A summary of:

What Makes Schools Effective?

Report of South Africa's National School Effectiveness Study

Edited by Nick Taylor, Servaas van der Berg and Thabo Mabogoane

Publisher: Pearson Education, Cape Town

Publication date: August 2012

Chapter 1: Context, theory, design. *Nick Taylor, Servaas van der Berg and Thabo Mabogoane*

Chapter 1 introduces the project and sets out the research design. The NSES is a research programme aimed at identifying lessons for policy and practice for government, principals, teachers, and parents. National policy lessons arising from any research study are most powerful if they can be shown to apply to the whole school population, and in order to address this consideration a nationally representative sample of 268 schools was drawn for the study. All provinces were included in the sample except Gauteng, which was excluded when it was discovered that provincial tests were being written at the same time as the first round of NSES data collection.

Aside from personal attributes, learning outcomes for any particular child depend firstly and most importantly on home characteristics, and secondly on the influence of all the teachers through whose hands the child passes. Therefore, cross sectional studies (which have only one point of data collection) cannot adequately account for the practices of the teacher currently working with any particular child. In order to address this problem, a cohort design was adopted for the NSES: this enables the gain scores exhibited by a learner over any one year to be related to the practices followed by the teacher for the same year. The NSES followed a cohort of children for 3 years, commencing with Grade 3 in 2007 and ending with Grade 5 in 2009. Around 16 000 children participated in each year of data gathering, within which a cohort of 8 383 was tracked over all three years.

Learner performance, the dependent variable, was assessed by means of literacy and mathematics tests which were administered in English to the learners at the end of each year. The test results are profiled in Chapter 2. It is common in large scale studies (such as TIMSS, SACMEQ or PIRLS)[1] to collect data on educational activities by means of survey questionnaires. Such methods do not

[1]Trends in International Mathematics and Science Study (TIMSS)
Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ)
Progress in International Reading Literacy Study (PIRLS)

always provide the most valid kind of data, given the well known tendency for principals and teachers, indeed all human actors, to reflect their own practices in a favourable light. Thus, the NSES school and classroom data was collected by means of interviews and direct observations using structured instruments and fieldworkers experienced in the work of schools. Due to budget limitations the NSES did not undertake classroom observations. This is a limitation of the study, given the importance of teaching quality to learner performance. However, we did assess teacher practices through an analysis of planning and assessment records, and undertook a detailed analysis of pupil writing in both maths and literacy by looking at all the exercise books in each subject of the best student in each class. We also administered a very short test in their respective subjects to maths and language teachers.

An asset-based method for assessing both school and learner socio-economic status (SES) was used, which has been demonstrated in other studies to provide a reliable proxy for SES. This data was derived from a questionnaire given to learners, which, *inter alia,* asked them to describe the educational practices they experience at home: reading, homework, and exposure to the language of instruction of the school.

Multivariate modelling techniques provided the first level of analysis of the NSES data. This exercise, described in Chapter 3, provides very useful lessons on practices which facilitate learning in the home and at the levels of school leadership and classroom teaching. However, in some instances the correlations revealed by our modelling exercise provide only blunt responses to questions like 'Is the presence of an annual curriculum plan associated with better learner test scores?' In the case of the NSES the answer to this question is affirmative, but that tells us little about what is entailed in these planning practices: it seems likely that curriculum planning is one element in a constellation of activities undertaken by effective school leaders and teachers in order to optimise learning. And the really useful knowledge that principals and policy makers need to understand is what that constellation of activities consists of, and how it ranges across schools which produce stronger and weaker test performances. We undertook a set of case studies to investigate this and a number of related questions concerning school leadership practices. The results of this sub-study are described in Chapter 4.

Similarly, we drew on a variety of other data sets, in combination with NSES data and regression findings, to investigate the complex subject of language of instruction in South African schools (Chapter 5), to probe the role of writing in language learning (Chapter 6), to describe the actual mathematics curriculum to which learners have access in class (Chapter 7), to profile teacher subject knowledge (Chapter 8), and to investigate how the age profile of learners changes as they progress through grades 3 to 5 (Chapter 9). Finally, Chapter 10 draws together the findings from the preceding chapters and speculates what these findings might mean for school policy and practice.

Chapter 2: Learner Performance. *Stephen Taylor and Nick Taylor*

The same literacy and numeracy tests were administered in English in each of the three waves of the NSES, at grade level in 2007, and thereafter to grades 4 and 5 learners in 2008 and 2009. The choice of a test language, which is not the LOI for most South African learners in grade 3, was made so that

the same language could be used in all three waves of testing. It is also the language in which all learning for some 90% of students occurs from grade 4.

Literacy

The literacy test consists of 40 items, across a range of text types (visual cues, poster, bar graph, non-fiction narrative and fiction descriptive) and literacy skills (reading and writing) and comprehension processes (word recognition, retrieval of information, inferential reasoning, interpretation, and evaluation). The average achievement of the NSES sample was rather low in both literacy and numeracy, considering that the tests were comprised of items ranging from grade 1 to grade 4 levels, as specified by the curriculum in operation at the time of the tests (NCS). The main purpose of the tests was to measure changes in learner proficiency in elementary literacy and numeracy through the middle grades of primary school.

Caution needs to be exercised in drawing diagnostic conclusions from the test scores, since there are too few items on some of the categories to draw valid and reliable generalisations. Nevertheless, there are some clear patterns in terms of the lower skills. Items requiring no more than the matching of words to pictures, the completion of sentences or the retrieval of information explicitly stated in the text are generally the easiest. When inferential reasoning is required to answer a question, learners struggle, especially when writing is called for, as opposed to selecting an answer from 4 options (multiple choice). Finally, learners struggle the most when asked to interpret information in order to arrive at an appropriate answer, particularly when called to produce an original answer. In general, items which require writing were considerably harder than multiple choice items. The fact that students did so poorly on items requiring longer responses raises questions about how much written work is covered in South African language classrooms, an issue we take up in detail in Chapter 6.

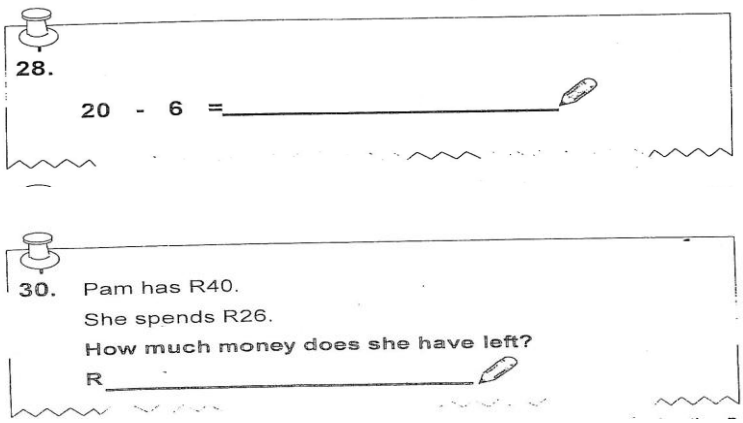
It is encouraging that in certain items learner performance improved considerably over the three year period. In the case of literacy, most of those items with an improvement in the average score of more than 20 percentage points required no more complex literacy skills than word recognition or information retrieval. Performance on items which required sentence writing to describe activities depicted in a simple picture was considerably better in 2008 and 2009 than in 2007. Considering that the same test was written in English each year, the fact that the main improvement in these skills occurred between grade 3 and grade 4 might reflect that in grade 3 most students would not have been exposed to English as the LOI whereas by grade 4 most students would have been.

None of the items requiring inferential reasoning or interpretation saw substantial improvement from grade 3 to 5. Mean achievement on items requiring writing in full sentences to interpret a non-fiction text remained below 10% throughout the 3 years of the NSES test programme. Very few grade 5 South African learners have attained the combination of sentence writing and the higher cognitive skills of inference and interpretation. Since these capacities underlie learning in all other subjects, including mathematics as we note below, it is clear that the roots of the country's poor learning outcomes lies in the slow pace of literacy development in the first five grades. As we shall argue in more detail in later chapters, the chief attributes of this slow pacing are two-fold. First, too little work is undertaken in each lesson. Second, most teachers tend to stick to low level cognitive tasks and fail to involve their learners in any kind of critical textual analysis and, through such activities, transport them into the reaches of higher cognitive development.

