EdQual

A Research Programme Consortium on
Implementing Education Quality in Low Income Countries

WHICH IN AND OUT OF SCHOOL FACTORS EXPLAIN VARIATIONS IN LEARNING ACROSS DIFFERENT SOCIO-ECONOMIC GROUPS? : FINDINGS FROM SOUTH AFRICA

EdQual Working Paper No.24:

Michèle C. Smith

University of Bristol

November 2010

University of BRISTOL

EdQual

A Research Programme Consortium on
Implementing Education Quality in Low Income Countries

EdQual RPC is a Research Consortium led by the University of Bristol UK and sponsored by the Department for International Development, UK.

The Consortium comprises:

- The Graduate School of Education, University of Bristol, UK
- The Department of Education, University of Bath, UK
- The Institute for Educational Planning and Administration, University of Cape Coast, Ghana
- The Faculty of Education, University of Dar es Salaam, Tanzania
- The Kigali Institute of Education, Rwanda
- The Education Policy Unit, University of the Witwatersrand, Johannesburg, South Africa.

EdQual also collaborates with the Institute for Educational Development, The Aga Khan University, Pakistan and the Instituto de Informática Educativa, Universidad de La Frontera, Chile.

EdQual runs research projects mainly in Africa, aimed at improving the quality of formal basic education for disadvantaged groups. Our projects include:

- Implementing Curriculum Change to Reduce Poverty and to Increase Gender Equity
- Leadership and Management of Change for Quality Improvement
- Literacy and Language Development through Primary Education
- School Effectiveness and Education Quality in Southern and Eastern Africa
- The Use of ICT to Support Basic Education in Disadvantaged Schools and Communities in Low Income Countries.

For more information and other papers in this series, visit www.edqual.org.

This Paper has been published by EdQual RPC and funded by the UK Department for International Development, although the views expressed are those of the Author[s].

ISBN: 978-1-906675-30-1

ABSTRACT

Previous studies on the role of the school in influencing attainment in South African schools have concluded that the inequalities which are known to exist in these are still largely due to the legacy of the Apartheid system on schooling. More recently policy focus has been on narrowing the gap between these in terms of the inequality in school resource levels and facilities.

The work presented here investigates which pupil background, school context and school resources (human and physical) factors affect individual pupil academic attainment by concentrating on developing separate multi-level models for individual learners of similar socio-economic status. This approach allows for the possibility that different in and out of school factors combine to explain the differences in attained mathematics and reading scores of South African Grade 6 pupils participating in the SACMEQ II survey in 2000, and that this could be dependent on the socio-economic status of the learner.

The conclusion discusses some pointers for South African policy. It is argued that focus should be wider than just on the resourcing levels of schools and whether or not they are efficient in using these resources to improve educational outcomes. The evidence points to the need additionally to target deprived, mainly rural, neighbourhoods and develop interventions and alternative strategies to overcome some of the acute social disadvantages pupils, especially of lowest socio-economic status, bring with them into school. These include poor nutrition, lower fluency levels in the language of instruction used in schools and higher chances of living away from home to be schooled.

Contents

Figures and Tables

1. INTRODUCTION

This paper explores whether the individual socio-economic background of a pupil is associated with how pupil background and school characteristics combine to explain variation in pupil reading and mathematics attainment towards the end of primary schooling. The research examines this by dividing pupils participating in the SACMEQ II study[1] of pupil, teacher and headteacher characteristics and the attainment of learners in Grade 6 in reading and mathematics into four status groups of increasing wealth and performing a multilevel analysis on each status quartile to establish which in and out of school factors explain differences in Grade 6 literacy and numeracy attainment for South African pupils.

International and national studies on South African achievement[2] over the recent decade or so attribute the huge attainment differences amongst primary school learners seen to date to the general legacy of the Apartheid system in creating a hugely unequal society prior to 1994. The pro-White minority policies led to large inequities in access to education for the majority black South African population (78% of population in 2003) compared to, in particular, the minority white South Africans (10% of population in 2003, both figures from National Treasury, 2003). These policies also led to great inequalities in the distribution of wealth amongst racial groups. The National Treasury 2001 study estimated that 50% of the population lived below the 'poverty line'. However, this poverty was unequal between racial groups with only 3% of whites classified as living in poverty compared to 60% of black South Africans (estimates). The Global Monitoring Report (2008) reports that circa 2000, 62% of South Africans lived on under $2 per day. Van der Berg et al. (2003) found that some 60% of children live below the poverty threshold of R400 per person per month (although the percentage of households living in poverty was reported to be between 40 and 45%).

This historical stratification of South African society in terms of race and wealth and its impact on later generations' post-Apartheid is still prevalent. Goldstein, 2010[3], cited evidence from the South African Institute for Race Relations (SAIRR) that only a small proportion of all who took the 2008 matric examinations scored enough to access university (approximately 19% of all secondary leavers). The racial divide is evident in the proportion of learners who pass the matric of all entered; only 57% of all Africans pass compared to 99% of Whites taking the exam. Overall, those who go on to study to university degree level, only 13% of all African matric exam takers will go on to obtain a degree compared with 69% of White matric exam takers. Thus, the knock on effect of the lack of a quality education and the knowledge acquisition of learners post secondary over the Apartheid era (at the very least) means that a great proportion of the teachers in the current system have a poor foundation of knowledge and mastery of subjects. Evidence of this knowledge deficit has emerged from national studies in South Africa which have found that teachers score poorly on tests given to end of primary phase pupils.

This will inevitably impact on the quality of learning and the capability of this work force to implement curriculum changes legislated by the post-Apartheid government in its attempt to raise the standard of educational outcomes. Major curriculum reform was introduced in the late nineties. However, implementation has proved difficult in that teachers were ill prepared and many lacked the subject knowledge and training to deliver the changes (Dugger, 2009, article in The New York Times). Thus the generational legacy on the education system in South Africa is also reflected in the quality of the current teacher workforce and its ability to teach current and future generations.

In addition to the clear racial stratification of educational opportunities due to past discrimination and the links to poverty and location of these communities of learners (predominantly rural communities with limited access to basic amenities and good nourishment, for example), the Apartheid system did not invest in school infra-structure. Castro-Leal (1999) highlighted the marked differences in allocation for schools in affluent areas serving Whites compared to non-White schools. This imbalance

[1] SACMEQ reference (Moloi 2005)
[2] PISA, TIMMS and SACMEQ references and National Studies from Fleisch
[3] Nicole Goldstein blog at http://blogs.worldbank.org/education/south-africas-long-walk-to -education-equality

was compounded by the large funds which privileged, historically-white schools could already raise through fees from parents.

Castro-Leal's study also points to wealth and regional allocation differences in the amount of public education spending on these groups pre-1994 with the richest fifth of households obtaining a higher spend per person compared to the least wealthy fifth of households. The survey of spending pre-1994 also found that the poorest households received lower proportions of public funding the higher the education level they were accessing and Africans were receiving almost half the amount of funding per capita compared to non-Africans. Marked regional differences in spending were prevalent and this was put down to the vast majority of poor Africans concentrated in particular in the provinces of Eastern Cape, KwaZulu Natal and Northern provinces. Therefore, there were a great many schools in rural settings with a predominantly African intake and large proportions of learners in poor or impoverished households.

In this paper, it is argued that the key to raising attainment levels is not just associated with school resources and processes (such as improving the standard of school facilities and general resourcing levels to affect a rise in the attainment of pupil attending 'poorer' resourced schools) but, for individual pupils of lower SES, policy addressing the well-being of these individuals and the level of need in the deprived neighbourhoods in which they live would benefit these pupils in terms of raising actual scores.

The findings indicate that the pupil background factors, in particular for those at the lower end of the social scale, and peer learner effects to a greater part explain variations in attainment and school effects and the resourcing level of the school play a far lesser role for pupils in these lowest wealth brackets. Conversely, factors associated with the school such as teacher training, qualification levels and monitoring practices feature more so in explaining attainment variations for the wealthier pupils. Thus, policy developments should embrace a wider set of factors which affect pupil attainment, not only school factors relating to physical resources, but also including the general health and well-being of individual pupils, reasons for grade repetition and the cultural and linguistic practices surrounding those who have a poor grasp of the language of instruction. There is some indication that strategies identifying those located in communities where the mother tongue is predominantly not the language of instruction for individual pupils and where there are greater levels of poverty and the resulting lower health levels that are associated with extreme hardship (often in the more rural areas of South Africa) would benefit those most in need of support to access the same educational opportunities as learners in more wealthy communities.

2. ANALYSIS

2.1 Background to the SACMEQ II data set

SACMEQ is a consortium of ministries of education supported technically by UNESCO's International Institute for Educational Planning (IIEP). Its primary function has been to train ministry personnel in aspects of the design and administration of data collection instruments and in data analysis in order to enhance the monitoring of education quality in their respective countries. Its second major function has been to provide support and information for participating countries to inform their own policymaking.

The first wave of data collection (SACMEQ I) in 1995 concentrated on Grade 6 Reading achievement and involved seven countries in sub-Saharan Africa. By the time Wave II took place, mainly in 2000 (with the exception of Mauritius and Malawi where the survey was conducted in 2001 and 2002 respectively), the study had expanded to incorporate surveying conditions of schooling and education quality in fourteen countries in South and East Africa (Botswana, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania Mainland, Tanzania Zanzibar, Uganda and Zambia) and encompassed sampling over 46,000 pupils in over 2000 schools. Alongside

the collection of detailed pupil and teacher background characteristics, school resourcing information, teacher attitudes to teaching and learning and head teacher reflections on school management, organisation and whole school issues, all Grade 6 pupils sampled were tested in both reading and mathematics.

2.2 Test construction

The reading and mathematics test constructs and items were largely drawn from materials developed by three international assessment programmes; Programme for International Student Assessment (PISA), PIRLS and Trends in International Mathematics and Science Study (TIMSS). PISA, PIRLS and TIMSS all presume the possibility of devising test items that are culturally neutral in that they can be translated and administered so as to measure the same competencies in different national settings. Some critics, including experts within the field of assessment design, have questioned the extent to which standardised tests can both be culturally neutral and measure something that is meaningful (e.g. Goldstein, 2004b).

Although great efforts were taken by the SACMEQ team to construct tests which reflected the common core content and skills of the curricula and core materials used in the teaching of mathematics and reading across the fourteen nations, there is always some scope to contest how well the tests apply overall to an individual nation/country context. For example, Masalila (2008) has investigated the match between the SACMEQ mathematics pupil test items and the Botswana curriculum to determine the reliability of the mathematics scores obtained for Botswanan pupils who took the SACMEQ II mathematics test.

2.3 Profiling the Grade 6 South African Pupils.

2.3.1 SES and quartile grouping of individuals

Dolata (2005) constructed a composite SES variable for the SACMEQ II data set based on wealth indicators identified as key in a principal components analysis of the data set. The principal component analysis of variables associated with economic and social standing resulted in the production of component scores. The first component identifies a set of variables which together explain the most amount of variation in the responses of the learners to their home background, of all variables considered in determining the SES of individuals. These first component scores were used to determine the SES of an individual via transformation to a Rasch Scale. This resulting composite consists of a combined measure of the level of the learner's parents' education, possessions (including livestock) in the home, lighting source in the home and the quality of the structure of the home in terms of the materials used to build it.

Prior research by Van der Berg (2008) has looked at dividing pupils into quintile groups based on the mean SES calculated for all pupils in a particular school. The motivation for this, he argues, is that historically approximately 20% of schools pupils attended were privileged schools in urban settings and this top 20% of schools served pupils who tended to come from more affluent backgrounds. He argues that pupils attending this top quintile of schools attain markedly higher mean attainment scores compared to the mean attainment of pupils attending the remaining 80% of schools.

