

A brief look behind the flat 2015 to 2019 TIMSS Grade 5 trend for South Africa

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Summary

The flat trend for South Africa in Grade 5 mathematics between 2015 and 2019 was disappointing, but also a bit surprising given steep improvements in performance in international testing programmes since 2002. Past experiences suggest it is important to scrutinise the microdata behind published performance trends in order to verify and understand these trends. This report finds that classical scores in items common across 2015 to 2019 displayed a flat trend, in line with official publications. It also finds that sampling issues are unlikely to distort the trend. Above all, the samples in 2015 and 2019 are very similar to each other in terms of household assets. In short, the microdata suggest the published trend seems to be a true reflection of reality.

This short report examines details behind the disappointing flat 2015 to 2019 trend for South Africa's Grade 5 TIMSS mathematics results. Past experience has confirmed the importance of interrogating details behind trends published in the reports of the international testing programmes².

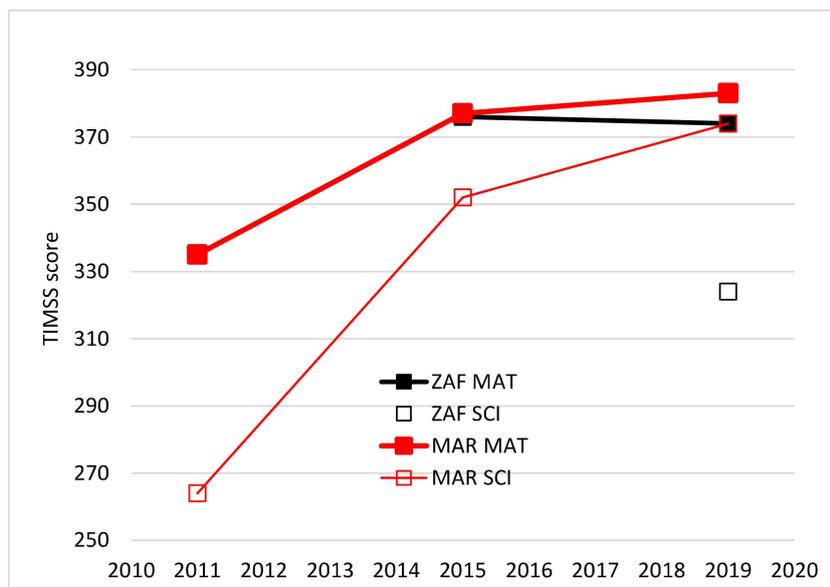
The following graph compares South Africa (ZAF) and Morocco (MAR). Morocco is easily the country with patterns most similar to those of South Africa in the 2015 to 2019 TIMSS primary-level data. Including this country thus provides a valuable perspective to the analysis. The graph raises a few interesting questions. It should be noted that Morocco, like most countries in TIMSS, tests Grade 4, while South Africa tests Grade 5. It is clear that both countries perform much worse in science than in mathematics, though the gap between the two subjects has been narrowing in Morocco. South Africa's under-performance in science in 2019, relative to mathematics, is perhaps not surprising considering that similar gaps have existed in the past in Morocco. It is noteworthy that mathematics roughly stalled between 2015 to 2019, in both South Africa and Morocco, despite the fact that both countries have displayed rapid improvements in the past – here the reference is to the Morocco trends seen in the graph, and in the case of South Africa trends seen since 2002 in three different international programmes³. Is the stalling of progress visible in the primary mathematics trends for both countries a coincidence, or are there measurement issues affecting both countries?

¹ Produced for the Department of Basic Education (DBE), as a background paper for a sector review.

² Gustafsson, 2020.

³ Department of Basic Education, 2020; Van der Berg and Gustafsson, 2019.