Numeracy

The 53 items comprising the maths test are spread over 12 topic areas, but over 60% of the items assess four operations on whole numbers: counting and ordering, addition, multiplication and subtraction. With the possible exception of number patterns, the remaining tasks are represented by too few items to draw hypotheses regarding learner mastery of the skills in question. It can be said that the test includes too few of some of the most important knowledge strands in school mathematics, notably fractions, equivalence and ratio. On the other hand, by focussing on a few of the most basic number operations, the test is able to gain a fuller understanding of learner capacity in the basic building blocks of mathematics.

The easiest group of items according to these descriptions were those that simply required counting, while the most difficult were questions that involve subtraction. The extent to which language plays a role in mathematics is illustrated by the fact that item 28 was found to be considerably easier than 30, both of which required simple subtraction of 2-digit numbers. The fact that in 28 one of the numbers is 1-digit will render it easier than 30.



Nevertheless, it is very likely that much of the difference between these two items lies in the fact that item 28 does not involve words and therefore eliminates any language related obstacles, although it does mean the learners have mastered the elementary symbolic language in which the question is posed. If this explanation is correct, then it would confirm findings from other test results that questions which are posed in verbal or mixed forms are generally more difficult than those posed entirely symbolically. The reason for this is that the former first require translation into a mathematical function before the answer can be computed, and therefore invoke language proficiency, conceptual understanding and logical reasoning in their solution. In contrast, in questions posed symbolically the mathematical function required to solve the problem is already given, and the answer may be computed by purely procedural means.

However, item 32 is comparable in difficulty to 30 (32 is slightly more difficult), even though it contains no words.

This illustrates a third factor (after mathematical task and form of representation) contributing to the difficulty of any item: number magnitude. Item 32 involves numbers that are too large to get an answer through counting, and the difficulty children encounter with such problems seems likely to be attributed to an 'abstraction gap'. This would signal a failure in classrooms to progress beyond concrete approaches to problem solving, and graduate to abstraction and the use of algorithms, a subject we return to in Chapters 7 and 8.

As would be expected, the numeracy items on which most improvement occurred were typically the easier items. It is interesting that there were several addition items that were poorly answered in grade 3 but in which considerable improvement occurred through to grade 5. There were also several that were poorly answered in grade 3 and in which virtually no improvement took place. An inspection of these items revealed that those in which learner performance did not improve were gerenally language-intensive.

Across the NSES sample there was clear improvement from one year to the next, with gains of about 17.5 percentage points for both literacy and numeracy over the life of the project. However, many children exhibited very low or negative gains. 25% of the sample recorded gains of less than 8.3 percentage points in literacy, while the same proportion recorded gains of less than 5.7 percentage points in numeracy. Lowest performing students in the system are also making least progress.

Poverty and achievement

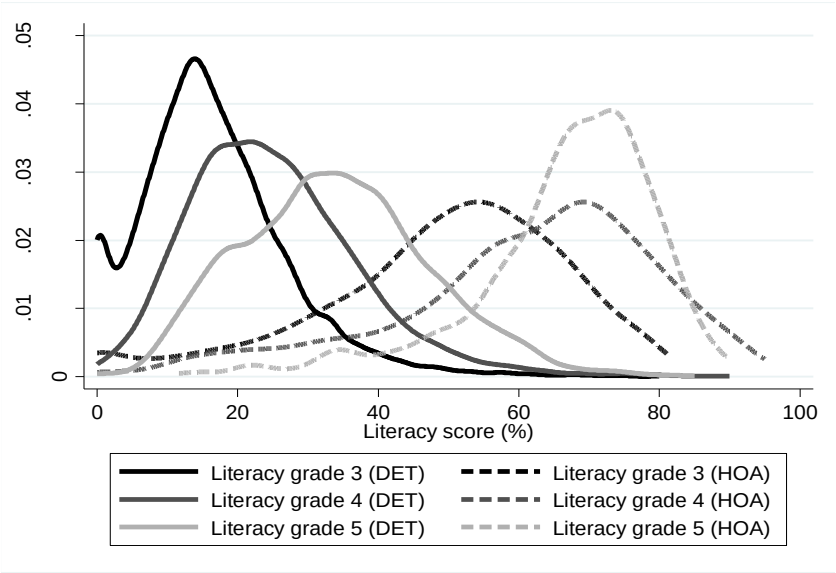
It is well known that educational achievement amongst South African children is strongly associated with socio-economic status. The NSES offers an opportunity to add to what is known about this and, in particular, to investigate whether the inequalities in cognitive ability that children of varying socio-economic status enter school with are reduced or exacerbated over time as schooling takes place. Findings in this regard are pessimistic: according to NSES data, as children progress through the school system it would seem that educational inequalities are widening rather than being reduced.

The majority of South African children are located in the historically disadvantaged system. On average, children in these schools demonstrate low proficiency in reading, writing and numeracy. The second sub-system consists mainly of schools that historically served white, Indian and some coloured children and produces educational achievement that is closer to the standards achieved in developed countries, although this stratum lags well behind its counterpart, even in Kenya. This second system has become increasingly racially integrated to the point where minority children are no longer be in the majority, but it now serves mainly affluent children of all races.

It is revealing to compare the distributions of achievement for each year for historically black schools with those for historically white schools. Figure 1 depicts these distributions for literacy. The three solid lines are for historically black schools and the three broken lines for historically white schools. For both groups of schools, the distribution of achievement improved with each year (shifting to the

right). It is alarming, however, that the distribution for grade 5 students in historically black schools was still considerably weaker than that of grade 3 students in historically white schools.

Figure 1: Kernel Density curves of grades 3, 4 and 5 literacy by ex-department



The picture for numeracy is similar, but here the difference between the grade 5 distribution for historically black schools and the grade 3 distribution for historically white schools is even greater. One can therefore conclude that by the fifth grade the educational backlog experienced in historically black schools is already equivalent to well over two years worth of learning.

Chapter 3: Modelling educational achievement. *Stephen Taylor*

Both through its longitudinal design and the richness and the relatively high validity of its data set, the NSES is able to go somewhat further than was previously possible in unpacking the so-called "black box" of how home, school and classroom practices impact on learning. The multivariate modelling exercise described in Chapter 3 investigated the strength of relationships between proxies for educational activities in homes, schools and classrooms, on one hand, and test scores, on the other. The results of education production functions should be interpreted with caution, as there are numerous potential sources of bias. We therefore examined several models, using different techniques and exclusion restrictions, and then made overall judgements based on various estimations of production functions. The first models presented are cross-section models explaining grade 4 literacy and numeracy achievement. Separate models for the full sample of South African learners and models for the historically black sub-system were also estimated. Thereafter, the learning gains from grade 3 to grade 5 are modelled using slightly more complex methods. What follows are the conclusions on which these models converged.

Two sub-systems and the influence of socio-economic status

As noted in Chapter 2, the historically advantaged sub-system of schools, formerly reserved for whites only, continue to serve relatively privileged families, although they are now deracialised to

the extent that minorities constitute a minority in numbers too. In contrast, African learners from the poorest four quintiles of the population, continue to be schooled overwhelmingly in the township and rural schools greatly disadvantaged under apartheid. There are important statistical and methodological reasons to analyse the two sub-systems separately when investigating what drives educational achievement in South Africa. Particular school inputs, teacher practices or other characteristics may affect student achievement differently across the two sub-systems, characterised as they are by stark differences in socio-economic status of the communities they serve, skewed resourcing prior to 1994, and the capacities of their staff.

Socio-economic status remains the most important determinant of educational outcomes in South Africa. The models presented here indicated that the mean socio-economic status within the school attended by a child is more important for learning than the child's own home background.

Home and learner level factors

The home level factors which remained significant were remarkably resilient across the various regression models, with student socio-economic status, age, gender, household size, frequency of reading on one's own at home, home language and exposure to English consistently associated with improved learning.

