ACCESS TO LEARNING - MATHEMATICS PERFORMANCE IN SCHOOLS IN GAUTENG AND EASTERN CAPE.

CREATE SOUTH AFRICA POLICY BRIEF 3

OCTOBER 2010

ACCESS TO LEARNING – MATHEMATICS PERFORMANCE IN CASE STUDY SCHOOLS IN GAUTENG AND EASTERN CAPE.

South Africa performs poorly on international assessments of mathematics. Learner performance at both at primary and secondary school levels does not appear to have improved significantly over the past 10 years. Assessment should provide a catalyst for improved learning and reflective teaching practices. Usually, standardised testing is used as a means of measuring learners' achievement, which can be a useful determinant of educational policy and reform. CREATE used standardised mathematics Grade 4 and 6 tests and administered them to Grade 5 and 7 learners in 12 schools in South Africa. Research explored whether learners at these grades in have the ability to read, write and respond to the kinds of numeric tasks specified by the National Curriculum Statement (NCS) as an indication of the extent to which learners could be considered "silently excluded". This policy brief describes the results of this study and suggests recommendations for assessment policies in South Africa. It is based on Pereira & Du Toit, (2010, forthcoming).

Introduction

There are many ways that learners may be assessed to measure academic achievement. Assessment is a major topic for discussion in the educational arena with diverse means of attempting to ascertain learner achievement. Teachers, administrators, parents, and support staff must be able to use test results to implement and improve a quality curriculum based on needs and interests of learners.

Many school systems, both internationally and in South Africa, give standardised tests to learners. These are key to the assessment of the health of any education system and also to benchmark change in the functionality of the system over time. The diagnostic nature of assessment instruments, if designed well, can help the system identify areas which need attention and thus inform the allocation of resources as well as school practices. Assessment should provide a catalyst for learning and for reflective teaching practices.

Measuring learners' achievement through standardised testing can be a useful determinant of educational policy and reform. But testing is not useful if it becomes a scheme of high stakes accountability that promotes aggressive individualism in schools or whipping sticks to punish poor performers. Reformers have yet to face up to the fact that the complexity of their task has far more to do with not destroying the very features that make education an uplifting, noble endeavour than it has to do with perfecting their devices for measuring and judging individual performance (Fenstermacher & Richardson, 2010).

There is a much more important reason for assessments, and in particular standardised testing - to foster improvement. Frequent assessment of learners helps them to refine concepts and deepen their understanding; it also conveys high expectations, which further stimulates learning.

In South Africa, many programmes have used standardised testing procedures to do just this, such as the National Department of Education Systemic Evaluation Study in Grades 3 and 6; the Western Cape biennial testing of Grades 3, 6 and more recently, Grade 9 and now the Annual National Assessment (ANAs) in which all schools are required to test all their Grade 1-6 and Grade 9 learners.

Many education evaluation studies use learner achievement results as measures on which to track the potential or realised impact of the project. The testing done in the CREATE project provides insights into the extent to which learners may be "silently excluded" as a result of low achievement.

Many schools in South Africa are plagued by poor time management practices at school and classroom levels, poor teacher knowledge of the subjects they are teaching, and by insufficient reading and writing on the part of learners. Large numbers of over age in grade children caused by late enrolment or repetition cause problems with teaching and lead to silent exclusion (Taylor et al. 2010). The achievement results from CREATE research mirror findings from the growing literature[1] on South African schools.

CREATE achievement tests

In June 2009, 12 township schools from two provinces (Gauteng and Eastern Cape) wrote standardised mathematics achievement tests. 487 Grade 5 learners wrote the Grade 4 mathematics tests while 662 Grade 7 learners wrote the Grade 6 mathematics test.

Both tests were administered in English. The tests were designed to be achievement tests with some diagnostic elements. Both tests were aligned to the National Curriculum Statement (NCS) for mathematics at the Intermediate Phase. In other words, it contains items that assess numeric skills in each of the five mathematics Learning Outcomes (LO): LO1 on numbers, operation and relationships; LO2 on patterns; LO3 on shapes; LO4 on measurement and LO5 on data.

Results of the standardised mathematics tests

The average score achieved by Grade 5 learners on the Grade 4 test was 23.5%. This signals a very poor overall result and suggests that most of the learners are not operating at the required levels expected by the NCS. In fact, the score obtained by the 12 schools is below the national average obtained by learners in the first national Systemic Evaluation in 2001 for numeracy (national mean of 30%).

The results also show that the variation between schools is very large (standard deviation = 16.39). We cannot say with certainty why these disparities are so large across these particular schools but this finding is not unique to this particular study. South Africa has the highest levels of between-school inequality[2] of performance in mathematics and reading, by a large margin, among SACMEQ countries (van der Berg, 2005). The massive disparities in performance between schools within the South African system are, to a large extent, structured by a history of poverty and deprivation, with African schools overwhelmingly presented in the poor-performing category.

