

Brombacher and Associates cc

Unit E23, Prime Park Mocke Rd, Diep River, 7800

T. +27 (0)21 706 3777
F. +27 (0)21 706 3779
E. info@brombacher.co.za
W. www.brombacher.co.za

Reg No.: 2003/026360/23 VAT No.: 4660208978

Member: A A Brombacher



www.GeoGenius.co.za

NumberSense



2019 MATHEMATICS TESTING REPORT

<u>The Link</u>

Report on the mathematics testing conducted during 2019

This report presents an analysis of the data collected during testing conducted by the Link team in Grade 2 and Grade 3, and Grade 4 during 2019.

In 2019 the assessments, developed by Brombacher and Associates, were the same for all grades. This allows for comparison of performance across grades.

The report that follows first explains the EGMA assessment and then summarises the data in different ways – in each case contrasting the start of the year with the end of the year data.

I believe that there are encouraging trends evident in the data collected and summarised in this report. As cautioned before, care should also be taken in assuming that the change in performance level from February to November is due to the activities of The Link alone. In the absence of a control group it is hard to know what part of the increase is the consequence of an additional year of schooling and what part is the consequence of the intervention. That said, the performance on the EGMA assessment is generally encouraging when compared with other data in the EGMA database (approximately 25,000 records) and I do hope that The Link team draws encouragement from this.

Best wishes

Aarnout Brombacher December 2019

EGMA analysis

Background to EGMA

EGMA gathers information about basic competencies—those competencies which should typically be mastered during the very early grades - and without which students will struggle or will potentially drop out of mathematics and school. Subtasks on the EGMA assessment were identified according to the following criteria:

- They represent skills that typical country curricula have determined should be acquired in early grades;
- They reflect those skills that are most predictive of future performance;
- They represent a progression of skills that lead toward proficiency in mathematics;
- They target both conceptual and computational skills; and
- They represent skills and tasks that can be improved through instruction.

EGMA is administered orally so that we can better ensure that students understand the instructions.

The subtasks of the EGMA that were used are summarised in *Table 1*.

Subtask	Skill	Description The child is asked to	
Subtasks that assess more procedural (recall) type of knowledge			
Number Identification	This task requires knowledge of the number symbols.	select a given number from three different numbers provided. There are 10 items in the subtask. (Untimed subtask)	
Addition and Subtraction (Level 1 [basic facts])	This subtask requires knowledge of and confidence with basic addition and subtraction facts. It is expected that students should develop some level of automaticity and fluency with these facts because they need them throughout mathematics.	mentally solve addition and subtraction problems, with sums and differences below 20. The problems ranged from those with only single digits to problems that involved the bridging of the 10. There are 10 items per addition and subtraction subtask. (<i>Timed</i> <i>subtask</i>)	
Subtasks that assess more conceptual (application) type of knowledge			
Quantity Discrimination (number comparison)	This subtask requires the ability to make judgments about differences by comparing quantities represented by numbers.	identify the larger of a pair of numbers. The number pairs used ranged from a pair of single-digit numbers to five pairs of double-digit numbers and four pairs of three-digit numbers. There are 10 items. (Untimed subtask)	
Missing Number (number patterns)	This subtask requires the ability to discern and complete number patterns.	determine the missing number in a pattern of four numbers, one of which is missing. Patterns used included counting forward and backward by ones, fives, tens, and twos. There are 10 items. (<i>Untimed</i> <i>subtask</i>)	
Addition and Subtraction (Level 2) ^a	This subtask requires the ability to use and apply the procedural addition and subtraction knowledge assessed in the Level 1 subtask to solve more complicated addition and subtraction problems.	solve addition and subtraction problems that involve the knowledge and application of the basic addition and subtraction facts assessed in the Level 1 subtask. Students were allowed to use any strategy that they wanted, including the use of paper and pencil supplied by the administrator. The problems extended to the addition and subtraction of two-digit numbers involving bridging. There are five items per addition and subtraction subtask. (Untimed subtask).	

Table 1. EGMA Instrument Subtasks

Subtask	Skill	Description The child is asked to
Word Problems	This subtask requires the ability to interpret a situation (presented orally to the student), make a plan, and solve the problem.	solve problems presented orally using any strategy that they wanted, including the use of paper and pencil and/or counters supplied by the assessor. Because the focus of this subtask was on assessing the students' abilities to interpret a situation, make a plan, and solve a problem, the numerical values involved in the problem were deliberately small to allow for the targeted skills to be assessed without confounding problems with calculation skills that might otherwise impede performance. The problem situations used are designed to evoke different mathematical situations and operations. There are six items. (Untimed subtask).

^a The Addition and Subtraction (Level 2) subtasks are <u>more</u> conceptual than the Addition and Subtraction (Level 1) subtasks because a student must understand what he or she is doing when applying the Level 1 skills. Although the (Level 2) subtasks are not purely conceptual, because, with time, students will develop some automaticity with the items in these subtasks, they are more conceptual than the Level 1 subtasks, especially so for early grade students.

EGMA results – performance levels

Given that the EGMA assessment assesses a progression of foundational skills, it does not make sense to calculate a "total" for each child's test as the subtasks are assessing different constructs. Instead we have classified each child as being at one of four performance levels determined as follows:

- Level 4: Add_sub_L2 > 60% AND Missing number > 60%
- Level 3: Add_sub_L1_attempted% > 80% <u>AND</u> Add_sub_L1_score > 40%
- Level 2: Add_sub_L1_attempted% > 40% <u>AND</u> Quantity comparison > 40%
- Level 1: Does not meet L2 expectations

EGMA results – performance on the procedural and conceptual items

Another way of measuring the students' performance is to compare their performance on the assessment items that assess procedural understanding (addition and subtraction (level 1); number identification; and quantity comparison) with the performance on the items that assess more conceptual understanding (addition and subtraction (level 2); and missing number). It is to be expected that, in general, students perform better on the more procedural items than they do on the conceptual items that require them to apply their procedural knowledge. If the NumberSense Programme, which is focused on students experiencing mathematics as a meaningful, sense-making, problem-solving activity, is having the desired impact, then we would expect the "performance gap" between the procedural and conceptual tasks to decrease.

The graphs that follow provide summarise the data first for all the Link students (by grade), then for the Grade 2s (by school) and finally for the Grade 3s (by school). In each case there are three graphs which illustrate

- The change in performance level distribution between the start and the end of the year
- The change in performance across the procedural and conceptual items between the start and the end of the year
- The distribution of change in student performance level. Note in these graphs, "L4" represents the students who started and ended the year on "L4".

The Link (all schools)



Figure 1: Change in performance level distribution between the start and the end of the year

Figure 2: Change in performance across the procedural and conceptual items between the start and the end of the year



The Link



Figure 3: Distribution of change in student performance level

The Link: Grade 2





Figure 5: Change in performance across the procedural and conceptual items between the start and the end of the year



The Link - Grade 2





The Link: Grade 3



Figure 7: Change in performance level distribution between the start and the end of the year

The Link - Grade 3

■%_Level_1 ■%_Level_2 ■%_Level_3 ■%_Level_4







Figure 9: Distribution of change in student performance level

The Link: Grade 4



Figure 10: Change in performance level distribution between the start and the end of the year

Figure 11: Change in performance across the procedural and conceptual items between the start and the end of the year







