

Policy Brief

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**Southern and Eastern Africa Consortium
for Monitoring Educational Quality**

Trends in Achievement Levels of Grade 6 Pupils in South Africa

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Introduction

This Policy Brief provides information about levels and trends in the reading and mathematics achievement of Grade 6 pupils in South Africa that participated in two large-scale cross-national research studies of the quality of education that were conducted by the 15 school systems involved in the Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ).

South Africa participated in SACMEQ II in 2000 and in SACMEQ III in 2007.

The achievement results showed that while South African learners' had improved their performance across the two SACMEQ studies (by 3 points in reading and 9 points in mathematics), they are still underperforming in both reading and mathematics. Using the results learners achieved in internationally benchmarked tests crafted by SACMEQ, credible standpoints are made on learner achievement levels.

SACMEQ's Literacy and Numeracy Indicators

When the SACMEQ Consortium was launched in 1995, SACMEQ's Governing Board (the SACMEQ Assembly of Ministers) emphasized that the planning of improvements in the quality of education required better indicators of the "literacy" and "numeracy" skills that were being acquired by pupils as they moved through the basic cycles of primary education. These indicators were considered important because they allowed senior decision-makers to assess the performance of school systems, and to provide information that could be used for strategies aimed at improving the quality of education.

The SACMEQ Ministers interpreted the concept of "literacy" as meaning reading comprehension skills that were transmitted through school language and reading instruction programmes. They interpreted "numeracy" as meaning the numerical and mathematical reasoning skills that formed the core of school mathematics programmes. The SACMEQ

Ministers wanted their school systems to be judged by the extent to which pupils acquired the knowledge and skills that they were expected to acquire – as specified in official school curricula, textbooks, and teachers' guides.

The SACMEQ Ministers decided that the design of tests for the assessment of pupil achievement in reading and mathematics in the SACMEQ research programme should focus on:

- (a) **Grade 6** - because (i) they wanted to monitor the "output" of their primary education systems before large numbers of the pupil cohort began to leave school, and (ii) they considered that assessments held at lower Grade levels would result in distorted results due to the "turbulence" in learning environments that occurred in many schools during the changeover (at around Grades 3 to 4) from the delivery of instruction in local to the official or national languages; and
- (b) **The National Language of Instruction** - because they were concerned that the acquisition of reading and mathematics skills in the national language of instruction was necessary for a successful transition to secondary schooling.

The SACMEQ reading and mathematics tests were developed from a careful analysis of the official school curricula, school syllabi, and textbooks used in both Namibia and other SACMEQ school systems. These tests made it possible to employ Modern Item Response Theory methods to undertake item analyses and test-scoring procedures. The test scores were transformed so that pupils from both the SACMEQ II and III Projects were placed on a single scale with the SACMEQ II scores anchored to a mean of 500 and a Grade deviation of 100.

The SACMEQ reading and mathematics tests were scored in two different ways for different reporting purposes:

- (a) **Scaled Scores** – which were useful for reporting the average performance of pupils at national and regional levels for both SACMEQ II and III Projects. These scores were scaled so that

meaningful comparisons could be made across countries for each project, and across projects for each country. The average scaled scores for South Africa and its regions have been reported in **Table 1** for the SACMEQ II Project (2000) and the SACMEQ III Project (2007).

(b) Competency (or Skill) Levels – which were useful for presenting a descriptive account of (i) the skills that pupils had acquired at eight levels of competence measured by the scaled scores, and (ii) the skills that must be acquired for pupils to move from one level of competence to a higher level. The competency levels for reading and mathematics have been described in **Table 2(a)** and **Table 2(b)**, respectively. These tables show the percentages of South Africa’s pupils at each competency level for the SACMEQ II Project (2000) and the SACMEQ III Project (2007).

Results for Average Scaled Scores

The average reading and mathematics scores of Grade 6 pupils across the 9 regions of South Africa were derived from SACMEQ reading and mathematics tests that were administered in South Africa to 3 163 Grade 6 pupils from 169 schools for the SACMEQ II Project in 2000, and 9 071 Grade 6 pupils in 392 schools for the SACMEQ III Project in 2007.

In order to examine **levels of achievement**, the average scores were colour-coded to show their levels relative to the SACMEQ II Project overall mean of 500. Green figures indicated ten points or more above the SACMEQ average, red figures indicated ten points or more below the SACMEQ average, and black figures indicated within ten points of the SACMEQ average.