The schools involved in the CREATE project are a case in point. CREATE stesses **meaningful** and equitable access to education, because, as many systemic studies[3] have posited, access without quality with have negligible effects on reducing inequality. **Whatever the reasons for the variation between schools, the average scores are disappointingly low and indicate that many students are failing to learn.**

Counting is the skill where the highest average score was attained (50.6%) while division and rounding off to the nearest 100 was the poorest (8% and 8.2% respectively) (see Figure 1). If we disaggregate the scores into the three difficulty levels, the mean for the Grade 3 level items were 41.9%, whereas the mean for the Grade 4 and 5 level items were 19.1% and 17.4% respectively.

Of the 12 schools only two schools achieved mean scores of 30% or more. Three schools scored mean scores of less than 10% overall. Furthermore, almost half of the Grade 5 learners in the sample achieved a mean of 50% or higher on the Grade 3 level items. Recent assessment regulations require a learner to

[1] Gauteng Department of Education Whole School Evaluation studies; 2009, 2010; the Gauteng Provincial Assessment Study (2009); PIRLS, 2007; TIMSS, 2007; SACMEQ, 2005, 2006; the national Department of Education's Systemic Evaluation Study (2001, 2005), Khanyisa, 2005; Quality Learning Project (QLP, 2005); Pupil Progress Project (PPP, forthcoming; National School Effectiveness Study, forthcoming)

[2] As measured by the intra-class correlation coefficient rho, which expresses the variation in performance between schools as a proportion of overall variation.

[3] See the Trends in International Mathematics and Science Study (TIMSS 1995, 1999, 2003, and 2007); the Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ, 1995-2010); Progress in International Reading Literacy Study (PIRLS, 2007); the national Department of Education's Systemic Evaluation Study (2001, 2005) and the Gauteng Provincial Assessment Study (2009).

have at least a level three (50% or more) in literacy and numeracy, to progress to Grade 4. These learners have progressed to Grade 4 and Grade 5, but less than half achieved 50% of the Grade 3 level skills and knowledge tested in this test. This poses a challenge for the teaching of mathematics in the Intermediate Phase. Learners are progressing through the system without having the necessary skills.

The situation in Grade 7 was similar. A mean score of 28.1% was achieved by the Grade 7 learners on the Grade 6 test. This finding is in line with the 2004 national Systemic Study for Grade 6, where a national mean of 27.1% was attained. Only six of the 12 schools had learners that achieved a mean of 50% or more on the test. The interschool variation was large, average achievements of schools varied from 17% to 39.5%.

Figure 2 shows that Grade 7 learners are beginning to master simple number sequences and geometric patterns, and to understand the meaning of decimal fractions and three and four-digit whole numbers. However, they struggled with operations on larger numbers, simple operations with decimals, working with 3-D figures, geometric transformations of 2-D figures, telling the time, and with the selection of operations in solving problems involving multiple operations.

Learners in both Grade 5 and 7 are not performing to expected levels. In fact, about half the learners in both Foundation and Intermediate Phase in these schools are at least two years behind curriculum expectations. If the basic building blocks of numeracy are not properly instilled in the learner in the Foundation Phase, the knowledge gap will accumulate and learners will lag behind.

The Foundations for Learning (FFL) programme, implemented by the Department of Education in 2008 to improve learner performance in reading, writing and numeracy, stressed the skill of basic mathematical operations in the Foundation Phase. If this translates into classroom practice at the Foundation Phase then any gaps being experienced by learners should have been narrowed when learners reach the Intermediate Phase. This is seemingly not the case in these schools, which suggests that teachers either do not understand the FFL documents, are not implementing the FFL, or the FFL documents themselves are flawed.