Those who are over-aged for their grade performed worse and learnt less over the two year period of observation. This result has not been dwelt on in this chapter because it is not clear what this means. It could mean that entering school late leads to worse outcomes, or that repetition leads to worse outcomes, or that those with worse outcomes tend to repeat and thus become over-aged. Chapter 9 teases out these issues at greater length.

The context of multiple languages in South Africa creates a disadvantage for many learners, and a situation in which the right policies around language of instruction are not immediately obvious. What this chapter has demonstrated, though, is that frequent exposure to English outside of school for those whose home language is not English or Afrikaans is beneficial for both their literacy and numeracy. Speaking and hearing English on the television was associated with higher achievement when controlling for home language and poverty. Those who spoke English at home up to three times a week did significantly better than those who never spoke it, while children who practice English four times or more a week did even better. The same increments emerged for hearing English on TV 1-3 times a week, or 4 times or more.

Interestingly, although being read to by an adult appeared to hold no advantage, children who read frequently at home on their own scored significantly better than those who did not. Furthermore, those who read up to three times a week do better than those who never read on their own, and those who read four times or more had an even greater advantage. These conclusions have a very clear message for schools, parents and community based programmes: stimulate the use of English in the home and the broader community, and find ways of encouraging children to undertake individual reading.

School level factors

School resource variables were typically not important determinants of achievement. Factors such as pupil-teacher ratios and school facilities were found to be only weakly associated with student

achievement. Rather, indicators of effective school management were consistently related to learning outcomes. This is in line with other research suggesting that the impact of school resources is conditional upon those resources being well managed.

No resource is more poorly used in South African schools than time, and a positive effect in both literacy and maths was obtained in our regression models for schools in which various proxies for time management were present: whether the principal was present on the day of the survey, how many teachers were absent, and the state of the teacher attendance register, which we found not to be up to date in over one quarter of schools. Interestingly, teacher absenteeism was approximately twice as high in schools where the teacher attendance register was not up-to-date. This demonstrates that teacher absenteeism reflects more than merely the commitment of individual teachers themselves but is also reflective of the quality of school leadership and organisation.

Another school management factor positively associated with better literacy scores is whether an inventory for textbooks and readers was present and up-to-date. Students in schools where inventories were both available and up-to-date performed better and achieved the highest gains. A positive effect was obtained for schools in which curriculum planning was reportedly done using a year schedule. The variables for the quality of LTSM inventories and for curriculum planning did not emerge as significant predictors of achievement when the sample was restricted to historically black schools. The fact that these variables come through in the full sample model but not in the restricted model may mean that these variables are indicative of the sort of planning and organisation that distinguishes more effective schools from less effective ones, but that these variables themselves are not levers which guarantee better learner achievement. This distinction highlights the difficulties of establishing effective school leadership variables, an issue we address in detail in Chapter 4.

Teacher and classroom factors

The models provide evidence that good assessment practices, teacher commitment and planning, teacher knowledge and effective curriculum coverage vary substantially across South African schools and are strongly linked to educational achievement.

Classroom level factors associated with literacy gains were teacher assessment practices and the quantity and quality of learner writing observed in workbooks. Classes who had completed at least one writing exercise of any kind per week over the year were at a very significant advantage. Further, where no writing of paragraph length or longer had been completed in the year, learners exhibited significantly smaller gains. Regarding assessment, the learners of teachers whose mark books showed more than two records were also at a decided advantage.

For numeracy, enhanced gain scores were associated with frequency of homework, number of exercises completed in workbooks over the year and the number of curriculum topics covered. Assessment practices also appear to have a more prominent effect on numeracy than on literacy. Teachers who spent more time on assessment and who frequently administered class tests produced greater numeracy gains.

As we have said, these conclusions should not be over-interpreted. More tests will not automatically lead to better learning. Rather, it is likely that a more focused, strategic approach to assessment, will improve performance, in combination with a number of the other factors mentioned above.

Chapter 4: School leadership and management. *Nick Taylor, Jeanne Gamble, Marianne Spies and Carel Garisch*

Large scale surveys such as the NSES cannot capture the details of the school level systems which drive curriculum delivery, nor of the relationships between staff which characterise effective schools. In order to investigate these important elements of school life and to gain a deeper understanding of those school leadership and management (SLM) practices which have the greatest effect on learning we undertook a set of ten case studies. We used a matched pairs design in which schools in each pair were selected to resemble each other in terms of socio-economic conditions, home language of learners, and both former and current education department and district administration. The main difference between the schools in each pair was that one achieved high test scores while performance at the other was mediocre. Under these conditions we assume that pedagogical practices, both in the sphere of school leadership and management and in the classroom play a large part in these differences of performance. In Chapter 4 we focused explicitly on school leadership.

In looking at these patterns, our starting point is that such a small sample provides very shaky ground for generalisation, and that our analysis at this point remains in the realm of hypothesis building. However, we are encouraged by the fact that our case studies reinforce the findings from other research in the area of school leadership and management. What the principal and staff do together in a well functioning school is to build systems which drive the work of teaching and learning. Parents are incorporated into an extended pedagogical team. A structured division of labour distributes functions and integrates curriculum delivery across the classroom, the school, and the home. School level systems regulating the flow of work are time management, curriculum planning, assessment, book procurement and retrieval, and teacher professional development. While there are standard features to these systems, in general, school leadership consists of finding innovative solutions for local manifestations of the problems endemic to poor communities: learner hunger, poor punctuality, shortages of books and classrooms, and home conditions not conducive to parental engagement. The case studies provide vivid examples of how enterprising principals deal with these issues under the most difficult conditions. They provide examples of how good leaders can make an enormous difference to the quality of teaching and learning, when compared to ineffective principal working under the same socio-economic and cultural conditions.

The case studies further suggest that the 15 variables which we examined are not all of the same importance in determining the quality of school leadership. Most important are two which appear to be primary levers for improving learning: *setting and communicating learning goals* and *time management*. The first captures the extent to which leadership is able to unite all actors in the school – parents, pupils, and teachers – behind a coherent and consistent focus on teaching and learning, while the second reflects the extent to which time is maximised and directed towards these goals.

A second set of indicators are those which drive curriculum delivery: *regulatory conditions* (establishing and maintaining clear norms of behaviour and disciplinary procedures), *distribution of leadership roles* (defining, allocating and coordinating various school functions to members of the SMT and leader teachers)*, directing curriculum planning and monitoring* (school leaders play a direct role in these functions)*, and collegial practice on both curriculum delivery and assessment* (teachers systematically work together on matters of curriculum, pedagogy and assessment).

The third set of indicators contains those activities which are associated with better performance, but after a certain threshold has been reached these practices seem to add no further value. These are *parental involvement* and g*overnance*. Regarding the latter, it is clear that conflict on the SGB can destabilise school relationships and work processes and hence affect performance. However, while excellent leadership may generally accompany excellent governance, an SGB which performs its administrative and governance functions adequately, without being too involved in curriculum issues, provides a sufficient platform for excellent performance. Regarding parental involvement, it would seem that, under conditions of poverty, the impetus for an active parent body is more likely to come from the school than it is to be initiated by parents. Further, in poorly performing schools leaders have a resigned attitude towards parental apathy, while their higher performing counterparts display a proactive stance toward building a relationship with the parent body.

Interestingly, the indicator which appears to matter least is the *relationship between school leadership and the unions*. In most schools in the sample, there is a curious attitude to the largest teacher union among teachers. On one hand, membership of SADTU is in the large majority if not ubiquitous. On the other, while teachers largely conform with union policy and practice, there is a significant if not majority view of the unions as a force which is educationally disruptive, and 'out there' rather than arising from within the school. Optimally, skilful leadership is able to minimise the effects of predatory union behaviour, in this case the appropriation of time for union activity at the expense of teaching hours and the promotion of its members to positions of authority regardless of expertise. Public violence and lesser acts of indiscipline perpetrated by teachers under the auspices of their union do occur, and are severely disruptive to learning. However, it seems that where school leaders and system-level managers have sufficient capacity, a productive relationships with the unions can be maintained and directed to positive ends.