Using the SACMEQ derived indicator for SES outlined above, the South African pupils were classified into four socio economic status groups based on the 25th, 50th and 75th percentile value of SES for individual pupils[4]. Motivation for looking at banding of individual pupils instead of the mean SES distribution of the school intake (the approach adopted by Van der Berg, for example) was that an understanding of the in and out of school factors which contributed to raised or lowered attainment

[4] Initial investigations involved subdividing the attainment distribution into three, four and five SES bands. Little difference between the distributions was apparent for quartile and quintile partitioning of pupils by SES. Therefore, quartile partitioning has been chosen for simplicity.

of individual pupils was sought in that it was possible that the balance of these changed for pupils of differing wealth and circumstance.

Figure 1 shows the location of school attended by a pupil, their individual SES and the general resourcing level of the school (according to the SACMEQ derived 'school resource level' indicator, based on a total count of the facilities and resources a school had out of a checklist of 72 items). It is clear that the majority of pupils from the lowest two quartiles attend rural/isolated schools and these pupils attend schools ranging from ones with 'limited' to 'comfortable' resource levels. A few attend 'affluently' resourced school. However, there are some wealthier pupils attending these rural schools, though they are very much a minority of pupils. Conversely, there are more pupils, of all SES backgrounds who are attending comfortable or better resourced schools in non rural settings, with pupils of all SES in cities accessing schools with the best resources. It is also the case that the majority of the wealthiest pupils (quartile 4 SES) attend city schools with affluent or prosperous levels of resourcing. Only a small proportion of all lowest SES quartile pupils attend city schools, but the schools they attend are well resourced also.

Figures 2 shows a breakdown of the distributions of pupil scores in reading by location of school attended and the SES status of the individual (similar distribution patterns are also apparent in mathematics scores (figure 5c Appendix). There is a clear distinction between the general mean attainment of pupils attending urban schools compared to rural/isolated schools and this trend occurs across all SES groups. However, the higher scores, particularly those pupils scoring 600 or higher, are attained by pupils predominantly from the wealthiest SES quartile in urban schools. Pupils from the lowest quartile bands attending urban schools struggle to attain these top scores, even though a few are attending the most highly resourced schools. For the poorest pupils, it would appear that other factors counteract, to a greater degree, these 'in school' effects.

This leads one to question whether education policies in the past in South Africa which have focussed in the main on improving the resource levels of schools as the precursor to raising pupil attainment are working?

The hypothesis is therefore whether out of school and contextual factors are key inhibitors of a pupil's attainment for those of lower SES over and above the resourcing level per se of the school attended by these. This is tested by performing separate multilevel analyses on the four SES groupings of pupils to determine whether different combinations of 'in' and 'out' of school factors, defined in the next section, explain the difference in mean attainment and variation in pupil attainment for pupils of different social standing.

2.3.2 Evidence of inequity between schools

The histograms of attainment by quartile grouping (figure 2) show that different score patterns exist for pupils from different status groups. There is far greater breadth in scores for the most advantaged group and only a handful of pupils from the lower two status groups, particularly those who attend schools located in rural areas, score above 600 points in either subject. Initial multi-level modelling of the pupil scores in mathematics and reading for the full sample, namely the 'null' model (where the degree of unexplained variation in the attainment of pupils *between* schools can be separately calculated) reveal that 70% and 64% (for language and mathematics) of the total unaccounted for variation in pupil scores was due to variation between schools; a clear indication of the high degree of inequity between schools.

If one takes the SES quartile group membership of a pupil into account in the null model for the full sample of pupils, it can be seen from table 1, that the between school variation (or *intra-class correlation*) in scores of pupils is generally smallest for those from the lowest income group. Score variation between schools is highest for the two highest status groups (up to 71% and 63% of the unexplained variation in reading comprehension scores for the third and fourth quartiles is due to variation between schools in pupil attainment, for example). This is again borne out in the distribution of reading attainment for the four quartiles in figure 2. There is a clearly narrower range in scores achieved by particularly the least wealthy quartile 1 pupils (range of circa 300 points) who are predominantly located in rural areas with access to schools with more basic facilities compared to the score range of the most affluent pupils located in large cities (range circa 600 points). In part, due to the stark contrast in schools accessed by the least wealthy and most wealthy learners and these clear

achievement differences, more recent South African policy has highlighted improving school resourcing for the non-historically advantaged schools by looking at the mean SES of the school intake and apportioning more money to those schools with lower mean SES intakes (Van der Berg, 2008; Jansen and Taylor, 2003).

	SES Quartile 1	SES Quartile 2	SES Quartile 3	SES Quartile 4	Sample size
Original South African sample maths (n=3135) rho	**0.46**	**0.55**	**0.62**	**0.53**	**3135**
Original South African sample reading(n=3163) rho	**0.57**	**0.56**	**0.71**	**0.63**	**3163**

Table 1: Intra-class correlations (rho) of scores of full sample for each status/quartile group.

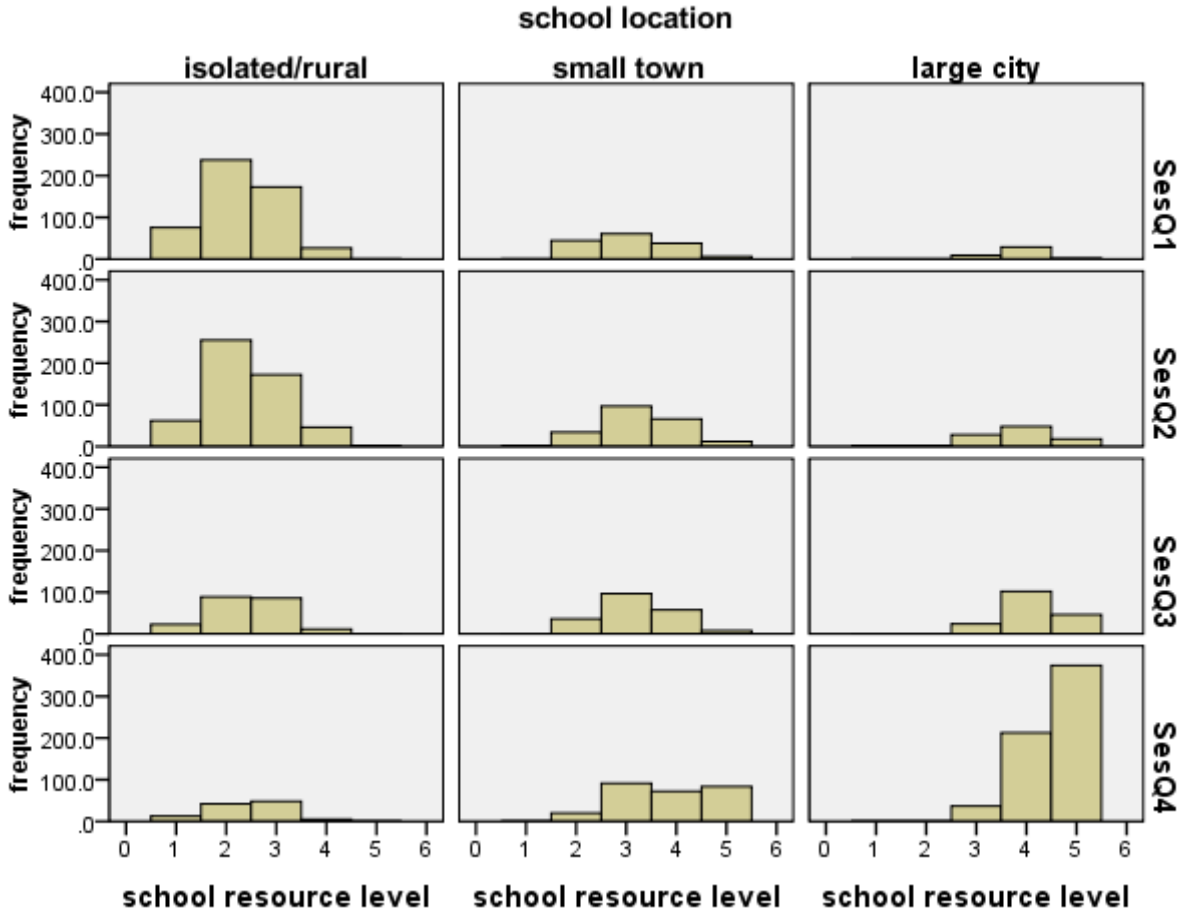


Figure 1 Profile of the resourcing level of school, school location and SES banding of South African Grade 6 pupils. Key to school resourcing levels: Level 1=insufficient Level 2-limited Level 3=basic Level 4=comfortable Level 5=affluent Level 6= prosperous.

	SES Quartile				Total sample size
	Quartile 1	Quartile 2	Quartile 3	Quartile 4	
Original South African sample	***724***	***888***	***619***	***932***	***3163***
Final Reading model reduced sample	**424**	**611**	**472**	**746**	**2253**
Final Mathematics model reduced sample	**476**	**652**	**512**	**832**	**2472**

Table 2 Original sample characteristics and reduced sample size in final multi-level models

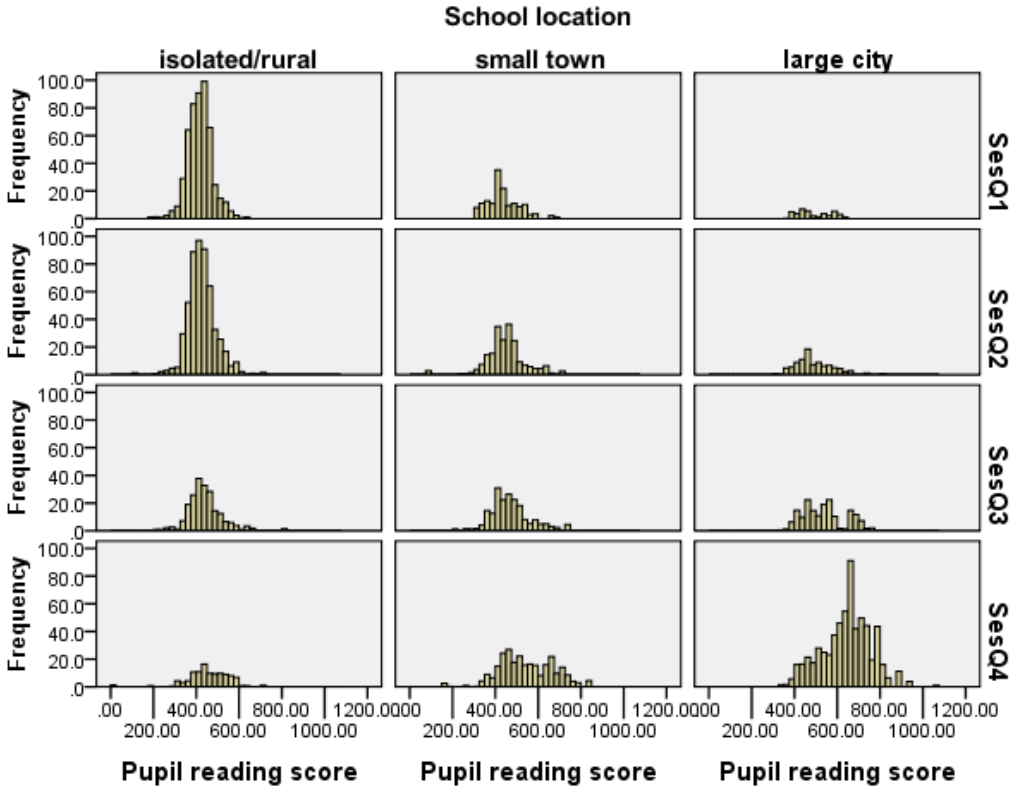


Figure 2 (a) Profile of location of school attended, individual SES banding and attainment in reading of South African Grade 6 pupils

