teachers (Table 23). However, t-tests indicate that at $p = 0.05$ there was no significant difference between the mean mathematics test scores for male and female teachers.

Teacher gender (Number of pupils)	Mean English Test Scores	Standard Deviation	Range for English scores	No. of pupils for maths	Mean Maths. Test Scores	Standard Deviation	Range for Maths scores
Male teacher (N = 2859)	23.56	18.21	88	3486	28.84	14.33	87
Female teacher (N = 1008)	29.95	19.84	91	361	27.50	15.47	74
Male H/Teacher (N = 3159)	23.74	17.85	91	3199	25.61	12.80	73
Female H/T (710)	28.40	21.21	88	737	25.70	12.96	71

Analysis of Results for Teacher Gender and Test Scores

Nyangura (1993) found female teachers to have a stronger influence in raising pupil achievement. There are differences in teacher gender by school type. About 80 percent of pupils in private schools are taught by male teachers as opposed to about 73 percent of

pupils in Government-aided schools. Urban schools report more female teachers than male teachers, and rural areas report more male teachers than female teachers. Private schools have a lower proportion of female teachers.

This study indicates that boys taught by male teachers had higher mathematics test scores compared to girls. For both mathematics and English, girls taught by a female teacher had higher test scores compared to boys taught by female teachers. Overall, girls' performance benefits more with a teacher of the same gender than boys. This is in line with the assertion by head teachers interviewed that female teachers teaching in upper classes is one of the major factors that improve pupil performance.

Further analysis relating pupil gender with teacher gender indicates that boys taught by male teachers had higher mathematics test scores (31.06) compared to girls (26.57). On the other hand, girls taught mathematics by female teachers had slightly higher mathematics test scores (27.51) compared to boys (27.43). However, the difference between the mathematics performance of boys and girls with a female teacher was not significant. For English, both boys and girls had higher scores when taught by a female teacher, although girls had significantly higher scores (31.02) than boys (28.80). Scores were 24.32 and 22.79 for boys and girls respectively taught by male teachers.

Head Teacher Gender

The proportion of pupils with male head teachers was 81.4 percent compared to 18.6 with females. There are no significant gender differences between head teachers of private and Government-aided schools. The proportion of pupils with male head teachers in private schools was 82.7 percent, while that in Government-aided schools was 81 percent.

The results show that pupils with female head teachers had a higher mean mathematics scores (26.09) compared to pupils with male head teachers (25.61). However, t-tests show that there were no significant differences at $p = 0.05$, in the mean pupil mathematics test scores for pupils with female teachers.

Similarly, pupils with female head teachers had a higher pupil mean English test score (28.31) compared to those with male head teachers (24.43). T-tests show that there were significant differences at $p = 0.01$, in the mean pupil English test scores for male and female head teachers.

Overall, boys performed better than girls in both mathematics and English. However, girls in urban areas performed better than boys. Pupils taught by female teachers had higher mean English test scores compared to those taught by male teachers. On the other hand, pupils taught mathematics by male teachers had higher mean mathematics test scores than those taught mathematics by a female teacher. Regression analysis of pupils' mathematics score against pupils' background characteristics, teacher characteristic, head teacher characteristics and inputs was $R^2 = 0.35$ which shows that the variations in pupil background characteristics, teacher characteristics, head teacher characteristics and inputs explain 35 percent of the variation in the pupils mathematics score.

Conclusions

The results of this study in Uganda specifically apply to primary 6 pupils, although with a sample size of about 3,950 pupils, and 200 schools, there is little doubt that the results of the study are fairly robust, and should be applicable to other grades in upper primary education in Uganda. It may well be that the results could also guide other countries struggling with similar problems to those in Uganda as they try to reach the Millennium Development Goal for completion of primary education.

The study was prompted by the need for improved efficiency in use of education resources. Results of the study point to some critical areas where improvements can be made in order to improve pupil performance, possibly with fewer resources. These results can therefore help to contribute to the debate on more efficient use of scarce resources.

There is strong evidence from the study that there is considerable variation in levels of inputs by school ownership and location, with private schools being better resourced than Government-aided schools, and urban schools being better resourced than rural schools. Rural Government-aided schools are at a bigger disadvantage. There is also considerable variation in test scores by school location (rural/urban and by region), and by type of ownership. This is something that Government would not wish to see and further investigation is warranted to determine why this is so and how to redress the situation.