Finally, the model predicts that the greatest learning gains are to be found in those leadership activities which are closest to the teaching/learning interface, and yet which are most poorly developed in all ten schools studied. Collectively these indicators point to those key nodes in the complex machinery of schooling most likely to leverage improved performance: *developing proficiency in the language of instruction as the medium of learning; use of books as the key technology for conveying knowledge; and professional development to improve teachers' subject and pedagogical knowledge*. Regarding the last of these, principals and teachers alike generally underestimate their own knowledge shortcoming, and those few teachers who do feel a lack in this area have little sense of agency with regard to their own knowledge development, falling back on a passive dependence on sources outside the school to provide training.

Chapter 5: Language and learning. *Carien Vorster, Aneesha Mayet and Stephen Taylor*

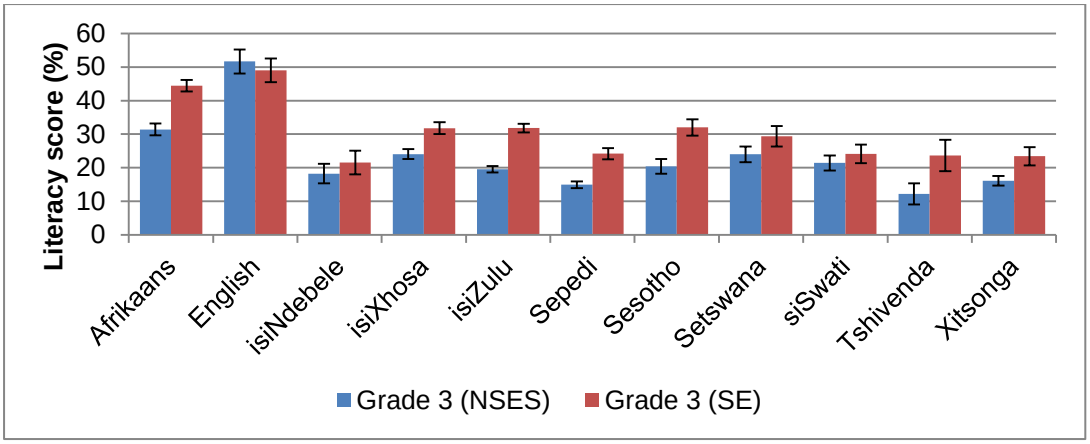
The majority of South African learners are trebly disadvantaged. First by poverty, second by attending poorly performing schools, and third by learning in a language which is not their mother tongue from grade 4. The research evidence indicates that mother tongue instruction in the initial years followed by a gradual transition to English, a policy known as additive bilingualism, is most effective in optimising learning under these conditions. This is the approach adopted by South Africa, although three points are pertinent regarding current language policies. First, the final decision for the choice of language of teaching and learning (LOLT) lies with the school governing body (SGB). Second, the poor quality of leadership and teaching in many schools is an overriding factor in producing low levels of learning, regardless of which approach to the question of LOLT is adopted. Third, there are claims that three years of mother tongue instruction are insufficient to lay the firm cognitive foundations required to support teaching and learning in a second language, and that mother tongue instruction should continue for at least six years.

Counterposed to the official preference for additive bilingualism, is a policy of straight for English (or Afrikaans), regardless of learners' mother tongue. This is the preference of a very small number of former homeland and DET schools and those former Model C, House of Representatives and House of Delegate schools in which African learners now constitute a majority. We would predict that this approach will be increasingly adopted by schools serving poor children in the cities of Gauteng and the Western Cape, and gradually in other provinces too, as the home languages rapidly become more heterogenous due to urban migration. The outstanding example of successful straight for English policies is Singapore, although it must be emphasised that this success was contingent on three factors not uniformly present in South Africa: a competent state, many highly successful schools and an English-rich environment.

Data from the NSES throws new light on the language debate in South African schools. A unique research opportunity is presented by the comparability between the NSES data and that of the Department of Education's Systemic Evaluation (SE) exercise undertaken on a national sample of grade 3 learners in 2007. The same tests were administered to the same learners in both the NSES and the SE, the only difference being that in the NSES learners wrote in English whereas in the SE the test was administered in their home languages. The NSES schools were a sub-sample of the schools who wrote the Systemic Evaluation tests, and we were therefore able to match individual pupils who wrote both tests, in their HL in the SE exercise, and in English in the NSES. The systemic evaluation was conducted in September/October 2007, and the NSES study shortly thereafter in October 2007.

Figure 1 depicts the mean literacy scores in the NSES and the SE by home language. 95% confidence intervals are provided to indicate whether the differences between the means were statistically significant. In the case of English speaking students who would have written both tests in English the difference in performance across the two tests was not statistically significant. In all the other language groups performance was higher in the SE, and in 8 of these language groups the difference was statistically significant.

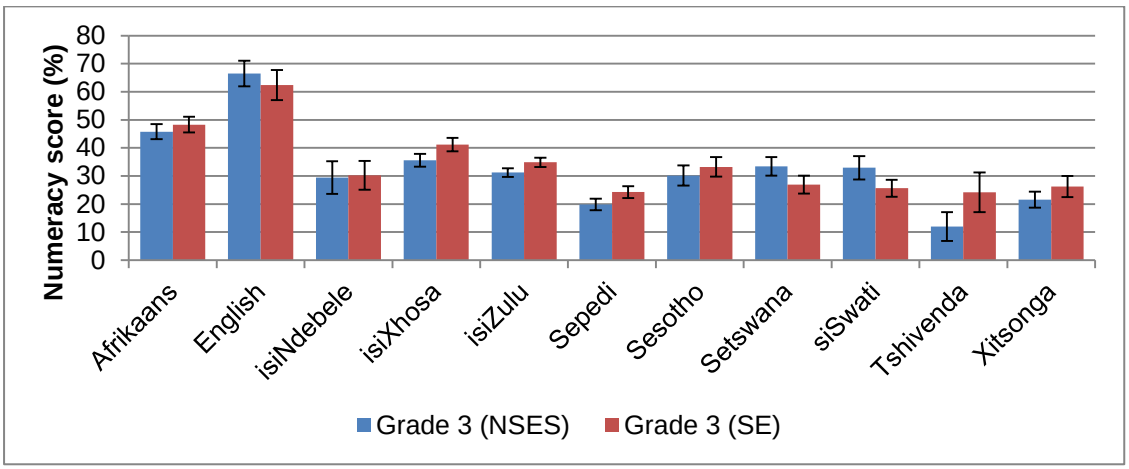
Figure 2: Mean literacy scores in NSES and SE by home language



Note: 95% Confidence intervals around the estimated mean are depicted on each bar.

Figure 2 depicts the same analysis for numeracy. The same basic pattern emerges although in the case of numeracy, for most language groups, the difference between performance in the NSES and SE is not statistically significant. This would indicate that the language of the test did not have as much of an effect on numeracy achievement as it did on literacy. This may indicate that although language proficiency affects performance in a numeracy test to some extent, this impact is not as large as that when literacy itself is tested. This is borne out in the simple correlation between SE and NSES literacy scores (0.65) being lower than the correlation between SE and NSES numeracy scores (0.76). It would be speculative to attempt to explain the reasons for lower language effects in maths, but one possible explanation which presents itself is that teachers use a great deal of English terminology in their maths lessons, because much of it is not available in the relevant African language, or, if it is available, is not widely known to teachers.

Figure 3: Mean numeracy scores in NSES and SE by home language



Note: 95% Confidence intervals around the estimated mean are depicted on each bar.

Howie *et al* (2007) have also compared test scores when learners write in their home language using the PIRLS 2006 study. Schools were given the choice of test language. Information was collected at the individual level about whether the language of the test was also the student's home language. Using this information, Howie *et al* found that, amongst both grade 4 and grade 5 children, there

was little observed benefit to speaking the language of testing at home in schools that took the test in any one of the other nine languages. This indicates that most South African learners are performing at very low levels of literacy, irrespective of what language they are tested in.

In conclusion, we would recommend that, regardless of exactly when a switch of language should occur, several strategies be pursued in order to ameliorate the language related obstacles to learning in the South African context. Teachers and learners should be given support that is focussed on easing the transition to English as the LOLT. Classrooms should be provided with sufficient reading materials in both English and the HL, and the importance of reading and writing stressed to school leaders and teachers (see Chapters 6 and 7). Pre-service and in-service training should aim to improve the proficiency of primary school teachers in both African home languages and English. This will empower them to provide a solid grounding in home language and early cognitive development and to effectively facilitate the transition in the LOLT.