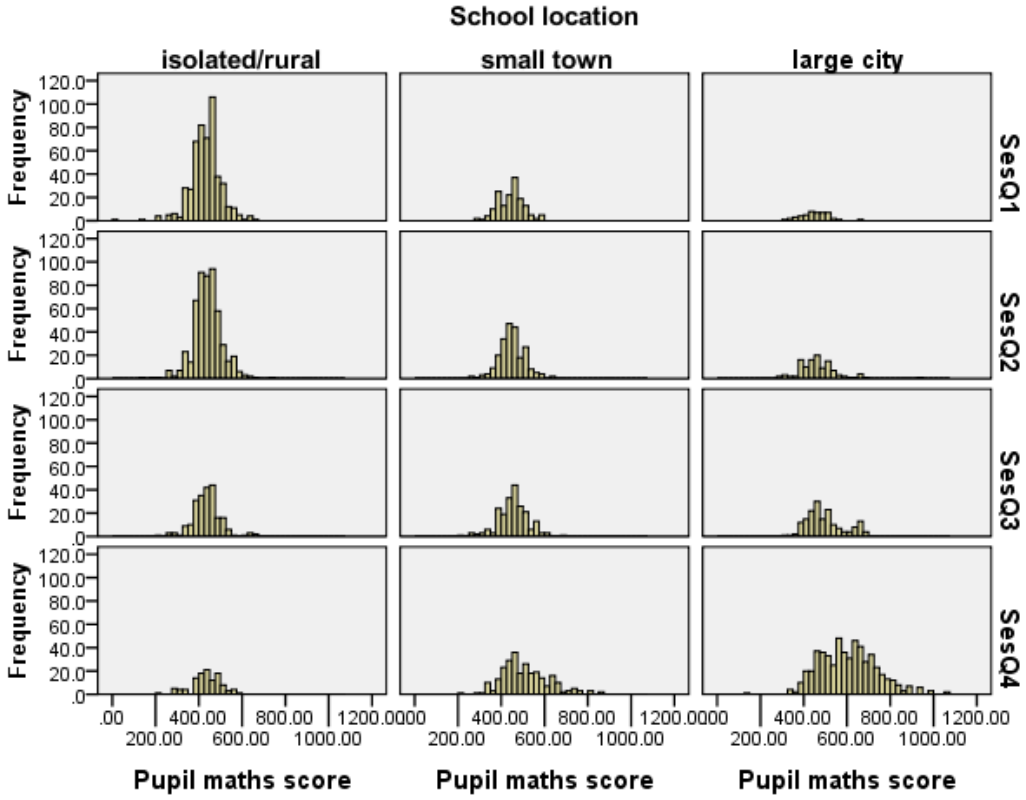


Figure 2(b) Profile of location of school attended, individual SES banding and attainment in mathematics of South African Grade 6 pupils

2.4 Identifying variables

The thematic approach used to select which of the 1235 SACMEQ II variables captured potential in and out of school influences on reading and mathematics achievement is summarised in Box 1. These themes emerged from ongoing work by the author (e.g. Smith and Barrett 2009) and also took into account limitations identified in the data set. For example, high missing responses for some covariates relating to school management/discipline and community support of the school would lead to an under-representation of pupils from the poorest quartile and thus also schools in isolated/rural locations. In addition, some variables did not vary enough in their responses to be reliably included. Therefore, final models did not include these covariates.

To this end, 'out of school factors' identified for inclusion were variables associated with pupil background, home educational resources and emotional support and well-being of a child in terms of their home living conditions and daily nutritional intake. In-school factors tested were those relating to school context (and peer effects), school physical and human resources and aspects of teacher pedagogy. Table 2 shows that the largest reductions in sample sizes occur for pupils from the poorest quartile in the final models built using this framework.

2.5 Multilevel modelling approach

Exploratory analysis revealed clear changes in the dependency of attainment on school location and school resourcing levels with differing individual SES. The multilevel models reported herein consider which pupil and school factors explain differences in mean attainment for pupils belonging to groups of similar SES and whether or not the same set of covariates account for differences in the variation and mean score for each of these status bands. The focus is on whether *individual* SES determines the covariate set of in and out of school factors which impact on pupil attainment. This differs from Van der Berg (2008), for example, where the relative effects of pupil background and school factors

on attainment for *schools* of differing mean SES was modelled. Further, his interest lay in determining the conditions under which better school resourcing leads to improved pupil outcomes.

A multilevel structure is used, with pupils nested within schools, to account for the fact that pupils in the same school are likely to have shared influences/experiences due to the school attended and similar characteristics. The SACMEQ measure of SES is used to partition SA pupils into four groups based on the 25th, 50th and 75th percentile values of individual pupil SES[5]. This approach makes no strong assumption of how an individual's SES and attainment change with increasing wealth. Separate multilevel models for learners of similar status are developed concurrently thereby enabling a comparison of the factor set found to explain variation in scores for each status group. This methodology also partitions the total unexplained score variation into pupil and school level effects for each SES group. In particular, the covariance matrix of school effects produced by this form of analysis allows an evaluation of the between school variation in scores for learner groups of different status. This helps in understanding how much of the variation in scores between schools is attributable to school processes or out of school (or other unmeasured/untested) factors for each wealth band and whether schools have the same effect on learners of different status.

Models, one each for reading and mathematics attainment, were developed using a 'step up' approach (Bryk and Raudenbush, 1992) by systematically interacting each predictor of interest (see Box 1) with SES band. Thus, the dependency of score on each covariate could be tested to see if its strength on attained score changed with SES. A factor was retained in the statistical model if it was found to be associated with score and significantly explained some of the variation in reading (or maths) attainment between schools and/or pupils. If the interaction of a predictor with SES was not found to be significant, the predictor was retested to determine whether its affect on attainment was constant across SES quartiles. A significance level of 5% was used throughout. Variables whose fixed effects coefficients are referred to as 'marginal' or 'provide some statistical evidence' for their inclusion in the models in this article are ones whose statistical significance level (for a Type I error) lay between 5 and 10%.

[5] Initial investigations involved subdividing the attainment distribution into three, four and five SES bands. Little difference between the distributions was apparent for quartile and quintile partitioning of pupils by SES. Therefore, quartile partitioning has been chosen for simplicity.

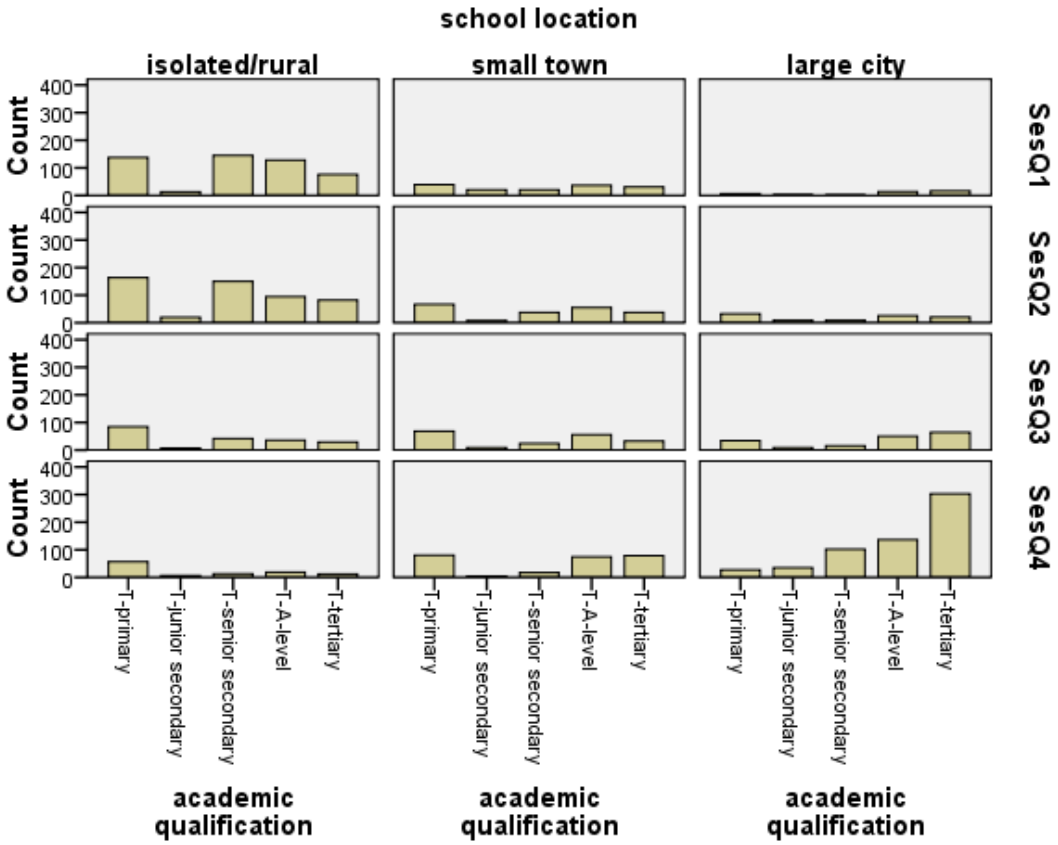


Figure 3 Profile of location of school attended, reading teacher level of academic qualification and individual SES banding of South African Grade 6 pupils

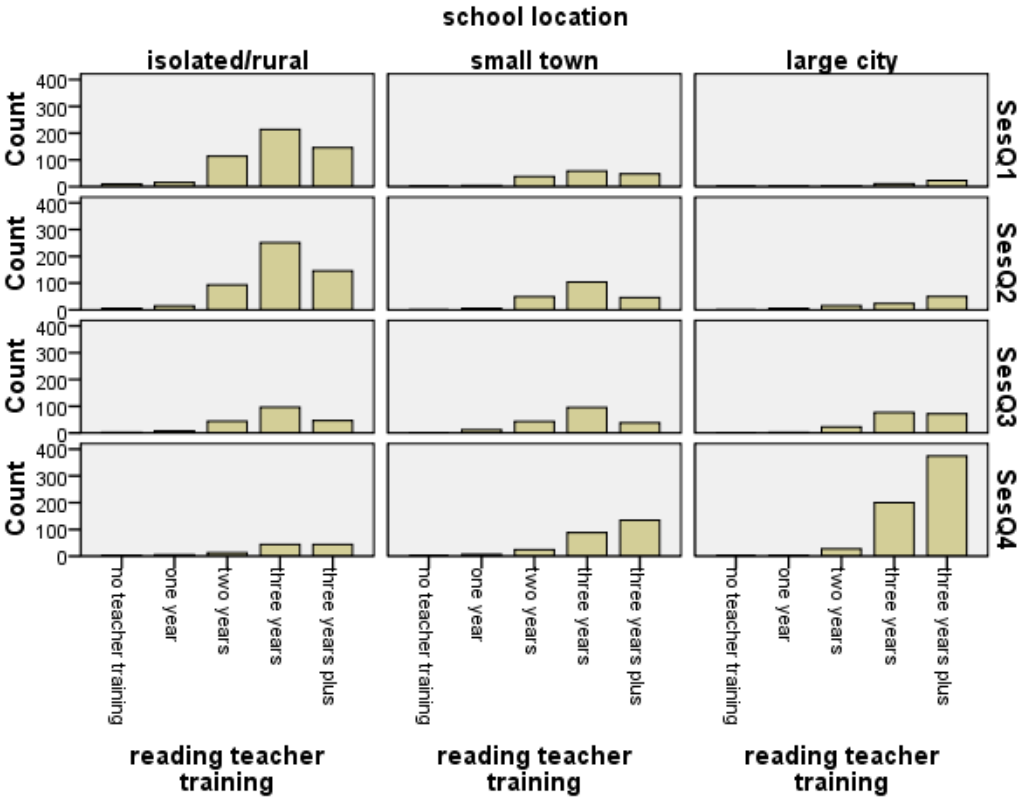


Figure 4(a) Profile of location of school attended, reading teacher level of teacher training and individual SES banding of South African Grade 6 pupils