In order to show **trends in achievement**, colour-coded arrowheads were used to show changes in average scores between 2000 and 2007. A green arrowhead denoted an increase of ten points or more, a red arrowhead denoted a decrease of ten points or more, and a grey arrowhead denoted change of less than 10 points above or below the SACMEQ mean of 500.

(a) Achievement Levels

It can be seen from **Table 1** that for South Africa as a whole, the mean score for reading increased by 3 points, from 492 points in 2000 to 495 points in 2007. Similarly, for mathematics, there was a minimal increase of 9 points in the national mean score, that is, from 486 points in 2000 to 495 points in 2007.

From the green figures in **Table 1**, it can be seen that

From the green figures in Table 1, it can be seen that two provinces (Gauteng and Western Cape) showed high levels of reading achievement, because they were substantially above the SACMEQ average in both 2000 and 2007. Similarly for mathematics, only Gauteng and Western Cape registered scores that were more than 10 points above the SACMEQ average for both the SACMEQ II and SACMEQ III Projects.

The red figures in Table 1 indicated that three regions (Eastern Cape, Mpumalanga, and Limpopo) showed much lower levels of achievement relative to the SACMEQ average for both reading and mathematics in both 2000 and 2007.

There were several provinces that had ‘mixed’ performance levels. For example, in the North West province learners had registered scores marginally above the SACMEQ mean but had significantly increased their scores between 2000 and 2007 in reading and mathematics by 78 and 83 points respectively.

(b) Achievement Trends

From the green arrowheads in **Table 1**, it can be seen that there were four provinces (North West, Mpumalanga, Free State and the Northern Cape) that showed significant improvements in reading, even though their scores were not green in 2000 and 2007. Similarly the same four provinces and the Eastern Cape showed significant improvements in mathematics.

From 2000 to 2007, three provinces (Western Cape, KwaZulu-Natal and Gauteng) showed a decline in performance in both reading and mathematics. In KwaZulu-Natal, the performance of learners had declined from scoring above the SACMEQ mean in 2000 to scoring significantly below the SACMEQ mean in 2007. There was a significant drop in reading and mathematics performance from 2000 and 2007 in the Western Cape, where learners’ scores dropped by 46 and 25 points respectively in these subjects.

Overall, the improvement of South African learners over the two SACMEQ projects was not significant.

Results for Competence Levels

Another way in which the SACMEQ results can be presented is by calculating the percentages of pupils who had reached each level of competence on a hierarchical scale of competence levels as explained below.

The reading and mathematics test items were first arranged in order of difficulty, and then examined

item-by-item to describe the specific skills required in order to provide correct responses. Items were then placed in groups so that the items in each group had similar difficulty values and shared a common theme with respect to the underpinning competencies required to provide correct responses.

This “skills audit” for the reading and mathematics tests resulted in the identification of eight hierarchical levels of competence for each test (Level 1 being the lowest, and Level 8 being the highest).

The results of the skills audit have been presented in **Tables 2(a), and 2(b)**. A description or summary name was linked with each of the levels – in order to summarize the competencies associated with each group of test items. The first three competence levels in reading and mathematics employed the same prefixes (Pre, Emergent, and Basic) in order to reflect the mechanical nature of the most elementary competencies. From the fourth level upwards, the prefixes of the summary names were different for reading and mathematics, and were designed to reflect deeper levels of understanding of subject specific competencies.

The eight competence levels provided a more concrete analysis of what pupils could actually do. They also suggested instructional strategies relevant to pupils who were learning at each level of competence.

For reading, it can be seen that there were increases in the percentages of pupils who were performing at Levels 3, 5 and 6, as indicated by the plus (+) symbols in front of the figures in the final column of **Table 2(a)**. Nevertheless, there was a slight drop in the percentage of learners performing at Levels 4 and 7 and no change in performance at level 8.

This meant that the percentages of learners who were performing at interpretive and inferential reading levels improved but performance at the analytical and critical reading levels still requires attention. It was pleasing to note that there was a corresponding decline in the percentages of learners who were performing at lower levels of competence (Levels 1-2), as indicated by the minus (-) symbol in front of the figures.

For mathematics, **Table 2(b)** showed that the percentage of pupils who were performing at Level 3 (Basic Numeracy) increased by (+) five percent, and the percentage of pupils performing at Level 4 (Beginning Numeracy) increased by 7%. While it was pleasing to note that there were less learners performing at the lower Levels (1 and 2) in 2007 than

in 2000, there were also a slight decline in the percentage of learners performing at the higher levels (7 and 8) that deal with concrete and abstract problem solving.

Summary of Results

The results discussed in this Policy Brief have shown that slight improvement was noted in the overall performance of South African learners in the third SACMEQ study. The slight improvements in scores become qualified when levels of achievement are considered.