Chapter 6: Writing Matters: The Neglect of Writing in South African schools. *Talia Dechaisemartin*

The power of writing comes from its ability to leave a permanent trace. This unique characteristic allows the writer to reflect upon what has been written, generating and refining ideas in the process. Moreover, it allows ideas and information to be detached from space and time, giving them a capacity to reach a wide audience across continents and generations. Even more important for the development of individual children, the academic literature has firmly established the centrality of writing in shaping the way we think, reason, and learn. As Langer and Applebee (1987) put it, "to improve the teaching of writing...is also to improve the quality of thinking required of school children." Most critically, writing is the key mechanism for developing the higher cognitive skills described in Chapter 3.

While writing helps us remember and better understand ideas, information, and experiences, not all types of writing tasks have the same effect on learning. Some tasks, like writing summaries or analytical essays, require a deeper level of processing than answering fill-in-the blank or short answer questions. Studies have found that the degree to which information is reformulated or manipulated through writing has an impact on how well the information is integrated, learned, and retained. This finding would seem to favour analytical essays as the writing task of choice, since they tend to demand careful structuring of an extended argument, and evaluation and reformulation of the material. This is not to imply that structured language exercises should be neglected, but that, in addition, extended writing is even more important. The NSES study reveals that such writing is done very seldom in South African classrooms, and this must rank as one of the biggest shortcomings of the school system, particularly for children from poor homes.

On average, South African grade 5 children perform writing of any kind in language classes just once every four days, as illustrated in the table below.

Table 1: Number of exercises and frequency of writing in Grade 5

Province	Average number of exercises per learner	Average number of school days between each writing exercise
EC	31.2	5.8

FS	40.9	5.1
KZN	47.1	3.6
LP	38.1	4.0
MP	39.3	3.9
NW	39.6	4.9
NC	44.2	4.0
WC	63.8	2.6
TOTAL	**42.1**	**4.3**

The most common form of writing seen in children's books consists of single words, with an average of 22 exercises of this type written over the course of the year across the sample. The next most frequently observed exercises consist of isolated sentences and reflect an average of 12 exercises over the year. Writing of paragraph length or longer is very infrequent in South African schools, occurring on average only once a quarter (3.6 times a year), as shown in Table 2.

Table 2: Average frequency of writing paragraphs: number of exercises over the year

Province	Half a page or less	More than half a page	Total
EC	1.7	0.6	2.3
FS	3.8	1.7	5.5
KZN	1.7	1.0	2.7
LP	2.1	0.3	2.4
MP	2.7	1.4	4.1
NW	1.8	0.5	2.3
NC	2.9	0.7	3.6
WC	5.8	1.8	7.6
TOTAL	**2.6**	**1.0**	**3.6**

Most disturbing of all is the number of books in which no paragraph writing at all was done over the year, a phenomenon seen in 44% of Grade 4 and 32% of Grade 5 classes in the NSES study.

South Africans would do well to face the writing crisis head on and launch a writing revolution, placing writing at the centre of school reform. The CAPS document is a start, but the real challenge will lie in its proper implementation. Teacher training will be crucial to the success of any writing movement. Teachers will need to know what constitutes good writing, how it is accomplished, and be armed with effective methodologies for its instruction. In the end, for teachers to become experts at teaching writing, it is inescapable that they will first need to become writers themselves.

Chapter 7: Writing and learning mathematics. *Nick Taylor and Benita Reddi*

Chapter 3 tells us that the quantity and quality of writing produced by any child in a year is significantly related to her math scores, but these statistics don't tell us anything about practice. The present chapter explores the literature on the representation and communication of mathematical

entities, and how these representational forms manifest in the writing of South African primary school children.

Representation and learning

Problem situations, words, visual images, concrete objects and abstract symbols are important tools in learning about and communicating mathematical ideas. Such multiple representations of the ideas are important in developing a flexible understanding of key concepts and procedures. We can summarise the passage from material instantiation to abstract symbol of a mathematical concept – via verbal and iconic descriptions – as a journey from more ambiguity to less, from contextual and evocative images to more coolly formal and abstract entities, from low levels of condensation to high, from fuzzy language to precise tools for conducting mathematical discourse. For example, a great number of material situations (three young friends at a party), verbal descriptions and iconic representations (drawings of the friends, or counters) may be used to exemplify the concept '3', but a single sign is needed to give the idea an unambiguous meaning and to work with the idea of 3 mathematically.

In emphasising the importance of writing, O'Halloran notes that ' ... in some cases the meaning of the written symbolic mathematics is not equivalent to the spoken language ... Quite simply, talking mathematics is not the same as doing mathematics .... ultimately students .... must understand and use the unique grammatical resources of mathematical images and symbolism which function differently to language...' (O'Halloran, 2011:234).

In negotiating the difficult path between material instantiations of mathematical ideas and their representation and manipulation using abstract symbols, two kinds of wrong turnings – or learning impedances – are common. The first occurs when teachers present mathematics as a set of unrelated procedures, at the expense of understanding the conceptual relations underlying the procedure. One of the simplest and most enduring formulations of this problem was given by Skemp who distinguished between relational and instrumental understanding in the classroom, where the former signals the application of 'rules without reasons' and the latter indicates 'knowing both what to do and why'. Zain Davis has labelled such 'rules without reasons' as 'pseudo-operations' a particular type of learning malfunction, which has no principled ground, where children are taught nonsensical procedures (for example when adding integers: 'The sign .. of the bigger number. You look at the bigger number between the two .. and then you take the sign .. of the bigger number').

The second common type of learning impedance occurs when an iconic representation of the concept obscures the idea it stands in place of, blocking access to abstract thinking. It seems that this too is a common problem in South African schools, where Schollar has identified the very widespread use of what he calls 'unit counting', in which children cover a page with tiny iconic marks, often running into hundreds, representing numbers, and then proceed to perform operations by counting the marks. The iconic representations are used to perform the operations of addition and subtraction by counting on or counting back, and of multiplication and division by repeated addition and subtraction. The scope for making errors of counting is large with such inefficient procedures, and the margin of error rapidly widens as the numbers increase in size. This behaviour illustrates the problem of children stuck in iconic modes of thinking about mathematical entities, and underlines the need to move on to the more highly condensed and efficient symbolism of arithmetic and algebra. By not moving to manipulating symbolic signifiers, learners are stuck in a

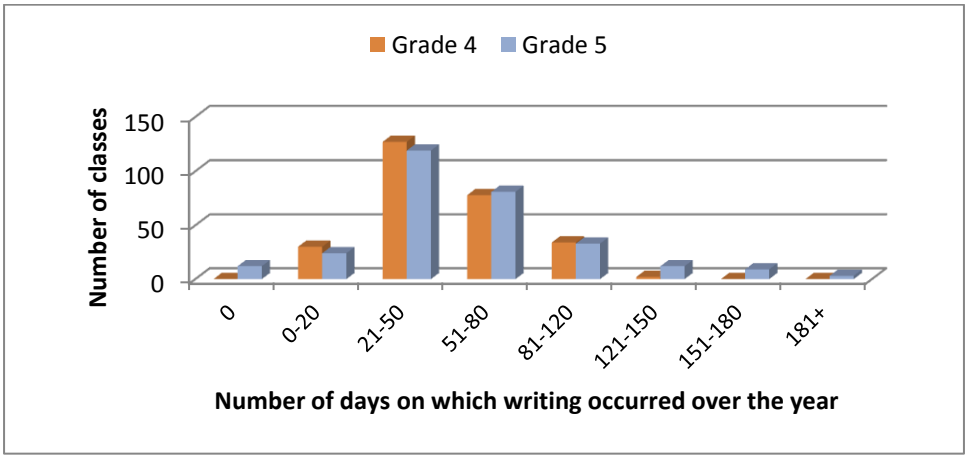
Sisyphean labour of operating on uncondensed symbols which have a one-to-one relationship with real or imagined objects. The great power of mathematics to abstract lower level concepts to symbolic entities, in order to make higher order concepts more manageable is neglected: these children are not learning to do mathematics, but to use only counting procedures to perform complex operations.