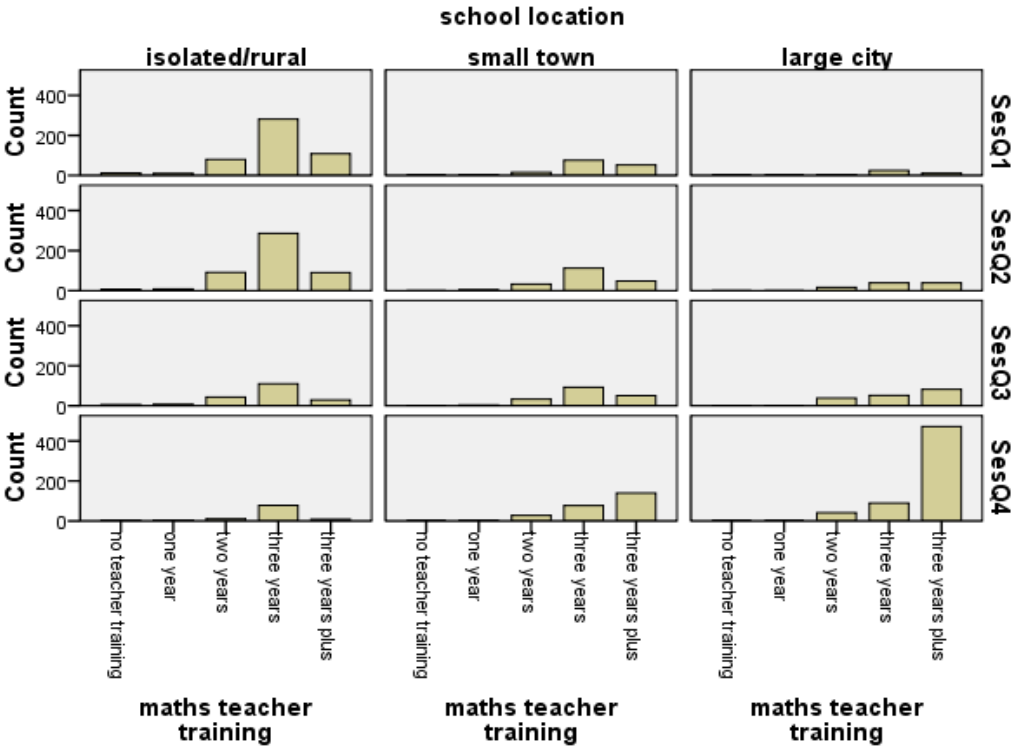


Figure 4(b) Profile of location of school attended, mathematics teacher level of teacher training and individual SES banding of South African Grade 6 pupils

3. FINDINGS

3.1 Reading and Mathematics attainment model findings

The final multilevel models for the four SES groups reveal that the 'in' and 'out' of school factors retained in the fixed effects part of the mixed effects models go some way to explaining differences in the mean attainment and variability in scores between schools but most especially for pupils from the poorest (quartile 1) and wealthiest (quartile 4) quartiles. This is evident in the larger reduction of unexplained variance between schools (intra class correlation) for pupils in the extreme quartiles shown in table 3.

	Q1 Null model	**Q2 Null model**	**Q3 Null model**	**Q4 Null model**	**Q1 Final model**	**Q2 Final model**	**Q3 Final model**	**Q4 Final model**
Maths between school variation (Intra class correlation)	0.45	0.59	0.61	0.53	0.28	0.43	0.42	0.21
Reading between school variation (Intra class correlation)	0.50	0.54	0.68	0.58	0.20	0.31	0.48	0.22

Table 3: Amount of unexplained between school variation for the null and final models of Grade 6 attainment in mathematics and reading comprehension

For example, for the first and fourth SES groups, the between school unexplained variation in reading scores reduces from 50 to 20% for quartile 1 and 58 to 22% for quartile 4 learners. Final models for the remaining quartiles showed smaller, though still large, reductions in the unexplained variation in attainment between schools; the variation in reading scores between schools for quartile 2 pupils reduces from 54% to 31% and to 48% (from 68%) for quartile 3. Thus, 80, 66, 64 and 83% of the between school variation is explained by the final models for reading for quartiles 1 to 4 respectively.

The random school effects section of the null models (see model results in appendix) show that unexplained score variation between schools is least for quartile one learners and most for the highest SES group; this indicates that the poorest learners deviate less from the mean score of this group within a school and that there is less variability in these scores attributable to schools compared to other SES groups. This could be because other factors not connected to the school are competing with the school related influences on score or that in-school conditions for this group are more consistent. Quartile 4 learner scores vary vastly between schools, on the other hand, suggesting greater impact of the effect of the school on scores.

Final models show that large reductions in the unexplained random school effects (for both subjects) are generally accounted for by the retained model factors, but these reductions are greatest for the extreme quartile groups – i.e. covariates explain most variation for the wealthiest and poorest learners. The set of in and out of school covariates explaining total and school variation differ for each status group. The remaining unexplained school variation is smallest for the poorest group; here pupil background factors and peer effects alongside some in-school factors substantially explain between school variation in scores (Table 7 shows the extent to which some peer effects are prevalent within the peer group). For the wealthiest group, the set of covariates combining to explain most of the original between school score variation are school-related factors and peer effects in some contexts. These variations were mainly due to differences in staff quality in terms of their teaching experience and training, school leadership and monitoring processes. Thus, in-school factors had a large impact on learner attainment and out-of-school factors were relatively unimportant for the wealthiest.

Correlations between school effects are all positive and high (near one) which means that in schools where pupils from one SES band do well, pupils from other SES bands in that school also do well (Tables 8(a) and 8(b)). It is likely that the school climate and organisation factors not tested in this model could further explain between school differences in attainment, particularly for the middle SES groups.
In modelling South African variations in reading achievement, Hungi et al. (2010) found that including the pupil level and composite variables for resources, pupil behaviour, and teacher behaviour (as reported by the headteacher) the percentage of school variation explained by their model was 57% (or 43% unexplained) and that 61% of the total variation available was explained by the predictors in their final model. This model result was for all pupils participating in SACMEQ II. The Lee et al. (2005) school effectiveness model (consisting of school composition, school context and physical human resource composites) for reading attainment for the full sample of pupils for South Africa explains 79.9% of the between school variation.
The results for the four separate analyses of the status groups reveal two categories of findings. Some factors have equal impact across all status groups. These are therefore independent of the status of the pupil. However, some factors relate to only particular wealth groups and thus are dependent on the SES of the individual.

The factors explaining differences in attainment which are independent of the social economic status of an individual include not only the level of school resourcing, but also school context, the nutritional well being of the individual and the level of training of staff.

Findings are reported using the themes outlined in Box 1 for in and out of school factors by SES group.

3.2 Factors associated with score.

3.2.1 Factors common to all SES groups

The following factors had equal effect on the mean attainment of pupils, irrespective of social status in each multi level model. Thus, there is no difference in the magnitude of the coefficient featuring in the fixed effects part of the separate multi level models for each social status group.

Common to all SES groups were the following factors in terms of their affect on mean attainment. Some factors were associated with the level of physical resourcing of schools, but by no means all.

i) Well being-nutrition

- Pupils who eat fewer than two meals per day attained lower scores, by 11 and 8 points on average, in reading and mathematics. However, it is evident that significantly more pupils from the lowest two quartiles report that they are under fed (almost 30% of pupils from quartile 1 and 26% from quartile 2-table 3 in appendix). Thus, a higher proportion of pupils in the poorest quartiles are at risk of lowering their academic achievement due to the inability to concentrate and be regularly active in their learning.

ii) School context

- Pupils in city schools attain distinctly higher mathematics scores, 27 points more than non urban counterparts, on average.
- Some evidence that smaller classes benefit individual pupils irrespective of social background in terms of their mathematics attainment, though the effect is smaller than others.
- There is a negative peer effect on mathematics attainment if pupils are educated with a high proportion of pupils with access to few or no books at home.

iii) School physical resources

- Lack of stationary for the individual learner has a depressing affect on mathematics and reading score. The results highlight basic resources such as writing implements and exercise books/paper.
- Whole school resources associated with raised mathematics and/or reading scores highlighted schools where teachers and pupils had access to a school computer (reading) or a video cassette recorder (mathematics) i.e. hi tech electrical devices.
- Increased mathematics scores were associated with good shelving in classes.

iv) School human resources

- Individuals taught by more mature reading teachers (older) attain higher scores in reading.
- Some evidence that pupils taught by reading teachers who have completed high levels of teacher training attain enhanced reading scores, on average.

Box 1: Details of in and out of school factors identified from SACMEQ II

A thematic approach, informed by engagement with literature, has been taken in identifying the variables within the SACMEQ II data set which pertain to 'in and out of school factors' and which are subsequently tested in the school effectiveness models.

Out of school factors

- **Pupil's individual background context**: gender, age, exposure to the language of instruction outside of school, residence during term time, individual grade repetition, absence from school and reasons for absence;
- **Basic living conditions in which the individual lives which promote a stable home environment** supporting the basic amenity and nutritional needs of a child so that they are able to participate and engage in their education. Factors: number of meals eaten in a day and access to amenities such as electricity and water in the home;
- **Educational resources and home support** available to an individual outside of school. Factors: number of books in the home, presence of a table in home and adult involvement in school work outside of school;

In school factors

- **School context:** location of school, male/female ratio in year group, number of pupils in school, class size, pupil teacher ratio and peer effects such as proportion of pupils in a year group who have access to water or electricity at home, who have little opportunity to use language of instruction outside school, who receive under two meals per day, who have been absent at least once, have access to fewer than 11 books, have repeated a year at least once;
- **School physical resources**: pupil's own resources (writing materials, writing/seating access), classroom resources - furniture and texts for pupils and teachers, whole school resources/facilities, school library access, school building conditions and whether temporary classrooms are in use;
- **School human resources**: teacher and head teacher age and gender, teacher qualifications - professional and academic, head teacher qualifications - professional and academic, management training, hours worked per week, whether teacher has a second job;

- **Pedagogy of teacher**: teacher practices: how often they fed back to parents via a report, parent meeting frequency, frequency with which homework is set, frequency with which work is marked, testing frequency of subject matter.

3.2.2 Factors dependent on SES group

In general, pupil background factors such as degree overage, their place of residence during term time, their competence in the language of instruction and school contextual factors such as the fluency levels of the peer group in the LOI, the access in general of the group of learners to books and the degree of repetition which has occurred amongst the peer group impacts differently on each SES group. Also, the in-school factors which make a difference to pupils of different social standing include the monitoring and testing practices of the class teacher and experience of the head teacher. These are shown to have varying effect (and in some cases no impact) on explaining any increase (or decrease) in pupil scores, on average, from each status group

3.2.2.1 Out of School

i) Stable home environment for the vulnerable

Differences in attainment for learners living away from the parental home were only observed for learners in the poorest quartile. These learners were likely to score less well in literacy if they lived in a hostel compared to those of the similar wealth who lived at home, with relatives or alone. Displacement of pupils to a setting where they lived communally with others i.e. in a relative's home or in a hostel, had a large negative effect on mathematics scores for learners from the poorest quartile.

Pupils from the wealthiest backgrounds with access to electricity in the home scored up to a competence level higher in mathematics than those from the same status bracket without a supply of electricity to their home.

ii) Gender

Girls from the wealthiest and second poorest groups scored markedly better in reading than boys of similar economic status. Girls from the second poorest group attain lower mathematics scores than their male counterparts.

iii) Language of Instruction

Grade 6 pupils in the lowest three SES quartiles reported markedly different patterns of exposure to the language of instruction (LOI) compared to the wealthiest. Over 90% of pupils of wealthiest status reported using the LOI sometimes or often outside school with almost 25% saying they had opportunities to use it frequently. This is in stark contrast to other groups where circa a quarter in quartile 3, 30% of quartile 2 and 38% of the poorest status learners indicating they rarely, if ever, had the chance to use the LOI outside school and at most 11% within each quartile indicating that they used it regularly. Thus pupils in the lowest three SES bands reported mostly that they sometimes could practise, very few practised regularly whilst those wealthiest of pupils, on the other hand reported some incidences at least when they were exposed to the LOI.