Given the importance of ensuring equality in levels of input, the study found that inputs which have been traditionally regarded as important for example funding per pupil, class size, textbooks, have a low correlation with test scores. The relationship between supply of inputs and test scores appears to be weak, to the extent that one can be tempted to conclude that more provision of inputs does not necessarily lead to better performance. School inputs accounted for as little as 7 percent of the variance in mathematics achievement, and 15 percent of the variation in variation in English achievement. The study provides some evidence that school resources alone do not explain variation in pupils' performance, but

other factors beyond availability of resources come into play. Strong academic emphasis, teacher motivation, strong leadership, and classroom processes appear to have a positive relationship with pupil's test scores.

This finding supports observations by Jimenez and Lockheed (1995) and Gray (1990) that adequate levels of inputs are a necessary, but not a sufficient condition for a school to be effective. Student achievement is not caused by one factor but is dependent on a whole range of factors including home, school and teacher characteristics. These characteristics interact in a complex way to influence learning. The study also leads to the conclusion that the impact of inputs depends on how well schools use them, and there is considerable variation in schools in this respect.

In addition, this study emphasizes the need for a balanced focus on resource availability and use, since without appropriate use or management; resources may not lead to improved learning. This situation is clearly demonstrated by textbooks, where textbook availability at the school level has a positive, but not significant relationship with test scores, whereas pupils' use of their own textbooks and number of textbooks at home have a significant influence on test scores. Due to limited use of textbooks, a lot of time is spent copying work on the blackboard, thus reducing time that should have been used for other critical learning activities. There might also be merit in providing training to teachers on use of textbooks to improve learning. Well designed teachers' guides would also greatly improve teacher use of instructional materials to improve learning. From the results of this study, one can conclude that provision of textbooks should be accompanied by use if they are to translate into improved test scores. In addition, these results emphasize the importance of improved access to textbooks by pupils if test scores are to improve.

Teacher characteristics also vary greatly. This study emphasizes the importance of investing more in in-service training focused on pedagogical practices than on training teachers to acquire academic qualifications. It also highlights the importance of accommodating teachers at or near the school. This study points to the need for female teachers at higher primary grades. Further, there may be need for Government to come up with ways of recognising demonstrated teacher competence. From the results of this study, it is possible that teaching ability may be more important than measurable teacher characteristics. Similar conclusions are arrived at for the head teacher. Teacher subject knowledge, commitment, interest and collegiality, have a positive relationship with test scores. Because the usual measures of teacher quality do not seem to demonstrate a strong influence on pupil performance, and the effectiveness of teachers based on these characteristics is mixed, further research is required in this area in order to understand better what makes teachers effective.

Other factors identified as having a big influence on learning achievement of primary 6 pupils in Uganda include pupil background characteristics, and classroom processes.

Instructional strategies like frequency of testing and homework are critical in that they help teachers to better understand their pupils' grasp of what is being taught, and thus work out new strategies to better facilitate learning. Varying teaching strategies to suit specific circumstances was identified to be an effective way of ensuring that even slow learners are not left behind. Remedial teaching also helps to improve on learning for those whose need is identified through test results. This study notes that learning is greatly influenced by the dynamic interaction of processes that go on between the teacher and the pupil as well as school inputs. Clearly, focus on the best use of available resources will improve quality for many pupils.

Strong academic emphasis was reflected in the school mission, schools involving parents in academic matters of their children, head teacher supervision of teaching and giving feedback to teachers, being at the school most of the time, involving teachers in discussions on how to improve performance, regular meetings between head teachers and teachers, and strategies that include remedial teaching for weaker pupils.

Pupil background characteristics, in particular parental education followed by number of books at home and language spoken at home in that order have a positive influence on pupils' test scores. Other background factors and characteristics that have positive influence on pupil test scores include; parental support and encouragement, and presence of lighting at home to extend the study hours. However, English or literacy is more influenced by pupil background characteristics than mathematics. Distance of school from pupil's home, family size and age, have a negative influence on pupil's test scores. Pupils who are not the right age for the class do badly, pointing to the importance of enrolling children on time and implementing automatic promotion.

Overall, results of this study indicate that pupil background characteristics and classroom processes have a weak, but positive correlation with primary 6 pupils' test scores. The influence of availability of school inputs alone appears to be weak. However, if availability of inputs is accompanied by proper use and school processes that emphasize academic achievement they do lead to better performance. It is clear from this study that there is no simple solution to raising pupil's academic achievement. There is clearly need for more resources and in particular better use of these resources especially textbooks.

Moreover, findings of this study suggest that school inputs, measurable teacher characteristics (education, experience and age), head teacher characteristics, do not have a strong influence on Ugandan primary 6 pupils' performance, but rather other factors like the way schools are managed, classroom interaction, and use of school resources may be more strongly related to pupils' performance. However, given the unusually large class sizes, strategies like better classroom interaction would be greatly enhanced with reduced class sizes.