Writing in South African primary maths classes

An examination of children's writing at the end of a school year tells us a great deal about what has happened in the class over the year. It tells us about which topics have been studied, how many exercises were performed in each topic, as well as something about the complexity of the exercises. In the second and third years of the NSES study, learner writing books for mathematics were examined and the frequency and extent of written exercises recorded for each of the 268 schools in the study. The results therefore are generalizable to the South African school population.

NSES data (Figure 6) shows that in the majority of classes (58% in Grade 4 and 53% in Grade 5), pupils write on 50 days of the year or fewer. This is equivalent to about one day in three or more. In a very small minority (2% in Grade 4 and 7% in Grade 5) do children write on at least 4 days a week.

Figure 4: Frequency of writing in maths classes, NSES sample



Children in South African mathematics classrooms are systematically deprived of access to written text, whether this is in the form of being exposed to ideas, explanations and activities through reading, or in the form of expressing themselves in writing. Not only does this practice severely inhibit learning, but the natural curiosity of children towards text is unable to find expression in the classroom. Both forms of common learning impedance described above are caused by a breakdown in building the relationship between mathematical writing and the concepts represented by written symbols, in the one case by moving too quickly to the abstract, and in the second by moving too slowly. In both cases South African learners are simply not doing nearly enough writing to avoid either of these stumbling blocks.

Curriculum coverage

Our examination of learner workbooks for maths also looked at the topics in which writing occurred. Mathematics is a discipline composed of a network of interrelated concepts in which higher order ideas and techniques grow out of simpler ideas. The school curriculum is carefully constructed so as

to build these concepts step by step so that higher order mathematical ideas rest on a firm foundation of earlier conceptual and procedural knowledge. For example, a proper grasp of trigonometry in the high school depends on a flexible understanding of the concepts of equivalent fractions, ratio, proportion and rate, and on good spatial perception and an understanding of spatial relations, all of which need to be built systematically through the primary school grades and into the early grades of high school. It follows that if any of these key topics is neglected at any stage of this process, learners will struggle with trigonometry. It is therefore of crucial importance that teachers follow the curriculum, ensuring that all students have a sound grasp of all the topics specified in the curriculum at each grade level. Failure to do this will lead to gaps in learner knowledge, which multiply rapidly as they proceed through successive grades.

In order to ascertain what mathematical topics learners are exposed to, the exercise books of the best learner in each maths class sampled by the NSES in Grades 4 (in 2008) and 5 (2009) were examined. Using a list of all the topics specified in the curriculum, fieldworkers noted each topic on which one or more written exercises had been completed. For each topic, we then computed the mean percentage of classes which had completed at least one written exercise. The results are aggregated by learning outcome in Table 3.

Table 3: Coverage of the five learning outcomes in Grades 4 and 5

Learning Outcome (LO)	Grade 4		Grade 5	
	Number of topics	Mean % coverage	Number of topics	Mean % coverage
Numbers, operations and relationships (LO1)	32	35	34	38
Patterns, functions and algebra (LO2)	12	13	12	12
Space and shape (geometry) (LO3)	15	23	14	18
Measurement (LO4)	14	17	17	15
Data handling (LO5)	11	12	12	10
Total	**84**	**24**	**89**	**24**

On average, only 24% of topics were covered in both Grades 4 and 5. Overall, 88% of teachers had covered no more than 35 (40%) of the 89 topics specified in the Grade 5 maths curriculum, and 58% had covered no more than 20 topics in Grade 4, which make up only 22% of the curriculum.

As shown in Table 4, there were very few topics in which at least half the sample had completed one exercise or more. These included only the simplest of topics: counting, writing numbers, the operations of addition, subtraction and multiplication, and rounding off numbers. More advanced topics, including those which constitute the building blocks for a deeper, conceptual understanding of the subject, were covered by very few teachers.

Table 4: Most and least commonly covered topics, Grade 5 maths

50% or more	Between 5% and 20%	5% or less
Counting Writing numbers Operations: addition, subtraction, multiplication	Ratio and rate Relationship between multiplication and division Checking solutions Additive and multiplicative inverses Commutative, associative and distributive properties Shapes, especially 3 dimensional models	Patterns: completing, describing and formulating numerical patterns All topics on data collection and analysis

Rounding off numbers	Converting between units of measurement (m to cm, hrs to mins, etc) Practical work on measurement Symmetry	

It is clear that the overwhelming majority of South African teachers of mathematics avoid topics which are in any way challenging. These are also the topics which build conceptual understanding. Only the simplest of topics are taught to learners, and then largely in a mechanical, procedural fashion. This practice has the most disastrous effects on the mathematical knowledge to which learners are exposed.

The larger question for this chapter is: what is it that so inhibits reading and writing as a form of classroom behaviour? Is it that books are not budgeted for, or is a large proportion of allocated funding lost to fraud? Does the problem lie in inefficient procurement, or are schools so apathetic towards books that they fail to procure at all? Or does the problem lie in the classroom, where teachers fail to use books that are available? The last of these situations may arise either through ignorance of the importance of books, or through fear that giving children access will expose their own poor knowledge foundations; that depriving children of books is way of strictly controlling children's access to knowledge, thus making poor learners entirely dependent on the knowledge resources and pedagogical methods of their teachers. Available studies indicate that all these factors are present, but, most important, that there are sufficient books available in most schools to provide children regular access, a situation which has strengthened considerably since the introduction of the Department of Basic Education workbooks in 2011. If this is so, then the most important policy question becomes: What do teachers need that will enable them to make full use of available textual materials? We take up this question in Chapter 8.

Chapter 8: Teacher knowledge and professional habitus. *Nick Taylor and Stephen Taylor*

This chapter picks up on the subject of teacher professionalism, an element in the theoretical framework derived in Chapter 4 for describing the school learning environment. In particular we return to Elmore's notion of professional practice as a collection of patterned actions, based on a body of knowledge, skill and habits of mind that can be objectively defined, taught and learned (2008: 64), and his contention that teaching is a pre-professional occupation, which has as yet been unable to specify norms of practice. In Chapter 8 we explore what this body of knowledge might consist of, what evidence there is of South African primary school teachers knowing it, and how it is related to children's learning.

Teacher professional knowledge can be said to comprise three components: disciplinary knowledge, subject knowledge for teaching, and classroom competence; or, put another way, content knowledge of the respective school subject; theoretical and research findings concerning the nature of the subject and methods of teaching it; and the practical ability to convey the subject to learners in real classrooms. We concern ourselves in this chapter primarily with the first of these, on the assumption that sound disciplinary knowledge is a prerequisite for making progress in the other two, important as they also are for good teaching.

The last few years has seen the accumulation of evidence to indicate that the majority of South African teachers know little more about the subjects which they teach than the curriculum expects of their children, and that some teachers know considerably less than this. The SACMEQ III[2] data provides the first opportunity to assess the nature of teacher subject knowledge in any systematic way. Furthermore, the data is particularly interesting in that a number of items were repeated in the learner and teacher tests, providing a unique opportunity to compare teacher and learner scores directly.

In describing the data from the SACMEQ teacher tests, we discuss mathematics and language separately. For both subjects 3 categories of items emerge when teacher and learner responses are compared on the same items. The first category included items on which teachers performed well (>=75%) and learners also performed fairly well (>=40%). In this pattern there is a *correlation between the two sets of scores*, in that a majority of both teachers and learners got the correct answer, although learners scored well below their teachers. We assume that these correlations indicate that teachers are effecting learning on these items, by whichever means, a process which we call *transmission* for the sake of brevity[3].