The impact on learner attainment is revealing. Improved reading comprehension scores are seen in only the lowest two quartile wealth groups for the subset of pupils reporting they sometimes used the LOI outside school. These learners score on average 19 points higher in reading comprehension (roughly half a competence level) than those within their wealth bracket who rarely, if ever, had opportunities to practise the LOI. Those learners from the middle two SES bands reporting some exposure to LOI away from the school setting had raised mathematics scores of between 15 and 18 points compared to those who rarely used it. For the wealthiest quarter of pupils, scores of up to a

competence level higher (35 points) in mathematics are associated with those pupils who have frequent exposure to the LOI compared to those who scarcely accessed it.

iv) Overage

Older pupils generally fared worse in mathematics and, for every year overage, the hindering effect of age on maths scores increased for learners from wealthier backgrounds. Older learners' attainment in reading, however, was either enhanced or depressed with increasing wealth (see results).

v) Book access in the home

An association between the presence of books in the home to support study and improved attainment in reading/mathematics was only found for the most privileged pupils (quartile 4). Those who had access to books at home attained higher reading comprehension scores of up to 60 points, the highest scores were for pupils reporting that they had 11-50 books at home. Pupils who had access to between 11-50 books at home for study and reference attained higher mathematics scores of 26 points, on average.

vi) Individual grade repetition

Learners who have repeated a grade one or more times tend to achieve acutely worse scores in both reading and mathematics with the poorest (quartile 1) and wealthiest (quartile 4) status learners most adversely affected by repetition. In particular, a repeater from the most privileged of backgrounds is likely to score between one and two competence levels (up to 59 points) lower in mathematics and/or reading if they have repeated one or more times, with the penalty increasing with more years repeated. For pupils in the lowest status groups, repetition affects those who have repeated two or more times only, but the penalty increases then the more times they have repeated.

3.2.2.2 Neighbourhood effects and school context

i) Language of instruction

Pupils schooled with many pupils who have a poor grasp of LOI fare worse and the affect on depressing scores increases with wealth, although the likelihood of being in a class/year with a high proportion of learners where the LOI is not their main language decreases with higher social standing.

Test outcomes for an individual in both subjects are severely depressed, on average, if a high proportion of their peer learning group do not have opportunities to practise the LOI outside school; for every 10% increase in the proportion of year group pupils who say they rarely use/speak LOI outside school, learners in quartiles 1 and 2 attain circa 6 points lower on average, those from quartiles 3 and 4 roughly 7 points lower scores.

For pupils of poorest status the neighbourhood effect will be particularly marked as the majority attend rurally-located schools and 50% or more of these pupils attend schools where at least 33% of their peer Grade 6 group do not practice LOI extensively outside school and 25% of these attend a school where 50% of the peer group have reported little opportunity to use the LOI once they leave the school environment. 25% of learners from the second quartile are likely to be schooled with a year group which has 43% of the year rarely using the LOI. For pupils in quartile 3, 25% of pupils attend schools where 35% or more of their year rarely, if ever, using the LOI outside school and 25% of quartile four pupils are prone to be attending a school where 15% or more of pupils rarely practise the LOI.

In all cases, it is clear that classroom level competences in the LOI are likely to affect the general amount of learning and understanding achievable on a daily basis.

ii) Grade repetition

Lower scores are attained by learners who are schooled with large proportions of pupils who have repeated a grade at least once and scores are increasingly depressed with increasing socio-economic background status of the individual.

A pupil from the poorest quartiles (one or two) who is schooled with a high proportion of the peer group of pupils who have repeated at least once is at risk of scoring less on the reading and/or mathematics test compared with pupils who learn with a group of pupils who have rarely repeated. For every 10% increase in the portion of pupils in the peer group who have repeated a year at all, the mean test score for the individual quartile one or two learner in the class is lowered by 5 points. For those from wealthier backgrounds in quartiles three and four the risk is higher at 10 points per 10% increase in the peer group who have repeated at least once. Table 5 (appendix) shows that three quarters of the pupils from quartile 1 are attending a school where at least 45% of the year group they are educated with has repeated a grade at least once. For quartiles 2, 3 and 4 for three quarters of pupils within each social class grouping, the proportion of the year group who have repeated drops to 35%, 30% and 10%. Also for these quartiles, a quarter of pupils in the poorest grouping are in years where almost 70% have repeated at least once compared to 65%, 56% and 40% in quartiles 2, 3 and 4 respectively. So, the majority of pupils by far from the poorest backgrounds are educated in environments where it is likely that one has repeated one year at least.

3.2.2.3 In School

i) School location

Pupils from the poorest quartile who are able to attend a city based school, in general, attain 39 points higher in reading comprehension than pupils attending small town or rural schools of equitable wealth and home circumstances. However, only 6% of pupils from this poorest socio-economic group attend schools in cities and it is clear from figure 1 that they will tend to attend the better resourced schools.

ii) School physical resources

Third and fourth quartile SES status pupils based in schools with access to a TV achieve higher reading scores of about 35 and 37 points on average compared with pupils attending a school without this resource. For the poorest quartiles relatively few pupils were likely to attend adequately resourced schools or better and so the affect of attending a school equipped with good electrical resources would not be so marked on as many individuals from this socioeconomic group of pupils compared to others of different SES status.

Pupils from quartile 3 who have their own mathematics text book tends to score 20 points higher than a pupil without their own book or one who shares a text.

iii) Teacher experience and qualifications (human resources)

There is also some indication that there is a beneficial effect on scores attained for children from the higher wealth brackets if children are taught by mathematics teachers who have spent longer periods training formally as a mathematics teacher (up to a maximum of four years teacher training). It is clear from figure 6 that pupils from this wealthiest quartile are taught in the main by maths teachers who predominantly have trained as teachers for the maximum period of four years compared to pupils from the lowest two SES groups where teachers have not all completed training by any means. Pupils from the wealthiest grouping also have markedly raised scores in both subjects, of up to 36 points, if they attend a school where the Headteacher has a good number of years of teaching experience.
In a school where pupils are taught by mathematics teachers who are slightly older, pupils attain slightly higher scores. This finding is in addition to the finding for pupils taught by mature reading teachers. Thus, more mature teachers have a beneficial effect on pupils of lowest SES. As pupils in this quartile are predominantly based in rural/isolated schools (some 73% of pupils in original sample) and the teachers in these schools tend to be qualified to a lower level than teachers in the city

schools, and they tend to have undergone slightly fewer years of formal teacher training, perhaps the experience gained on the job for older teachers in the rural schools benefits the pupils?

iv) Teacher pedagogy

Pupils from the poorest background benefitted in terms of reading test score achieved if they were taught by reading teachers who set written tests on a regular monthly basis and who regularly corrected and fed back on their work. These pupils increased test scores of 25 and 19 points on average, respectively, compared to those pupils from this socio-economic group who do not receive frequent tests and who do not receive regular constructive feedback on their written work. Pupils from the wealthier status groups who are taught by mathematics teachers who regularly correct/mark work attain increased test scores of approximately 32 points on average compared to those pupils from this socio-economic group who do not receive regular constructive feedback on their written work.
By way of a contrast, those pupils from the lowest two quartiles who were taught by mathematics teachers who set written tests over regularly - at least once per week - attained severely lower mathematics scores, on average 34 and 33 points respectively, compared to those pupils from each of these socio-economic groups who do not receive such frequent testing in mathematics. Clearly testing practices in the classroom should support the learning process and time given over to such regular testing could be to the detriment of coverage of the curriculum and could also be damaging to confidence levels of pupils.

4. CONCLUSION

In trying to unravel the complexities of differences in attainment amongst South African pupils, *peer effects* on learning (negative) are particularly marked in year groups/classes where there are high proportions of repeaters, pupils who are struggling with fluency in the LOI and, for the wealthier pupils the repetition rates have a greater negative impact on scores if there are high numbers of repeaters in the year.

For pupils placed in the poorest social group, home circumstances such as non-residence in the familial home during term as well as lack of opportunities to practise the language of instruction individually and indicated poor fluency overall amongst peers is a marked inhibitor on attained scores. These pupils, alongside quartile 2 pupils are most likely to be underfed. As pupils from these two social standing groups are predominantly attending school in rural or isolated areas, some of the issues are related to the lack of general opportunities to obtain materials in the LOI.

Teacher training to full term is associated to some extent with improved scores. It is also clear that there is a polarisation of teachers in both subject areas, but more so in mathematics, who have trained for four years in urban schools and who are teaching the most privileged pupils. There is indication that older/more mature teachers (perhaps with more experience on the job) aid the pupils from the second quartile slightly more so than the other quartiles in terms of attained score in mathematics.

In reading attainment for pupils from the poorest backgrounds, regular and proactive marking of work by the subject teacher is wholly supportive for learners to improve their competence in the language. This difference in reading comprehension score for pupils whose teacher regularly corrected their work compared to those whose teachers did not was not seen for pupils of equal social standing in the other wealthier bands. Conversely, pupils form the top two quartiles had markedly improved scores if their mathematics teacher fed back on their mathematics work regularly.

For the least wealthy pupils, over-testing (at least once per week) practised by their class teacher has a large negative effect on attained mathematics scores. This could be due to too much contact time given over to testing at the sacrifice of conceptual teaching time and curriculum coverage. Given also the more complex thinking skills that the teacher is seeking to develop in the individual, the time needed to nurture this normally and the very real issue that large proportions of the lowest status

learners are likely to struggle with understanding concepts in the LOI (Fleisch, 2008), these practices are likely to have a detrimental effect on pupil scores.

Gender effects were only consistently seen for pupils from the second quartile with girls scoring higher than boys in reading comprehension and the converse in mathematics.

Headteachers leading schools with a number of years of teaching experience were linked to markedly higher test scores in both subjects for pupils from the wealthiest socio-economic group.

5. POLICY IMPLICATIONS

5.1 Review language of instruction strategy particularly in rural/isolated areas

Fleisch (2008) intimates the complexities of learning in school through the LOI given that there are eleven official languages in South Africa and there had been, up to time of publication of his book, no consistent practice and strategy for learning in the LOI within South Africa. He notes that precious curriculum time can be taken up in translating for learners in the classes where there is a poor grasp of LOI to the common tongue and that the time at which switching to LOI takes place in school is often when the learner has just started to master their own mother tongue medium of learning in early primary years. The learner is then expected to switch to higher order thinking in a language that they can barely express themselves in and this has an inhibiting affect on their powers of self expression and their ability to understand complex text, concepts and problems if they are learning in a language they are not competent in.

The most recent Strategic Plan for 2011-2013 from the South African Department of Basic Education (DoBE) issued in 2010, however, gives a first clear indication of a national strategy to begin to tackle the language of instruction issues which have plainly been a key factor to underachievement in South African schools to date. A national programme to improve the quality of teaching and learning in Grades R-12 is being implemented currently (2010-11) and one fundamental change to previous strategic plans is the specific measure of issuing 'guidelines for language for strengthening Learning and Teaching and mother tongue instruction' which will be evaluated and monitored closely over the coming three years to 2013. These will come in the form of lesson plans and workbooks in all official languages and first additional language (English) for teachers and learners covering Grades R-6 in the first incidence (Grades 7-9 subsequently). Learning and teaching support material supplied to all Grade R-12 schools available in print or electronic form (through the Thutong education portal).