The findings of this study could well be used in the policy dialogue with education policy makers and stakeholders on improving efficiency of expenditures in the education sector. Given these findings and given the level of resources required to reach the Education for All and Millennium Development Goals there is no room for complacency in the current levels of pupil performance of primary 6 pupils in Uganda. The findings of this study clearly demonstrate the need to focus on school and classroom processes and better use of education resources focused on improvement of learning.

Implications of the Results for Current and Possible Future Policy in Uganda

Current Policies

Current policies in Uganda include automatic promotion and appropriate age entry. However, neither of these policies is enforced adequately. Other policies are placing textbooks in the hands of children, reducing class size to below 55 in the upper primary grades and to 40 in the medium term. What do the findings of the study show for each of these areas of policy?

Automatic promotion and appropriate age entry. While Uganda has a policy of automatic promotion this is not being implemented everywhere and many children repeat (13.8 per cent in 2004). The general literature suggests that repetition tends not to work with the same texts, large classes and subject to the same teaching styles. Clearly, enrolling children at the appropriate age and promoting them each year is a good policy measure for Uganda. However, in tandem with enforcement of automatic promotion, it may be necessary to administer regular tests and homework that would identify pupil's weaknesses, and address them through remedial teaching to ensure acquisition of the desired levels of competency.

Class size. The need to reduce class size below 55 (at primary 6) is not supported by this study. This study demonstrated that some schools with large classes (around 60) performed significantly better than those with smaller ones. Large class sizes are likely to be a feature in Uganda for a number of years to come. Accordingly, the current limited resources in Uganda may be better used by helping teachers to effectively teach large classes.

Textbooks. The limited influence of textbooks in this study, even in cases where there is a relatively low level of pupil to textbook ratio, may be attributed to limited use and or access to textbooks by pupils. The recent Government decision to have books in the hands of pupils by allowing pupils to take textbooks home is a move in the right direction. This study may also point to the need for training of teachers on effective use of textbooks and Government may wish to apply resources for this purpose.

Possible Future Policies

Headteachers and teachers. Head teacher and teacher characteristics in particular qualifications, experience and age appear to have little influence on primary 6 pupil performance. Yet, these are the major criteria used for determining remuneration. It would serve the system well to examine and include teacher effectiveness as key criteria for determining teacher remuneration.

In-service teacher training. The mismatch between the primary curriculum and primary teacher education curriculum may explain the limited influence of in-service training. This would call for a review of the teacher education curriculum alongside the review of the primary education curriculum to ensure adequate match. In addition, in-service training needs to be better focused on pedagogical issues, and also to be better aligned with the curriculum. As suggested above, it could also concentrate on helping teachers utilize textbooks better.

Classroom processes. Given the limited influence of school inputs, and background characteristics, school processes for example regular monitoring of pupils' learning, regular homework, regular feedback to pupils, remedial teaching for weaker pupils, academic emphasis, language issues, pupil/teacher and teacher/teacher interaction should be emphasised.

Caveat

However, these results should be interpreted with caution because they do not prove that the resource caused the variation in pupil's achievement, but rather that the two are related. The relationship might be as a result of factors that are associated with both achievement and resources for example economic level of families from which children come. Although these factors can be statistically controlled, caution in interpretation remains necessary. The

rich body of literature reviewed, of necessity, was drawn from countries many of which were radically different in terms GNP, level of teacher training, school and classroom resources, and so forth.

Implications for Policy in Other Countries

While the caveat above applies to other countries even more than to Uganda, there are aspects of the findings of this study which could bear investigation and research in other countries. These include, but are not confined to: appropriate age entry; automatic promotion; utilization of textbooks; classroom and school management, teacher support.

Future Research

It is evident that other factors besides school inputs and pupil's background characteristics influence scholastic performance. The findings of this study suggest that more research needs to be carried out in order to understand how school inputs interact to enhance learning achievement. Research into other factors like school and classroom processes may help to enhance understanding of factors that influence learning.

Future research could also help clarify under what circumstances pupils in large class sizes perform better than those in smaller class sizes and this needs further investigation. Similarly, what contributes to continued teacher effectiveness also needs to be better understood. In that regard, an investigation into factors that contribute to continued effectiveness of teachers and head teachers with age, experience and tenure would help to shed more light in this area, and therefore help guide policies for improved effectiveness.

Although a nationally representative sample of school pupils was used, this study only includes pupils from grade 6. Research that follows pupils from one grade to another and that which includes pupil prior achievement would greatly contribute to the understanding of the value added by education inputs. This suggests a need for longitudinal studies treating issues similar to those considered in the present study.