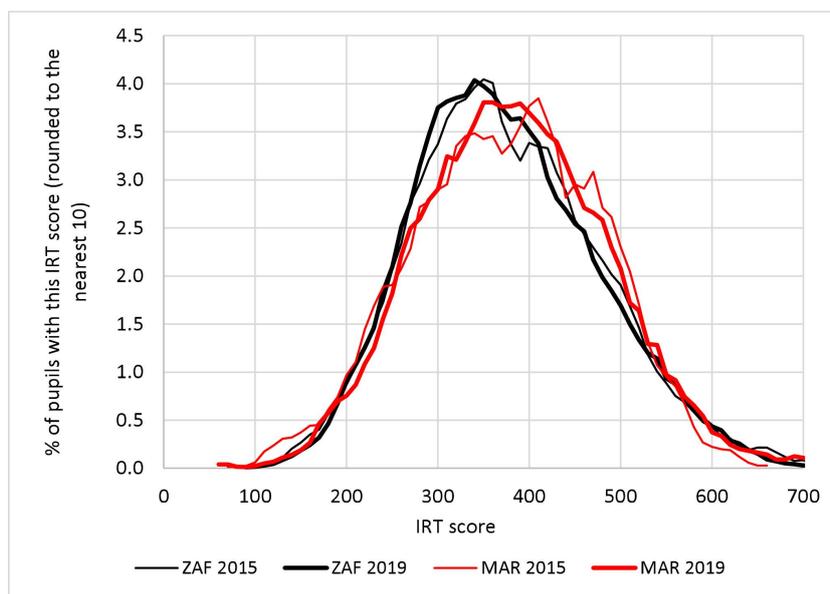
Figure 1: Comparing South Africa to Morocco



Sources: All values from international TIMSS reports.

The distributions of results in the two countries for 2015 and 2019 in mathematics are illustrated in the next graph. There is nothing unusual in these patterns.

Figure 2: Mathematics distributions in South Africa and Morocco



Source: Analysis of the microdata available through the TIMSS website. The first plausible value used.

There were seven mathematics test blocks⁴ repeated across both years. The number of items, classical scores and annual improvements in terms of standard deviations per block are shown in the following two tables. Table 1 confirms that on the whole there was no general improvement in the classical scores across the two years in South Africa. Percentage correct for the same 89 items was 43% in both 2015 to 2019 – as items were repeated across the seven blocks, total unique items is lower than the sum of the column ‘Items’. In contrast,

⁴ ‘Block’ here should be understood as a part of the test, with a specific set and sequence of items (or questions).

Morocco's trends shown in Table 2 are somewhat inconsistent. An average annual increase of 0.05 standard deviations a year, or 0.2 over the four years, was found, based on 88 items – one item used in South Africa was not used in Morocco. Roughly, 0.2 standard deviations would be around 20 TIMSS points, more than the 6-point improvement for Morocco's mathematics between 2015 and 2019 seen in Figure 1. This implies that Morocco fared relatively poorly in the seven non-common blocks in 2019. As common blocks are secure, the possibility that Morocco 'drilled' these blocks to learners in the run-up to the 2019 testing would not be possible. From a Moroccan perspective, this warrants further interrogation, though the matter will not be explored here.

Table 1: Classical scores by block in South Africa

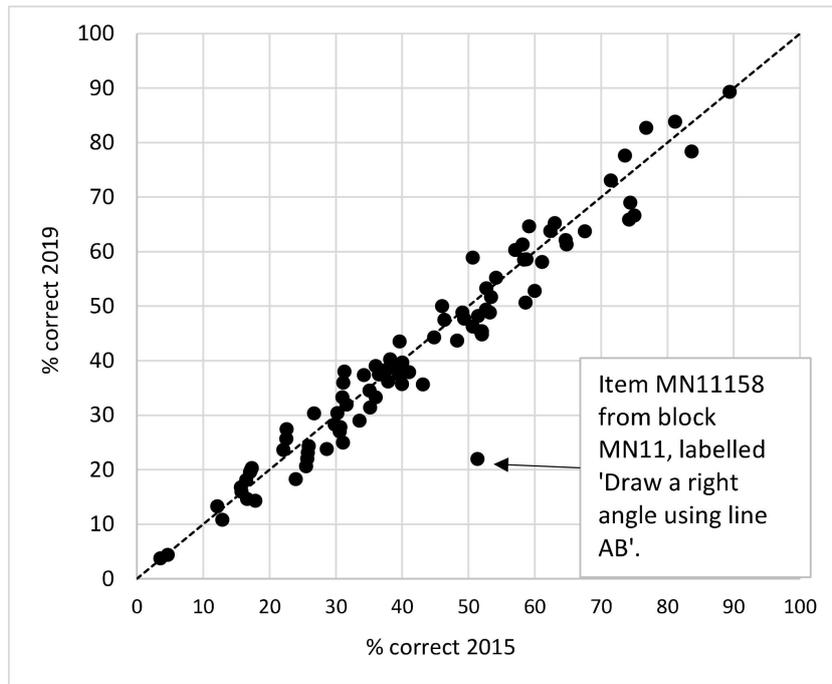
Block	Items	% score 2015	% score 2019	Std. dev. 2015	Annual std. dev. gain
MN01	26	38	40	23	0.02
MN03	26	44	44	25	0.00
MN05	26	43	43	24	0.00
MN07	26	48	51	24	0.03
MN09	24	48	46	29	-0.02
MN11	25	40	38	24	-0.02
MN13	24	41	40	23	-0.01
Simple average	25	43	43	25	0.00