The results of learners in reading literacy indicated that South African learners in 2007 performed similar to their counterparts who participated in 2000. The results trend showed that in 2007, almost 63% of learners were not competent in reading levels 1 to 4, compared to almost 66% in 2000. There was however more learners showing skills in interpretive and inferential reading (levels 5 and 6) in 2007 than in 2000.

The results of learners in mathematics were more differentiated across the eight levels (Table 2). In 2007, 35% of learners were situated at Level 2 – the emergent numeracy level compared to 44% in 2000, in the same category. A higher number of learners showed competencies at levels 3, 4, 5 and 6 in 2007 than in 2000. The number of learners displaying competencies at level 8 – abstract problem solving, remained unchanged at one percent in 2000 and in 2007.

In addition, the results showed that in both 2000 and 2007 there were very wide differences in learner achievement across the 9 provinces of South Africa. In 2007, there were three provinces, Western Cape, Gauteng and the North West, where learners achieved scores above the SACMEQ mean in both reading and mathematics.

The minimal increase in pupil achievement levels in South Africa between 2000 and 2007 can probably be attributed to a combination of several factors ranging from teaching practice, teacher development and the use of resources. During this period, South Africa had also phased in a revised national curriculum statement for learners from Grade R (reception year) to Grade 9.

Research-Based Conclusions and Lessons

The following conclusions have been based on the results discussed in this Policy Brief concerning: (a) achievement levels for Grade 6 pupils – as measured

by scaled test scores, and (b) achievement trends of Grade 6 pupils – as measured by their location in one of the 8 competency levels.

1. Levels of Achievement: In 2007 the average reading and mathematics performance of Grade 6 pupils in South Africa (495) was close but marginally below the SACMEQ overall average (512) in reading and (510) in mathematics. In both reading and mathematics, the percentage of learners achieving at the higher SACMEQ levels was significantly low.

Education authorities should share this information with the Curriculum, and the In-service Teacher Education Units in the Department of Basic Education (DBE) with a view to seeking ways of improving the quality of reading and mathematics instruction in South African primary schools.

2. Trends in Achievement: Between 2000 and 2007 the regions in South Africa presented a mixed picture in the average reading and mathematics performances of Grade 6 pupils. For reading, in five regions such as the Eastern Cape, Free State, Mpumalanga, Northern Cape and the North West, there were positive increases while in the remaining four (Gauteng, KwaZulu-Natal, Limpopo and the Western Cape) there was a decline in 2007.

The Department of Basic Education (DBE) should continue to strengthen upward trend in the five provinces that showed positive improvements while looking critically at how the remaining four can reverse their decline in performance. The DBE should encourage all provinces to ensure that everything possible is done to ensure that the average performances in reading and mathematics reaches levels above the SACMEQ mean.

It is significant to note that SACMEQ II (and SACMEQ III) Project tests were constructed carefully so as to ensure that the structure of the learner tests was congruent with the content and skills derived from detailed analyses of the curricula, syllabi, examinations and textbooks used in the SACMEQ countries¹. The results therefore have valuable lessons for teaching and learning.

¹ A full account of the process and the findings of the study have been documented in the South African report on the SACMEQ II Project (Moloi and Strauss, 2005).

Lessons for Teaching Practice

The trends observed in Tables 2(a) and 2(b) indicates that South African learners are not comfortable with the more demanding skills of reading and mathematics.

In terms of reading, the lesson is for teachers to expose learners to extracts and passages that demand skills from interpretive to critical reading and further exemplify this work with boy learners and learners from low socio-economic groupings. Learners must be given high quality class work exercises that stretch the imagination and creative reading skills of learners. For example reading levels 5 to 8 should feature in any narrative prose given to learners.

Similarly in mathematics, to improve on the high percentage of learners having only basic numeracy (level 3), teachers need to expose learners to extensive applications and high order questions involving concrete and abstract problem solving skills. The number of learners showing a competency in these levels is significantly low.

Lessons for Teacher Development

On a broader systemic level, Higher Education Institutions, providing teacher education, must ensure that teachers are trained in developing tasks and assessments inclusive of all levels of learning. All student teachers must display a practical competence on exposing learners to answer high order questions. For in-service teachers, the Departments of Education should (DoBE and DoHE) should structure in-service training programmes (INSET) that deal specifically with teachers' needs on content associated with the higher levels of achievement.

Lessons for Curriculum Materials

The provision of materials to schools should be appropriately balanced with different levels of achievement explicit for teachers and learners to apply in class work exercises and assessments. Additionally lesson plans, milestone documents and workbooks supplied to or generated at school level must be structured to facilitate learning across all required levels of competency.