There is no doubt that the results of this study will be important for policy dialogue on how to improve efficiency in use of education resources, in particular during this era of a constrained resource envelope, which calls for better use of existing resources due to limited availability of additional resources.

Other research would help to monitor the extent to which conditions change over time in Uganda, and how these changes are related to achievement scores. In other words similar studies should be carried out in conjunction with the National Assessment of Progress in Education to help monitor what is happening in the education system and what seems to be having the most impact on learning achievement levels.

Regression Results

	(1)	(2)	(3)	(4)
	School level performance		Individual performance	
	Numeracy	Literacy	Literacy	Numeracy
Funding per pupil (log)	3.394***	5.587***		
	(3.29)	(3.96)		
Pupil desk ratio	-0.034	-0.059		
	(1.03)	(1.32)		
Pupils in P6 (class size)	-0.061**	-0.065**		
	(2.57)	(2.02)		
Pupil/textbook ratio—English		0.425		
		(1.05)		
Pupil /book ratio—Mathematics	0.139			
	(0.37)			
Government school	-6.595***	-14.821***	-18.093***	-10.107***
	(2.70)	(4.50)	(15.16)	(9.23)
Number of pupils (school size)	0.008*	0.007		
	(1.82)	(1.26)		
Rural	-6.080**	-9.695***	-15.947***	-7.803***
	(2.48)	(2.89)	(16.02)	(8.90)
East	-3.038*	-7.765***	-9.453***	-4.146***
	(1.87)	(3.37)	(11.31)	(5.80)
North	-0.856	-8.227***	-3.407***	2.165**
	(0.41)	(2.90)	(3.14)	(2.36)
West	2.634	-0.780	2.518***	5.078***
	(1.58)	(0.34)	(2.89)	(6.94)
Female pupil			-1.625***	-4.258***
			(3.07)	(9.71)
Age			-1.816***	-1.001***
			(9.07)	(5.95)
meduc==2			-0.513	0.103
			(0.69)	(0.17)
meduc==3			0.044	-1.411*
			(0.05)	(1.81)
meduc==4			0.187	-2.038
			(0.12)	(1.56)
feduc==2			-0.027	2.343***
			(0.03)	(3.27)
feduc==3			0.859	2.883***
			(0.93)	(3.74)
feduc==4			1.721	3.984***
			(1.30)	(3.59)
Repeated at least once			1.134*	-1.376**
			(1.73)	(2.46)

	(1)	(2)	(3)	(4)
	School level performance		Individual performance	
	Numeracy	Literacy	Literacy	Numeracy
Female teacher			4.416***	-1.794**
			(6.06)	(2.10)
htsuper1			9.049***	3.707***
			(5.25)	(2.81)
htsuper2			9.060***	2.746**
			(5.11)	(2.06)
htsuper3			9.599***	2.932**
			(5.27)	(2.14)
htsuper4			4.384**	1.400
			(1.99)	(0.79)
Math assignments at least thrice a week				3.263***
				(6.20)
Constant	-0.768	-16.025	76.834***	63.754***
	(0.07)	(1.00)	(14.80)	(14.12)
English assignments at least thrice a week			3.587***	
			(5.92)	
Observations	167	167	3225	3067
R-squared	0.31	0.45	0.39	0.26

Note: T-statistics in parentheses.

***Significant at 1%, **Significant at 5%, *Significant at 10%

Specification of Models for Input Availability

The input availability model is:

$$TS_i = \alpha + \beta_1 \text{TXTBOOK}_i + \beta_2 \text{CLASSIZE}_i + \beta_3 \text{FUNDING}_i + \beta_4 \text{BENCH}_i + \beta_5 \text{MINUTES}_i + \epsilon_i$$

where TS_i is the student test score: English test score measuring Literacy and Math test score measuring Numeracy. The variable TXTBOOK_i is the number of pupils sharing a text book in pupil i class. The variable CLASSIZE_i is the number of pupils in pupil i class. The variable FUNDING_i is the funding per pupil in pupil i school. The variable BENCH_i is the number of pupils per bench in pupil i class. The variable MINUTES_i is the number of minutes per week pupil i teacher spends on teaching.

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Results point to some critical areas where improvements can be made in order to improve pupil performance possibly with fewer resources. This analysis is particularly focused on changes which can be made by the Uganda Ministry of Education and Sports to improve efficiency in the use of resources. This study provides some evidence that school inputs alone explain a small proportion of the variation in pupil performance. Educational processes, such as the way schools are managed, the mode and level of classroom interaction, teaching strategies, and better use of school inputs, may be more strongly related to pupil performance.

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