A second pattern is shown by items in which both teacher and learner scores are low. In this case, whatever pedagogy the teachers may be employing, they would find it extremely difficult to transmit this knowledge to their learners if they are without it themselves. We call this pattern *knowledge impedance.* The third pattern is where teacher knowledge is high (≥75%) but learner scores are low (<40%). One is tempted to conclude here that the impedance to learning is due to teachers' inability to convey the knowledge they obviously have, although as we shall see below, the explanation is probably a lot more complex. For this reason, we label this pattern of scores *unexplained impedance.*

Language

As we did in the case of the NSES learner test in Chapter 2, we classified the SACMEQ teacher test items according to the PIRLS framework, constructing a grid using the PIRLS four processes of comprehension: focus on and *retrieve explicitly stated information*; *make straightforward inferences*; *interpret and integrate ideas and information*; and *examine and evaluate content, language, and textual elements*. However, unlike the NSES test, which assessed both reading and writing, SACMEQ is purely a reading test in which all items are posed in multiple-choice format. The test consists of comprehension exercises on 11 separate texts, ranging in difficulty from those containing only very simple vocabulary and syntax, to relatively dense technical descriptions and complex discursive passages. A variety of text types includes literary writing, expository descriptions, philosophical speculation, a school timetable, a job advertisement, and a collection of 3 posters on healthy living.

[2] The third round of the Southern and Eastern African Consortium for Monitoring Education Quality was conducted in Grade 6 language and mathematics in 2007, where South Africa was one of 14 participating countries.

[3] The term transmission is used here in a formal sense to indicate that at one point in time only the teacher possesses a certain concept, and at a later point learners also possess it; this is the founding assumption of schooling. Distinguishing between 'transmission' and 'impedance' is not intended to imply any particular theory regarding interaction between teacher and pupil, nor the process which enables learners to exhibit proficiency in any knowledge field, and any of the following terms would serve equally well as place-holders for 'transmit': facilitate, develop, co-construct, etc.

The results for South African teachers, compared with those of the total SACMEQ sample, are shown in Table 5, disaggregated by four processes of comprehension.

Table 5: Teacher scores on the SACMEQ language test (mean percentage correct)

	Retrieve	Infer	Interpret	Evaluate	Total
SACMEQ	73.64	54.82	37.27	36.07	61.90
SA	75.06	55.21	36.61	39.73	62.99

Provincial variation within South Africa shows the Western Cape to be the highest performing province by some distance in both language and maths. However, when comparing SA's top province against other African countries the picture is sobering. For example, Kenyan teachers outscore those in the Western Cape by a significant margin in maths.

Grade 6 language teachers did not fare well on the SACMEQ reading test. They performed best on items requiring no more than the retrieval of information stated explicitly in the text. In general, performance fell off as soon as the higher cognitive processes were required to answer a question. Some good scores were recorded on items requiring straightforward inferences, but questions involving interpretation and evaluation were generally very poorly done.

Of the 21 items common to the teacher and learner language tests, a total of 11 show a *correlation* in scores, a much higher proportion than is the case for mathematics (2/15), although the strength of this correlation varies and in 5 of these items is rather weak. As shown in Table 2, items on which transmission occurs are most frequent in the 'retrieve' category, with teachers finding it harder to teach the higher order comprehension skills of inference, interpretation and evaluation. This is hardly surprising, since the majority of teachers are not proficient in these skills themselves.

Mathematics

The 42 items in the teacher math test may be clustered into 5 mathematical strands: arithmetic operations; fractions, ratio and proportion; algebraic logic; rate of change; and space and shape. 15 items were common to the teacher and learner tests. The results are shown in Table 6.

Table 6: Teacher percentage scores on the SACMEQ maths test

	Arithmetic operations	Fractions, ratio and proportion	Algebraic logic	Rate of change	Space and shape	Total
SACMEQ	69.55	57.65	48.75	44.47	66.33	57.47
SA	67.15	49.68	46.51	42.30	56.44	52.39

Four observations arise from an analysis of the math data. First, the subject knowledge base of the majority of South African grade 6 math teachers is simply inadequate to provide learners with a principled understanding of the discipline. While many of the items in the teacher test draw on knowledge not in the primary school curriculum, it would seem that it is through these concepts, procedures and representations that teachers gain the insights necessary to provide children with a flexible, conceptual understanding. Teacher performance on these items is poor, and is not a lot better on a number of critically important topics specifically listed in the grade 6 curriculum. Performance on items 6 and 27, both of which occur in the grade 6 curriculum, illustrate the point.

6. $10 \times 2 + (6 - 4) \div 2 =$

While a small majority of teachers (54%) are able to compute the correct answer, only 22% of learners can do so. The item requires an application of the classic BODMAS[4] rule for choosing the order in which to perform operations in a problem containing more than one operation. The first distractor for this item is obtained by ignoring the rule and performing the operations from left to right, a procedure followed by 37% of teachers and the largest category of learners (38%). Clearly, a good proportion of teachers and almost all learners are confused about the application of this fundamental arithmetic property, and we may ascribe the transmission failure in this case to a lack of disciplinary knowledge on the part of teachers (knowledge impedance).

Only 40% were able to answer item 35 correctly:

27. To mix a certain colour of paint, Enni combines 5 litres of red paint, 2 litres of blue paint, and 2 litres of yellow paint. What is the ratio of red paint to the total amount of paint?

Second, the pattern showing a correlation between teacher and learner scores, indicating successful transmission, is seen in only two very simple maths items. Item 3 is a visual comparison of two fractions, and item 5 involves a geometric pattern showing multiples of three.

Third, for the pattern characterised by low teacher and low learner scores, it seems self-evident that transmission failure is due to insufficient teacher disciplinary knowledge. Teachers do not possess the knowledge themselves and therefore cannot promote its learning among pupils. Eight of the 15 items common to the teacher and learner tests fall into this category, including item 6 shown above. A regression analysis of teacher scores against those of their learners indicates that it is only when teachers have a very sound grasp of the mathematical principles are they able to convey this knowledge effectively. The SACMEQ data indicates, for example, that grade 6 teachers need to be able to successfully solve problems of proportional reasoning involving linear equations and their graphs to at least grade 10 level before they are able to explain the concepts of ratio and proportion to their learners.

Fourth, interpretation of the high- teacher-low-learner-score pattern is a more complex matter. In the 5 items exhibiting this pattern transmission failure could arise from one or a combination of three factors: insufficient subject knowledge on the part of the teachers, bad pedagogy, or poor language facility on the part of teachers and/or learners. There is evidence to indicate that all three factors are present to a greater or lesser degree, but fine-grained classroom observation studies would be required to map these in detail.

These conclusions support the hypothesis that, in order to be effective, a teacher needs to have a deep understanding of the principles of the subject discipline, and that different degrees of a relatively shallow understanding have no marked effect on learner performance. The implications are that providing teachers with a thorough conceptual understanding of their subject should be the main focus for both pre- and in-service teacher training. We might expect some short-term efficiencies to be generated by obvious improvements in pedagogy, such as getting school leaders

[4] BODMAS is a mnemonic for remembering: Brackets, Of, Division, Multiplication, Addition, Subtraction

and teachers to understand that reading and writing should be done every day in every subject, and that extended writing in all subjects, interpretive analysis of language texts and complex problem solving in maths should be undertaken weekly. However, any such pedagogical gains are likely to reach a low ceiling, unless a great deal more attention is paid to teacher subject knowledge at the same time.

Chapter 9: Learner age and performance. *Jennifer Shindler and Double-Hugh Marera*

In each year of the study NSES learners completed a form, one item of which was their date of birth. This enabled us to track the age profile of each successive grade. This exercise shows that only 53% of Grade 3 learners in 2007 were appropriately aged, which reduced to 51% of Grade 4 learners in 2008 and 50% of Grade 5 learners in 2009. Only around 3% of the Grade 3, 4 and 5 learners were under-aged for their grade, while 36%, 41% and 46% of learners in Grades 3, 4 and 5 respectively were over-aged. Children being underage for their grade is not a significant problem in the South African school system, which is victory for recent government policy on enrolment age.

Male learners constitute a small majority in each grade, while females tend to be more age appropriate, a consequence of the fact that boys repeat more frequently than girls. In the over-aged category, boys substantially outnumber girls in each grade and by Grade 5 more than 50% of male learners are over age. Among appropriately aged children the higher SES categories predominate, while the lower SES categories predominate amongst over-aged children. In other words, poorer children are far more likely to be over aged for their grade.

Overage learners are a result of late enrolment and grade repetition. It is estimated that about 15% of first time enrolling learners are older than the correct age for Grade 1. Repetition is a greater problem, and NSES data shows that by Grade 5 more than one out of every three learners (about 37% of learners) has repeated at least once.