Figure 1: Mean percentage scores per numeracy skill, Grade 4

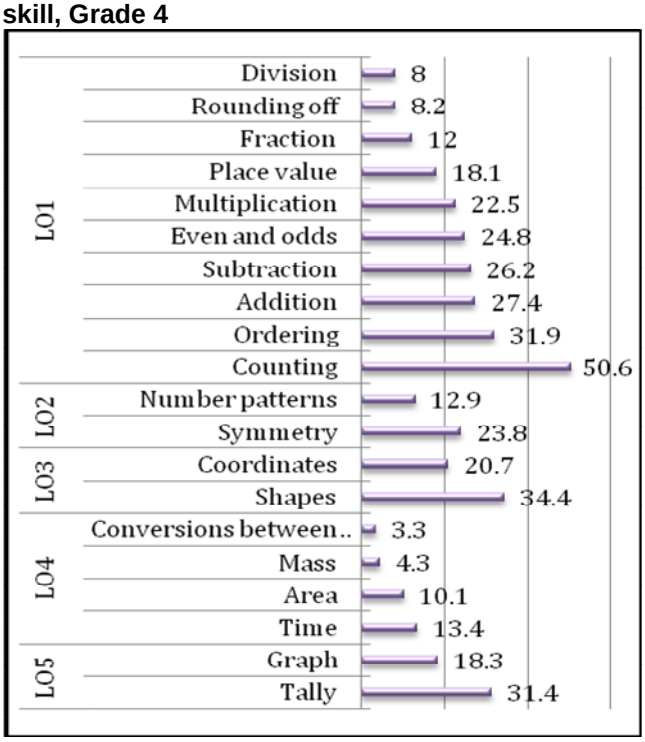
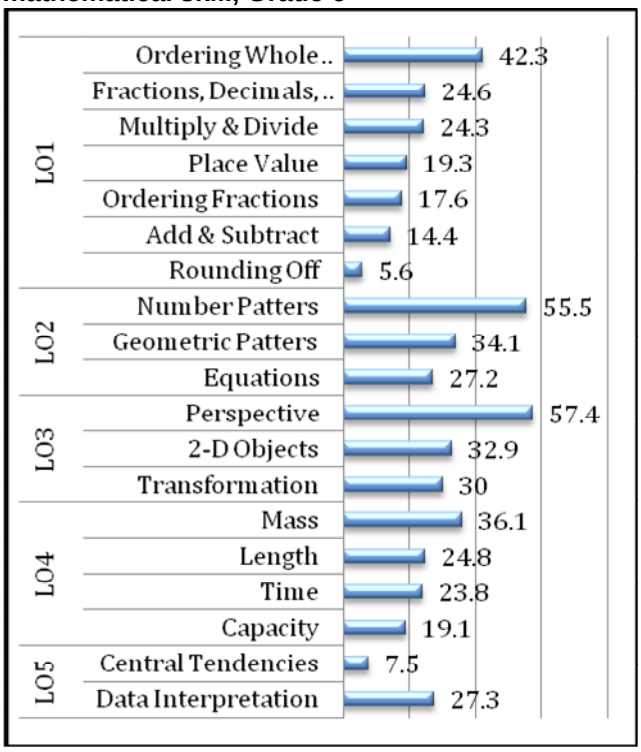


Figure 2: Mean percentage scores per mathematical skill, Grade 6



Policy recommendations

Improved learner performance depends on good quality teaching and support from the school system. If the needs of the learner who is struggling are not identified and dealt with, the learner is unlikely to benefit from repeating. In practice a very narrow view of learner performance based on inadequate diagnosis of learning problems and support needs is often the only measure that teachers' have to determine whether a child should repeat or not.

Many learners are being promoted through the system without reaching criterion levels of achievement for progression. This may result in many struggling to keep up with the curriculum. Though some of these learners might benefit from repeating a year, this may require additional programme of support which were not evident in case study schools.

Policy on repetition (only one repetition allowed per curriculum cycle, more than 50% on Grade 3 tests for progression) needs to be reviewed in the light of data on achievement levels, insights into the effectiveness of repletion practices in schools, and consistency in practice. The new Department of Basic Education Curriculum and Assessment Policy Statements (CAPS) should address this.

Language proficiency is a sensitive but important issue, which affects learning achievement in mathematics. The Department of Education's Language in Education Policy (LiEP) promotes additive multilingualism[4]. However, schools are not implementing this properly. In many cases, teachers use a largely unplanned code switching strategy. There is a risk that core concepts in mathematics may not be understood. Learners need to be fluent in the language of learning and teaching to have full access to mathematical terms and concepts and the associated reasoning skills.

Mathematics learning materials need to be developed in all 11 of South Africa's official languages, which explain concepts and procedures, along with enrichment material to support teaching in languages that are not the mother tongue of learners.

Learners in the case study schools cover a wide range of capability spanning achievement levels across several grades in the same teaching groups. Teachers in these schools appear to have had no special training to develop strategies to teach mixed age and mixed grade groups, or to assess the progress of learners diagnostically with a view to support more effective learning. Nor is it clear what support is available to them to develop such skills

There is a need for continued implementation of teacher development programmes to increase the levels of skill of teachers in both the teaching and assessment of mathematics. This needs to be coupled with clearer accountability of teachers to minimise "silent exclusion" as a result of low levels of achievement.

Observations of teaching suggested that in some case study schools learners do not write and read often and time on task can be low in teaching periods.

Teachers need support and learning materials and classroom management to ensure that learners to read and work from mathematics text books and perform written tasks on a daily basis. The cognitive processes associated with mathematics learning for children of different ages and common misconceptions and learning obstacles need to be clearly understood by teachers.

Nominal access to mathematics education in case study schools is high. Levels of achievement are unacceptably low and unevenly distributed, and many learners are two or more grades below expected levels and are unlikely to achieve a secure grasp of the national curriculum.

Improved access broadly defined depends on better diagnostic monitoring of learners progress, more concern for managing progression and support to low achievers effectively, and better matching of curriculum and pedagogy to learner and educator capabilities.

This Policy Brief is based on Pereira & Du Toit, (forthcoming), and has been written by Carla Pereira. A full list of references is available in the paper.

CREATE is a DFID-funded research programme consortia exploring issues of educational access, transitions and equity in South Africa, India, Bangladesh and Ghana. For more information go to: www.create-rpc.org

[4] This means that learners learn an additional language while maintaining and developing their home Language.