5.2 Target school resourcing on provision of basic stationary for each individual and investment in ICT resources

The post-Apartheid government sought to overcome the widely varying quality of schools in terms of resourcing and facilities by targeting funding at improving school conditions in particular for the schools and communities in most need. It was hoped that this would be a key factor in raising attainment. Schools identified for extra funding were ones which were in the lowest quintile of school 'need' based on a poverty index value combining a measure of the degree of poverty of the school community and the overall state of the school facilities. These schools were apportioned a greater percentage of the overall fund for physical resourcing of schools, followed by the second most poor schools and so on (Jansen & Taylor, 2003).

However, this policy has undergone some criticism in that the implementation has had little impact on outcomes and there has been a considerable loss of money due to vast differentials in efficiencies of management systems in different regions. Also, many schools and their communities were not greatly improved as such a high proportion of schools were poorly resourced to start with, that many were not captured and allocated sufficient funds to make a real difference. This had an effect, for example, on stationary provisions for individuals and substantiates findings reported here.

The strategic plan to 2013 (DoBE) indicates that the use of quintiles for classifying schools according to increasing need 'lacks sufficient credibility in schools and amongst analysts' and states that this is under review. However, the strategies outlined in the plan in general use the quintile school classification to identify which schools/communities to target and support with regard to strategies aimed to help the poorer learners.

The most recent Strategic Plan for 2011-2013 from the South African Department of Basic Education (DoBE) outlines plans to issue all learners with workbooks (up to Grade 6 in the first instance) which include outlines of the curriculum material they are expected to cover. The poorest, quintile 1, schools will be provided with basic resources and these schools will be subsequently guided and monitored. Although this will act as a guide to all teachers on expected coverage of the curriculum, this could also lead to quite prescriptive teaching. The issue of workbooks is a first step to ensuring all learners receive basic stationary but, again, could narrow the focus of the work produced by the learners in class.

5.3 Initiatives for setting up libraries/shared resources for communities to have wide access to books/resources

The DoBE strategic plan to 2013 approaches basic literacy and access to resources and textbooks for learners in a more integrated fashion. There are specific measures to promote libraries and media centres in schools and national literacy initiatives such as raising awareness of International Book Day and a reading awareness campaign to promote reading.

5.4 Improve the quality of pupil monitoring (through testing and the type of feedback on work given to learners) through professional development

The 2010-13 strategy stipulates that at the heart of the plans for Basic Education is to improve the quality and learning experience of learners in Grades R-12 through a national strategy for monitoring and tracking learner progress, through the development of workbooks for all to Grade 9 (at first) to establish the curriculum coverage expected for all learners in all schools and through formal national testing at various grades. This specification of the curriculum for teachers of each Grade will give opportunities to identify development opportunities for teachers in improving monitoring practices and by provision of exemplar material to aid with planning and to provide clear benchmarks for assessment.

Formal records of all pupils will be kept at a centralised database at the DoBE to help with national and regional planning and monitoring; the Integrated Education Management System (EMIS).

The extension of formal Basic Education to the Reception year for all communities is outlined in the strategic plan. Issues surround the quality of the experience for different SES status learners (Fleisch, 2008) in the preparedness of pupils of different SES for schooling and practices for learning. The DoBE plan highlights the challenges to implementing this uniformly in the medium term given the provision of early years education by private bodies to date. A national early years strategy is to be rolled out but the implementation and quality of delivery of this programme applied to numerous provisions will take time to establish. The DoBE anticipates that the disparities will ease as the process brings these provisions into the public school system and the various monitoring strategies in place will oversee the quality of the Reception Year increasingly.

5.5 Are there enough experienced, highly qualified teachers and headteachers and are they being distributed/attracted fairly to schools serving all communities?

The government's strategic plan gives further insight into the continuation of more recent policy focus on the quality of the teacher and leader workforce. There is mention of the intention to complete the national plan for teacher education and development, to continue to support the national Funza Lushaka bursary scheme and to develop the national policy criteria for qualifications allowing

employment in basic education. Commitment to the leadership national college for head teachers and managers is pledged alongside utilising monitoring and evaluations to shape the type of teacher and headteacher professional development courses offered.

5.6 Target communities with fragile food resources to ensure pupils are not hungry and therefore are unable to learn to their true potential.

Commitment to the national feeding programme targeted at quintile 1 to 3 primary school children is highlighted in the medium term strategic plan alongside sustainable food production initiatives in the same. National campaign on healthy lifestyles is also planned. A health screening programme of Grade 1 learners in 2010 in quintile 1 schools is set for 2010, with a pledge to extend to all R and Grade 1 learners in primary quintile 1-3 schools by 2013.

5.7 Given repetition rates, are teachers skilled to differentiate in their classroom practices? Implications for quality of training.

A multi-grade support programme for teachers in rural areas to deal with multi-grade teaching issues and advise on good practise is intended for 2010-11. The establishment of school hostels in these rural and farming areas is also intended from 2010-11. However, this needs to be implemented carefully as the findings reported here highlights the underachievement of pupils displaced from their familial home.

A formal review of the repetition policy at national level however is not explicitly outlined in the strategic plan to 2013. Findings in this paper would suggest that this is an area critical to improving the attainment of learners.

REFERENCES

Abidoye, R.O., 2000. Comparative school performance through better health and nutrition in Nsukka, Enugu, Nigeria. Nutrition Research **20**(5), 609-620.

Atherton P. (2009) School effectiveness and educational quality across Southern and Eastern Africa. Working Paper, University of Nottingham.Baker,

D.P., Gösling, B., and Leterdre, D.K., 2002. Socioeconomic status, school quality and national economic development: a cross-national analysis of the 'Heyneman-Loxley' effect on mathematics and science achievement. Comparative Education Review **46**(3), 291-312.

Beaton, A.E., Postlethwaite, T.N., Ross, K.N., Sperrit, D. & Wolf, R.M., 1999. The benefits and limitations of international educational achievement students. IIEP/UNESCO, Paris.

Brock-Utne, B., 2007. Learning through a familiar language versus learning through a foreign language—a look into some secondary school classrooms in Tanzania. International Journal of Educational Development 27(5), 487-498.

Brophy, J., 2006. Grade repetition, Educational Policy Series 6, IIEP UNESCO/International Academy of Education, Paris.

Castro-Leal, F., 1999. 'Poverty and inequality in the distribution of public education spending in South Africa' In South Africa: Poverty and inequality: Informal Discussion Paper Series, February 1999. World Bank Country Department I African Region.

Colclough, C., Rose, P. & Tembon, R., 2000. Gender inequalities in primary schooling: The roles of poverty and adverse cultural practice. International Journal of Educational Development **20(1)**, 5-27.

Davison, J., 1993. School attainment and gender: attitudes of Kenyan and Malawian parents toward educating girls. International Journal of Educational Development **13(4)**, 331-338.

Department of Basic Education, 2010. *Strategic Plan 2010-2013*. Government of South Africa.

Dolata, S., 2005. Construction and validation of pupil socioeconomic status index for SACMEQ education systems, Paper presented at SACMEQ International Invitational Research Conference, Paris, September 2005.

Dugger, C. W., 2009. 'Eager students fall prey to Apartheid's legacy'. Article in The New York Times published September 20, 2009.

Fleisch, B., 2008. *Primary Education in Crisis. Why South African schoolchildren underachieve in reading and mathematics.* Juta, Cape Town.

Galeb, S., Moestue, H., Anthony, P., McCoy, A., Ravi, C. & Prudhvikar Reddy, P., 2005. Child learning in Andhra Pradesh: the interplay between school and home, Young Lives working paper no. 27, Young Lives & Save the Children UK, London.

Glewwe, P., 2005. The impact of child health and nutrition on education in developing countries: theory, econometric issues, and recent empirical evidence. Food and Nutrition Bulletin **26(2)**, Supplement 2, pp. S325-S250.

Glick, P. & Sahn, D.E., 2000. Schooling of girls and boys in a West African country: the effects of parental education, income, and household structure. Economics of Education Review **19(1)**, 63-87.

Goldstein, H., 2004a. International comparisons of student attainment: some issues arising from the PISA study. Assessment in Education: Principles, Policy and Practice **11(3)**, 319-330.

Goldstein, H., 2004b. Education for all: the globalization of learning targets. Comparative Education 40(1), 7-14.

Heyneman, S. and Loxley, W., 1983. The Effect of primary school quality on academic achievement across twenty nine high and low income countries. American Journal of Sociology **88**(6), 1162-1194.

Hungi, N. And Thuku, F. W., 2010. Variations in reading achievement across 14 Southern African school systems: which factors matter? International Review of Education **56**, 63-101.

Lee, V. E., Zuze, T.L. and Ross, K.N., 2005.School effectiveness in 14 sub-Saharan African countries: links with sixth graders` reading achievement. Studies in Educational Evaluation **31**(2-3), 207-246.

Moloi, M. (2005). *Mathematics Achievement in South Africa: A Comparison of the Official Curriculum with Pupil Performance in the SACMEQ II Project*. Paper presented at SACMEQ's International Invitational Educational Policy Research Conference, Paris UNESCO IIEP

Masalila, T.B., 2008. Towards a systematic framework for examining the congruence among reading objectives, tasks and competencies in Botswana's primary schools, unpublished Masters thesis, IIEP UNESCO, Paris.

Mrutu, A.S., Ponera, G.E. & Nkumbi, E.M., 2005. The SACMEQ II project in Tanzania: a study of the conditions of schooling and the quality of education. SACMEQ, Harare.

Mullis, I.V.S., Martin, M.O., Kennedy, A.M. and Foy, P., 2007. *PIRLS 2006 International Report: IEA's Progress in International Reading Literacy Study in Primary School in 40 Countries*. TIMSS & PIRLS International Study Center, Boston College, Chestnut Hill, MA.

Ross, K.N., Saito, M., Dolata, S., Ikeda, M. & Zuze, L. (2005) 'The Conduct of the SACMEQ II Project' in Onsomu, E., Nzomo, J. & Obiero, C. The SACMEQ II Project in Kenya: A Study of the Conditions of Schooling and the Quality of Education, Kenya working report. SACMEQ/Ministry of Education, Science and Technology, Harare/Nairobi.

SACMEQ (2009) Visualization of Research Results on the Quality of Education, www.sacmeq.org, last accessed 29 October 2009.

Saito, M., 2007. Construction and Application of SACMEQ School Resources: Portray of School Systems based on the Rasch Scaling Technique. Journal of Inetrnational Cooperation in Education **10(1)**, 165-182.

Smith, M.C. & Barrett, A.M. 2009. Redistributive social justice in Southern and East Africa: Investigating the affect of social & economic differences on primary pupils' literacy scores. Paper presented at the 10th UKFIET International Conference on Education and Development, University of Oxford, 15-17 September 2009.

Smits, J. & Hoşgör, A.G., 2006. Effects of family background characteristics on educational participation in Turkey. International Journal of Educational Development **26**, 454-460.

Sukon, K.S. & Jawahir, R., 2005. Influence of home-related factors in numeracy performance of fourth-grade children in Mauritius. International Journal of Educational Development **25(5)**, 547-556.

Tansel, A., 1997. Schooling attainment, parental education, and gender in Côte d'Ivoire and Ghana. Economic Development and Cultural Change 45, 825–856.

Tikly, L. (2010). A Roadblock for social justice? An analysis and critique of the South African education roadmap. Comparative Eduaction forthcoming?

Thrupp, M., Lauder, H. & Robinson, T., 2002. School composition and peer effects. International Journal of Educational Research **37**(5), 483-504.

Tomaševski, K., 2001. Human rights obligation: making education available, accessible, acceptable and adaptable. Rights to Education Primers no. 3. www.right-to-education.org [accessed 20 February 2010].

UNDP, 2002. Human Development Report 2002: Deepening Democracy in a Fragmented World. UNDP, New York.

UNDP, 2004. Human Development Report 2004: Cultural Liberty in Today's Diverse World. UNDP, New York.