Clearly grade repetition is not serving learners well, as over-aged learners achieve significantly worse than appropriately aged learners in both numeracy and literacy and in all skills assessed. In fact, the gap in achievement grows as learners progress through the grades, with over-aged children in particular falling further and further behind. The much poorer performance of over-aged learners occurs regardless of grade, gender, province, socio-economic status or former department that administered the school during apartheid.

Chapter 10: Where to from here? From fact to act. *Martin Gustafsson, Thabo Mabogoane and Nick Taylor*

The NSES data which, except for Gauteng, is representative of South African schools, shows that attendance and punctuality by principals and teachers, thorough curriculum planning, frequency and use of assessment for teaching, teacher knowledge, and curriculum coverage vary substantially across South African schools, and are strongly linked to pupil test scores. For example, our modelling exercise estimated that the national average for maths could be expected to improve from 34% to 42% in response to raising teacher knowledge and curriculum coverage across the system.

The Department of Basic Education, following many countries in both the developed and developing world, is in the process of implementing a series of accountability measures throughout the school system. However, such measures may be subject to gaming and other perverse practices: for example, reports of schools and even whole districts in the United States cheating in the tests used to measure progress on the No Child Left Behind accountability system are increasing (Jacobs and Levitt, 2003; Ravitch, 2010; Jonsson, 2011). System-wide gaming of the South African Senior Certificate examinations are known to have occurred in the years 1999-2003 (Umalusi, 2003; Taylor, 2009). At the same time, evidence from developing countries indicates that well designed and implemented accountability systems such as national assessments play an important role in improving the quality of education (Ravela, 2005; Delannoy, 2000).

Elmore (2003) concludes that accountability systems can be effective in raising learner scores, but that there is wide variability among schools in their responses to such initiatives. The response of any particular school to external accountability measures depends on the state of what Elmore calls its internal accountability systems. The NSES data, together with our case studies and other research (Christie et al, 2007), indicate that strong internal accountability is led by a coordinated focus on teaching and learning by school leaders, teachers and parents. Specifically, the school-level systems which drive improved performance in South African schools are time management, curriculum planning and monitoring, the systematic use of assessment to focus teaching and learning, and the procurement and retrieval of books.

The key to improving the ability of poorly functioning schools to respond to accountability pressures is capacity building, aimed at aligning and strengthening internal accountability systems. Hopkins, Harris, and Jackson (1997) have developed a typology of school ‘‘growth states’’, distinguishing between Type I or ‘‘failing’’ schools, Type II or moderately effective schools, and Type III or generally effective schools. The authors go on to suggest a basket of strategies aimed at making Type I schools moderately effective: carrots and sticks are useless here as these institutions do not possess the internal management arrangements to enable them to get the work of teaching and learning done. These schools require a high level of external intervention and support. The overall strategy is to begin with stabilizing school organization, then addressing teacher capacity, and then augmenting learner opportunity. For failing schools, there should be a clear and concerted focus on a specific, limited number of factors: often the first thing to do is to replace the principal and distribute leadership to a wider circle of teachers. Of course, intervening in schools in this way requires far higher levels of capacity in district and provincial offices than currently obtain in the large majority of the country’s provinces.

At the level of the classroom, NSES findings strongly indicate that the verbal culture which pervades South African schools needs to be replaced by a greatly increased tempo of reading and writing. Children need to read and write every day in every subject. At least once a week such writing should consist of extended essays of a descriptive, expressive or analytical kind. It has been shown that, even in the poorest schools, Grade 1 children can be taught to write page-long stories about themselves, their friends and families: this is the kind of writing which develops the higher cognitive processes and which is so sorely lacking throughout our primary schools.

In a content-rich subjects like mathematics increasing teacher knowledge is key to improving performance. To date very few teacher development programmes have proved to be effective in

achieving this important goal. For example, the report of the Council of Higher Education on the majority of programmes providing Accelerated Certificates in Education over the last decade, at a cost of billions of rands, concludes that:

> The absence of a sustained plan that addresses the continuum of learning that is required, and in particular that addresses poor subject specialisation knowledge, is perhaps the greatest weakness of the ACE programmes.
>
> CHE, 2010:135

Although the evidence is very limited at this stage, the few programmes that have been shown to impact significantly on teacher knowledge and learner performance are block release courses of at least a week in duration, where substitutes are hired to replace teachers on course (de Chaisemartin, 2010). It would seem obvious that training of such intensity and duration will have a far more profound effect on teachers' knowledge and practice than the kind of afternoon/weekend/holiday workshops which characterise most INSET programmes.

However, before any of these steps can have optimal traction, we would suggest that a commitment to expertise needs to replace the present culture of patronage which dominates large parts, not only of the school system, but of the entire civil service, leading to widespread malfunction in the delivery of services. This is obviously a political problem which needs to be addressed in the political sphere. Until this happens individual schools may be led to improved performance through inspired principals, but system-wide reform of the largely dysfunctional school system cannot occur. Instituting a commitment to expertise in the civil service means employing and promoting all personnel within the public sector on the basis of merit, knowledge and skills, rather than according to seniority or to their political or union connections.

Acknowledgement

The NSES was designed and managed by JET Education Services, and subsidised by the Royal Netherlands Embassy and JET. Aneesha Mayet led the fieldwork and Thabo Mabogoane coordinated the capture and analysis of data. The additional research on which Chapter 4 is based was supported by JET Education Services and the SPADE project, which is sponsored by the Department of Higher Education and Training and the Department of Basic Education, through the European Union Primary Education Sector Policy Support Programme. Any opinion, findings, conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of any of the sponsoring parties.

References

CHE. (2010). Report on the Nation Review of Academic and Professional Programmes in Education. *HE Monitor No. 11.* Pretoria: Council on Higher Education.

Christie, P; Butler, D; and Potterton, M. (2007). *Schools that Work. Report to the Minister of Education of the Ministerial Committee.* Pretoria: Department of Education.

de Chaisemartin, T. (2010). Evaluation of the Cape Teaching and Leadership Institute. Johannesburg: JET Education Services. Available at www.jet.org.za

Delannoy, F. (2000). *Education reforms in Chile, 1980-1998: A lesson in pragmatism*. Washington: World Bank.

Elmore, R. (2003). Accountability and Capacity. In Carnoy, M., Elmore, R., & Siskin, L. (Eds.). *The new accountability: High schools and high-stakes testing.* New York: RoutledgeFalmer.

Hill, H., Rowan, B., and Ball, D. (2005). Effects of Teachers' Mathematical Knowledge for Teaching on Student Achievement. *American Educational Research Journal*, 42(2), 371-406.

Hopkins, D., Harris, A., & Jackson, D. (1997). Understanding the school's capacity for development: Growth states and strategies. *School Leadership and Management*, 17(3), 401–411.

Jacob, B., and Levitt, S. (2003). Rotten apples: an investigation of the prevalence and predictors of teacher cheating. *Quarterly Journal of Economics*, 118(3);843-77.

Jonsson, P. (2011). America's biggest teacher and principal cheating scandal unfolds in Atlanta. *Christian Science Monitor*, July 5. Downloaded at http://news.yahoo.com/americas-biggest-teacher-principal-cheating-scandal-unfolds-atlanta-213734183.html 10 July 2011.

Langer, J., and Applebee, A. (2007). *How Writing Shapes Thinking: A Study of Teaching and Learning*. WAC Clearinghouse Landmark Publications in Writing Studies: http://wac.colostate.edu/books/langer_applebee/. Originally Published in Print, 1987, by National Council of Teachers of English, Urbana, Illinois.

Ravela, P. (2005). A formative approach to national assessments: The case of Uruguay. Prospects, 35(1): 21-43.

Ravitch, D. (2010). *The death and life of the great American school system: how testing and choice are undermining education.* Basic Books.

Taylor, N. (2009). Standards-based accountability in South Africa. *School Effectiveness and School Improvement*, April: 1-16.

Umalusi (2004). *Have the standards of the Senior Certificate examination declined? Summary report on the evaluation of the senior certificate examination*. Pretoria, South Africa: Umalusi.