A Concluding Comment

The task of improving the quality of education for a whole system of education must be seen as a long-term challenge. There are very few examples in the world where “quick fix” responses have resulted in system-wide positive improvements in the quality of education delivered across a nation.

Clearly there is a need to expose learners to examples of applying skills associated with the higher SACMEQ levels in both reading literacy and mathematics. In the national curriculum statement emphasis is placed on teachers designing tasks in such a way as to ensure that a variety of skills are assessed. Assessment should be used to maximise learners' access to the knowledge, skills, values and attitudes (Department of Education, 2002). The eight SACMEQ levels for reading literacy and mathematics provides an appropriate benchmark to model assessments and to structure learning so that learners can be exposed to the expected range of competencies for their age group.

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Table 1: Levels and Trends in Pupil Achievement across Regions in South Africa

	Pupil reading score			Pupil mathematics score	
	2000	2007		2000	2007
Eastern Cape	444	448 ▶		449	469 ▲
Free State	446	491 ▲		448	492 ▲
Gauteng	576	573 ▶		552	545 ▶
KwaZulu-Natal	517	486 ▼		510	485 ▼
Mpumalanga	428	474 ▲		433	476 ▲
Northern Cape	470	506 ▲		461	499 ▲
Limpopo	437	425 ▼		446	447 ▶
North West	428	506 ▲		420	503 ▲
Western Cape	629	583 ▼		591	566 ▼
SOUTH AFRICA	492	495 ▶		486	495 ▶
SACMEQ	500	512 ▲		500	510 ▶

Values in **Green** = 10 points or more above SACMEQ II mean of 500

Values in **Black** = less than 10 points above or below SACMEQ II mean of 500

Values in **Red** = 10 points or more below SACMEQ II mean of 500

Notes about trend:

▲ Increased by 10 points or more

▶ Minimal change (less than ±10)

▼ Decreased by 10 points or more

Table 2(a): Percentages of Pupils Reaching Various Levels of Competence in Reading

Reading Skill Levels			2000	2007	Change
Level	Description	Skill/Competence	%	%	%
1	Pre-reading	Matches words and pictures involving concrete concepts and everyday objects.	12.2	9.9	-2.3
2	Emergent Reading	Matches words and pictures involving prepositions and abstract concepts.	18.8	17.3	-1.5
3	Basic Reading	Interprets meaning (by matching words and phrases, completing sentences).	19.1	21.1	+2
4	Reading for Meaning	Reads to link and interpret information located in various parts of the text.	16.0	14.7	-1.3
5	Interpretive Reading	Interprets information from various parts of the text in association with external information.	9.4	10.6	+1.2
6	Inferential Reading	Reads to combine information from various parts of the text so as to infer the writer's purpose.	7.0	9.6	+2.6
7	Analytical Reading	Locates information in longer texts (narrative, document or expository) in order to combine information from various parts of the text so as to infer the writer's personal beliefs (value systems, prejudices and biases).	10.9	10.2	-0.7
8	Critical Reading	Reads from various parts of the text so as to infer and evaluate what the writer has assumed about both the topic and the characteristics of the reader	6.6	6.6	=

Table 2(b): Percentages of Pupils Reaching Various Levels of Competence in Mathematics

Mathematics Skill Levels			2000	2007	Change
Level	Description	Skill/Competency	%	%	%
1	Pre-Numeracy	Applies single step addition and subtraction.	7.8	5.5	-2.3
2	Emergent Numeracy	Applies a two-step addition and subtraction involving carrying.	44.4	34.7	-9.7
3	Basic Numeracy	Translates verbal information into arithmetic operations.	23.8	29.0	+5.2
4	Beginning Numeracy	Translates verbal or graphic information into simple arithmetic problems.	8.8	15.4	+6.6
5	Competent Numeracy	Translates verbal, graphic, or tabular information into an arithmetic form in order to solve a given problem.	6.1	7.1	+1
6	Mathematically Skilled	Solves multiple-operation problems (using the correct order) involving fractions, ratios, and decimals.	5.8	5.9	+0.1
7	Concrete Problem Solving	Extracts and converts information from tables, charts and other symbolic presentations in order to identify, and then solve multi-step problems	2.1	1.9	-0.2
8	Abstract Problem Solving	Identifies the nature of an unstated mathematical problem embedded within verbal or graphic information and then translate this into symbolic, algebraic or equation form in order to solve a problem.	1.3	0.6	-0.7