UNDP, 2007. Human Development Report 2007/08 - Fighting Climate Change: Human Solidarity in a Divided World. UNDP, New York.

UNESCO, 2003. Education for All Global Monitoring Report 2003/4 - **Gender and Education for All: The Leap to Equality**. UNESCO/Oxford University Press, Paris/Oxford.

UNESCO, 2006. Education for All Global Monitoring Report 2007: Strong Foundations - Early Childhood Care and Education. UNESCO/Oxford University Press, Paris/Oxford.

UNESCO, 2007. Education for All Global Monitoring Report 2008: Education for All by 2015 - Will we make it? UNESCO/Oxford University Press, Paris/Oxford.

Van der Berg, S., 2003.

Van der Berg, S., 2008. How effective are poor schools? Poverty and educational outcomes in South Africa. Studies in Edducational Evaluation **34**, 145-154.

Willms, J.D., 2006. Learning Divides: Ten Policy Questions about the Performance and Equity of Schools and Schooling Systems. UNESCO Institute for Statistics, Montreal.

Yu, G. & Thomas, S., 2008. Exploring school effects across southern and eastern African school systems and in Tanzania. Assessment in Education: Principles, Policy and Practice **15(3**), 283-305.

Zhang, Y (2005). Rural-urban gaps in sixth graders' reading literacy scores in Sub-Saharan Africa: Unequal opportunities and unequal results. SACMEQ Research Conference, Sept 2005, Paris, UNESCO IEP.

APPENDICIES

South African Mathematics model for SES Quartiles (n=2472 pupils) *

Variable	Null model				Final model			
	Quartile 1	Quartile 2	Quartile 3	Quartile 4	Quartile 1	Quartile 2	Quartile 3	Quartile 4
Pupil level								
Constant	450.1 (5.10)	468.6 (5.24)	480.5 (6.14)	509.5 (5.27)	406.1 (55.9)	427.7 (54.3)	429.4 (62.3)	441.7 (68.4)
Girl (ref: boy)					1.2 (5.3)	-11.0 (4.3)	-2.3 (5.2)	0.37 (5.5)
Age in months					+0.30 (0.13)	-0.43 (0.12)	-0.33 (0.17)	-0.55 (0.25)
Lives with relatives (ref: lives at parental home)					-19.9 (8.0)	-11.4 (6.2)	-13.6 (7.6)	-2.3 (11.0)
Lives in a hostel					-37.8 (12.2)	16.6 (13.6)	-11.9 (17.7)	5.5 (23.5)
Live by myself					-14.5 (9.7)	14.0 (8.4)	-3.8 (11.1)	-12.2 (19.1)
Sometimes speaks LOI (ref: never speaks)					8.2 (6.1)	17.7 (5.0)	15.1 (6.5)	3.3 (11.0)
Often speaks LOI					-0.9 (10.9)	9.1 (9.2)	13.0 (10.6)	34.9 (13.0)
Electricity (ref: no electricity)					-3.0 (7.2)	1.1 (4.5)	-7.2 (6.3)	31.9 (13.7)
Under 2 meals per day (ref: 3 meals per day)						-8.1 (3.4)		
2 -3 meals per day						-5.7 (3.0)		
Books at home -10 or fewer (ref: no books)					-2.3 (6.0)	-8.1 (5.1)	4.5 (6.9)	-0.7 (11.8)
Books at home 11 to 50 books					0.8 (9.3)	-0.5 (6.9)	-7.0 (8.2)	25.7 (12.5)
Books at home 51 plus books					-25.4 (10.6))	-5.6 (7.7)	-3.9 (9.8)	25.3 (12.8)
Repeated year-once					-4.4 (5.8)	-13.2 (4.8)	-8.8 (6.2)	-26.3 (8.2)
Repeated year-twice					-16.7 (8.1)	-2.2 (6.7)	-24.7 (9.1)	-52.0 (17.1)
Repeated year-three (+) times					-39.5 (10.6)	-13.6 (10.3)	-17.7 (13.8)	-35.5 (21.8)
Home interest					-2.5 (1.2)	-1.5 (1.1)	-4.0 (1.4)	-7.5 (1.5)
School level								
School location- town(ref: rural school)						4.3 (9.3)		
School location- large city						27.4 (11.5)		
Proportion not using LOI outside school in Grade 6					-64.5 (22.9)	-20.9 (24.3)	-40.5 (27.6)	-68.4 (33.1)
Proportion with under 11 books in Grade 6						-58.1 (21.2)		
Pupil teacher ratio						1.1 (0.6) (10% sig)		
Pupil has exercise book						16.1 (4.0)		
Pupil has own maths text book					-8.8 (5.6)	-2.2 (4.8)	20.2 (5.4)	-1.3 (6.6)
Importance of class shelving						17.6 (7.4)		
School has vcr resource						+22.7 (10.3)		
MT-class furniture is important					-32.8 (9.2)	-26.8 (9.5)	-18.3 (10.4)	-25.6 (11.0)
MT age					1.1 (0.5)	1.6 (0.5)	1.1 (0.5)	0.1 (0.5)
MT: no. of years teacher training					6.5 (5.4)	5.2 (5.6)	11.4 (6.1)	13.6 (7.0)
HT gender (ref: male)					-10.8 (9.3)	24.8 (9.7)	0.4 (11.3)	0.2 (12.1)
HT: no. of years teaching					0.5 (9.8)	12.3 (10.3)	10.3 (11.3)	35.8 (12.0)
MT tests 2-3 times term					-13.9 (8.8)	7.9 (8.9)	-1.5 (9.5)	3.1 (10.0)
MT tests 1+times weekly					-34.4 (10.5)	-32.8 (10.7)	-9.7 (11.9)	-8.1 (11.9)
MT sometimes corrects h/w					-5.4 (9.9)	7.6 (10.2)	31.0 (14.6)	29.4 (14.2)
MT mostly/always corrects h/w					4.2 (9.4)	3.0 (9.9)	18.5 (13.9)	32.4 (10.7)
Random effects in variation								
school	2503.59	3443.21	4648.35	7938.95	1090.59	1687.99	1871.35	1621.52
pupil	3086.14	2413.06	2954.49	7150.06	2804.04	2249.27	2620.41	6156.87
Total variation	5589.73	5856.27	7602.84	15089.01	3894.63	3937.26	4491.76	7778.39

% of total variation explained					30.3	32.8	40.9	48.4
% of school variation explained					56.4	50.8	59.7	79.5
Intra class correlation	0.45	0.59	0.61	0.53	0.28	0.43	0.42	0.21

*(SE) denotes the standard error of the coefficient in the column. All coefficients are jointly significant at p≤0.05. Mathematics teacher is abbreviated to MT and headteacher to HT.

South African Reading model for SES Quartiles (n=2253 pupils) *

	Null model				Final model			
Variable	**Quartile 1**	**Quartile 2**	**Quartile 3**	**Quartile 4**	**Quartile 1**	**Quartile 2**	**Quartile 3**	**Quartile 4**
Pupil level								
Constant	456.8 (5.2)	466.2 (5.4)	488.0 (7.3)	525.8 (9.2)	412.1(36.7)	400.7 (41.8)	544.9 (56.1)	447.8 (63.7)
Girl (ref: boy)					0.9 (5.1)	15.6 (4.8)	7.8 (5.7)	16.9 (5.8)
Age in months					-0.3 (0.1)	-0.2 (0.1)	-0.8 (0.2)	-0.5 (0.3)
Lives with relatives (ref: lives at parental home)					-5.4 (7.3)	-3.7 (6.7)	-2.4 (8.2)	-2.6 (11.2)
Lives in a hostel					-36.9 (10.4)	-23.9 (14.5)	14.2 (19.6)	-10.5 (23.5)
Live by myself					-1.5 (9.1)	-3.0 (9.0)	-6.9 (13.2)	-28.2 (20.1)
Sometimes speaks LOI (ref: never speaks)					19.3 (5.7)	18.8 (5.7)	8.3 (7.0)	-1.5 (11.3)
Often speaks LOI					2.5 (9.8)	10.0 (9.7)	9.5 (11.8)	26.0 (13.9)
Under 2 meals per day (ref: 3 meals per day)					-10.7 (3.5)			
2 -3 meals per day					5.4 (3.1)			
Books at home -10 or fewer (ref: no books)					-7.4 (5.6)	-0.5 (5.7)	4.2 (7.9)	25.0 (12.8)
Books at home 11 to 50 books					-13.0 (8.7)	-4.3 (7.8)	-5.1 (9.4)	60.0 (13.6)
Books at home 51 plus books					-13.1 (9.6)	-12.9 (8.9)	7.3 (11.2)	54.6 (14.0)
Repeated year-once (ref: never repeated)					-8.5 (5.7)	-9.1 (5.6)	-9.0 (6.8)	-39.4 (8.5)
Repeated year-twice					-29.3 (8.0)	-16.5 (7.8)	-15.4 (10.1)	-59.5 (17.6)
Repeated year-three (+) times					-21.5 (10.0)	-28.1 (11.4)	-16.9 (16.7)	-47.0 (23.0)
School level								
School location- town (ref: rural school)					-2.5 (9.2)	0.2 (10.5)	-8.5 (13.7)	-25.3 (15.5)
School location- large city					39.2 (13.9)	15.8 (14.1)	-3.2 (17.4)	7.8 (18.0)
Proportion ever repeated a year in Grade 6					-45.4 (18.7)	-48.6 (21.8)	-96.9 (30.1)	-85.1 (33.4)
Proportion not using LOI outside school in Grade 6					-62.0 (18.0)	-60.8 (22.0)	-73.3 (31.7)	-35.1 (35.4)
Pupil has exercise book					8.9 (4.3)			
Pupil has pens					12.1 (3.4)			
School has television					12.4 (10.1)	7.0 (11.3)	35.0 (14.4)	36.8 (15.1)
School has computer					33.7 (10.8)			
RT age					0.9 (0.3)			
RT: no. of years teacher training					7.3 (3.7)			
HT: no. of years teaching					0.6 (7.6)	9.4 (8.5)	2.9 (11.9)	25.8 (12.1)
RT tests 2-3 times term					25.3 (9.0)	5.8 (10.2)	-3.6 (12.5)	-12.3 (12.3)
RT tests 1+times weekly					9.7 (9.3)	-3.4 (10.4)	-1.7 (13.0)	-4.5 (12.7)
RT sometimes marks homework					18.4 (8.8)	-8.7 (9.6)	0.8 (13.6)	-15.4 (11.3)
RT mostly/always marks homework					18.8 (8.5)	-0.8 (9.1)	9.6 (13.1)	-16.7 (11.1)
Random effects in variation								
school	2885.97	3671.96	6822.91	9950.95	583.1	1260.9	2453.0	1650.1
pupil	2860.26	3136.56	3159.38	7092.36	2396.7	2780.6	2715.1	5907.5
Total variation	5746.23	6808.52	9982.29	17043.31	2979.8	4041.5	5168.1	7557.6
% of total variation explained					48.3	40.6	48.2	55.7
% of school variation					79.8	65.7	64.0	85.8

explained									
Intra class correlation	0.50	0.54	0.68	0.58	0.20	0.31	0.47	0.22

*(SE) denotes the standard error of the coefficient in the column. All coefficients are jointly significant at p≤0.05. Reading teacher is abbreviated to RT and headteacher to HT.

Table 4 Frequency with which language of instruction is spoken outside of school

		Ses Quartiles											
		SesQ1			SesQ2			SesQ3			SesQ4		
		Count	Row N %	Column N %	Count	Row N %	Column N %	Count	Row N %	Column N %	Count	Row N %	Column N %
LOI spoken at home	never	279	37.5%	37.8%	253	34.0%	30.1%	137	18.4%	23.5%	75	10.1%	7.5%
	sometimes	379	19.3%	51.3%	498	25.3%	59.2%	400	20.4%	68.6%	689	35.0%	68.9%
	often	81	17.8%	10.9%	90	19.8%	10.7%	46	10.3%	8.0%	236	52.2%	23.6%

Table 5 Pupil reported frequency of meals received per day

		Ses Quartiles											
		SesQ1			SesQ2			SesQ3			SesQ4		
		Count	Row N %	Column N %	Count	Row N %	Column N %	Count	Row N %	Column N %	Count	Row N %	Column N %
Meals Per day	Fewer than two meals	159	29.2%	28.4%	184	33.8%	26.4%	110	20.2%	20.6%	91	16.8%	9.4%
	2-3 meals	146	18.5%	26.0%	207	26.4%	29.7%	162	20.6%	30.3%	272	34.5%	28.0%
	3 meals	256	17.9%	45.7%	306	21.4%	43.9%	262	18.3%	49.1%	608	42.5%	62.6%

Table 6 Number of pupils attending schools located in an isolated/rural area, small town or city

		Ses Quartiles											
		SesQ1			SesQ2			SesQ3			SesQ4		
		Count	Column N %	Row N %	Count	Column N %	Row N %	Count	Column N %	Row N %	Count	Column N %	Row N %
school location	isolated/rural	513	73.2%	37.6%	535	63.8%	39.2%	209	36.0%	15.3%	108	10.8%	7.9%
	small town	148	21.2%	18.0%	208	24.9%	25.4%	198	34.2%	24.1%	267	26.7%	32.5%
	large city	39	5.6%	4.2%	95	11.3%	10.2%	173	29.8%	18.6%	623	62.5%	67.0%

Table 7 Proportion of pupils in a school year group who have repeated a year, do not use LOI outside school or eat fewer than two meals per day

SES Quartile		Proportion ever repeated year	Proportion Not Using LOI	Proportion under 2 meals
Q1	Min	.00	.00	.00
	P25	.45	.15	.11
	Mean	.54	.35	.33
	Median	.55	.33	.25
	P75	.69	.50	.50
	Max	.89	1.00	1.00
Q2	Min	.05	.00	.00
	P25	.35	.10	.11
	Mean	.51	.29	.28
	Median	.55	.25	.20
	P75	.65	.43	.43
	Max	.89	.74	1.00
Q3	Min	.00	.00	.00
	P25	.30	.06	.10
	Mean	.43	.22	.24
	Median	.45	.15	.20
	P75	.56	.35	.35
	Max	.89	.74	1.00
Q4	Min	.00	.00	.00
	P25	.10	.00	.00
	Mean	.25	.11	.13
	Median	.20	.06	.10
	P75	.40	.15	.16
	Max	.89	.71	1.00

Table 8 (a) School level random effects for reading scores.

Between schools correlation of the achievement of pupils within a school from different quartiles are indicated in italics. Correlations over one are due to the multilevel modelling estimation process not bounding the estimates to one. Standard deviation of the quartile variation is shown in brackets.

Reading score school random effects	Q1 school level variation	Q2 school level variation	Q3 school level variation	Q4 school level variation

Q1 school level variation	583.1 (146.0) *1.0*			
Q2 school level variation	1062.9 (161.6) *1.2*	1260.9 (231.5) *1.0*		
Q3 school level variation	1201.1 (210.4) *1.0*	1655.3 (262.0) *0.94*	2453.0 (412.2) *1.0*	
Q4 school level variation	1137.9 (224.3) *1.16*	1060.8 (250.4) *0.74*	1519.5 (317.0) *0.76*	1650.1 (363.2) *1.0*

Table 8 (b) School level random effects for mathematics scores.

Between schools correlation of the achievement of pupils within a school from different quartiles are indicated in italics. Correlations over one are due to the multilevel modelling estimation process not bounding the estimates to one. Standard deviation of the quartile variation is shown in brackets.

Mathematics score school random effects	Q1 school level variation	Q2 school level variation	Q3 school level variation	Q4 school level variation
Q1 school level variation	1090.6 (220.0) *1.0*			
Q2 school level variation	1476.4 (211.4) *1.1*	1688.0 (259.0) *1.0*		
Q3 school level variation	1453.1 (225.0) *1.0*	1904.5 (254.1) *1.1*	1871.4 (307.4) *1.0*	
Q4 school level variation	1678.2 (251.6) *1.3*	1688.1 (255.9) *1.0*	1826.7 (273.3) *1.0*	1621.5 (327.5) *1.0*

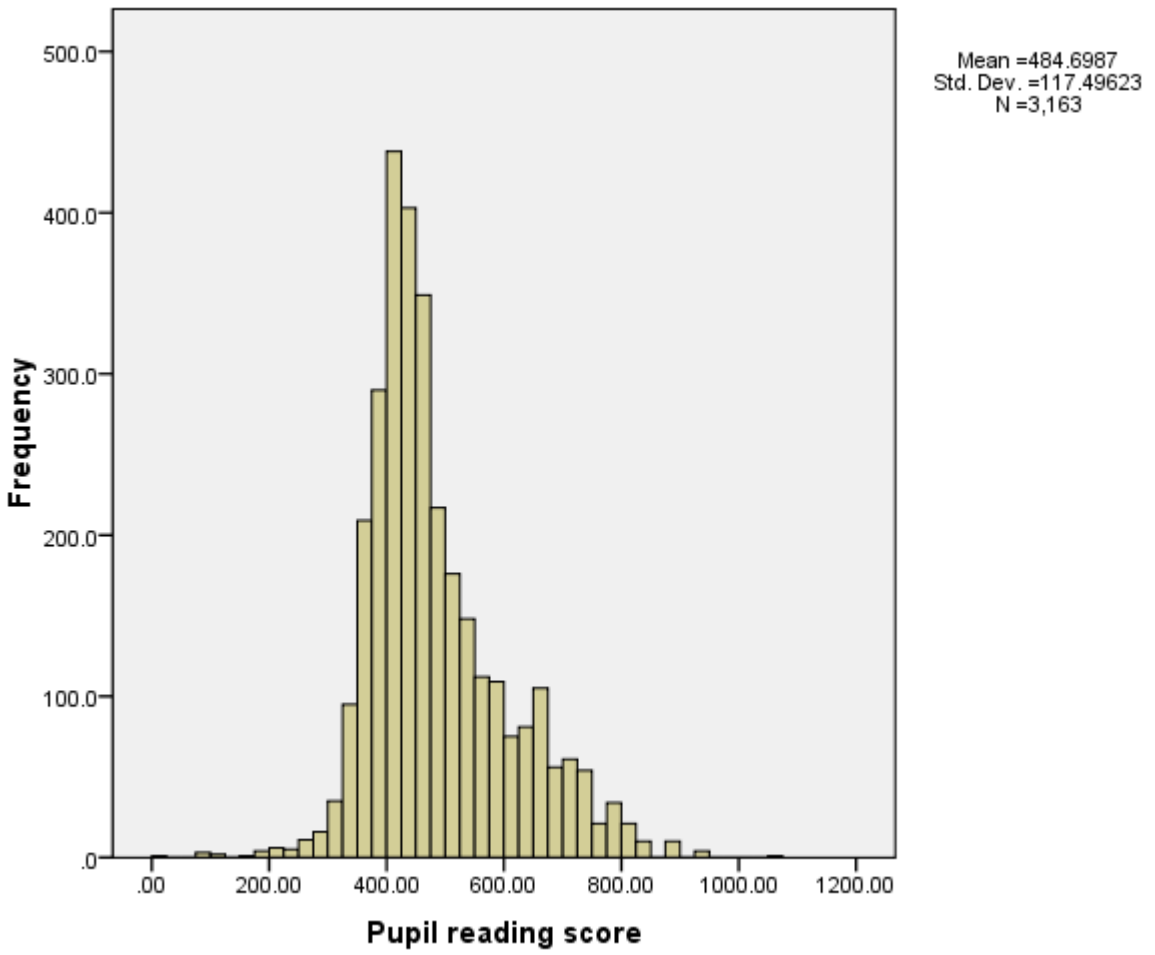


Figure 5 (a) Reading score distribution across all schools

Figure 5(b) Reading score distribution by SES quartile

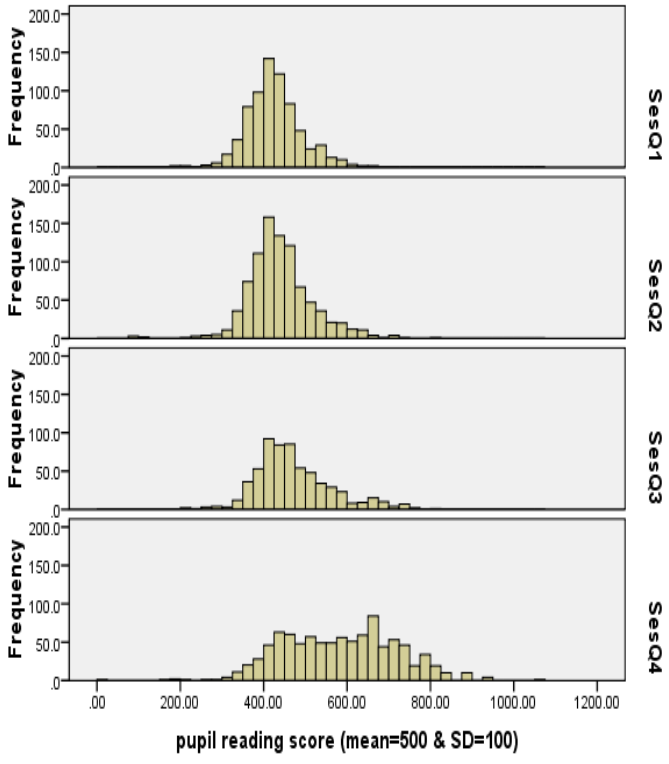
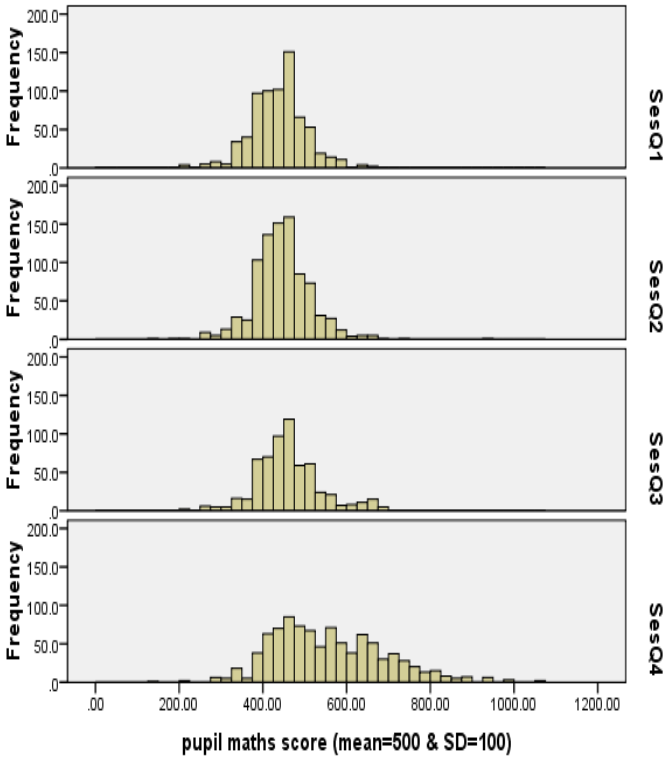


Figure 5(c) Mathematics score distribution by SES quartile



EdQual RPC
- Implementing Education Quality in Low Income Countries

Contact:

EdQual RPC
Graduate School of Education
35 Berkley Square
BRISTOL BS8 1JA
T 0044 (0)117 331 4288
F 0044 (0)117 925 7584

www.edqual.org

University of BRISTOL