Table 2: Classical scores by block in Morocco

Block	Items	% score 2015	% score 2019	Std. dev. 2015	Annual std. dev. gain
MN01	26	42	47	25	0.05
MN03	26	42	48	25	0.05
MN05	26	44	50	23	0.07
MN07	26	49	55	26	0.07
MN09	24	45	49	27	0.04
MN11	24	41	45	23	0.04
MN13	24	39	41	23	0.02
Simple average	25	43	48	24	0.05

Figure 3 illustrates that the lack of progress with respect to the 89 items in South Africa is a phenomenon that is spread fairly evenly across the individual items. Outlier items such as MN11158 referred to in the graph are noteworthy, but just one such item would not unduly influence the overall trend. It is clear that in the case of South Africa, there was only one outlier item.

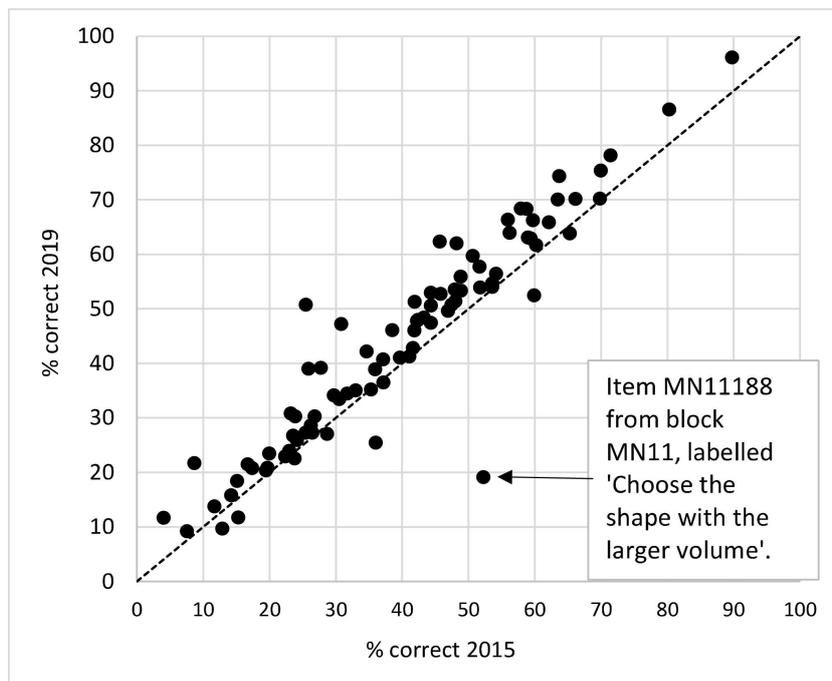
Figure 3: Item-level mathematics trends in South Africa



Note: Learner weights not used for this analysis.

In Figure 4 the improvement in Morocco is clear, though there were more outliers – this is also reflected in a slightly lower correlation across the two years in Morocco of 0.96, compared to 0.98 in South Africa. The item ‘MN1158’, a clear anomaly in the South African data, is not included in the Morocco graph as this item appears not to have been administered in 2019 in that country.

Figure 4: Item-level mathematics trends in Morocco



The samples across the two years in South Africa appear comparable. In Table 3, key indicators of socio-economic status available in the TIMSS data point to high levels of

stability. Above all, nothing in the table suggests there was a more disadvantaged sample of learners in 2019, compared to 2015, something which could have produced a flat trend where in reality there was an improvement.

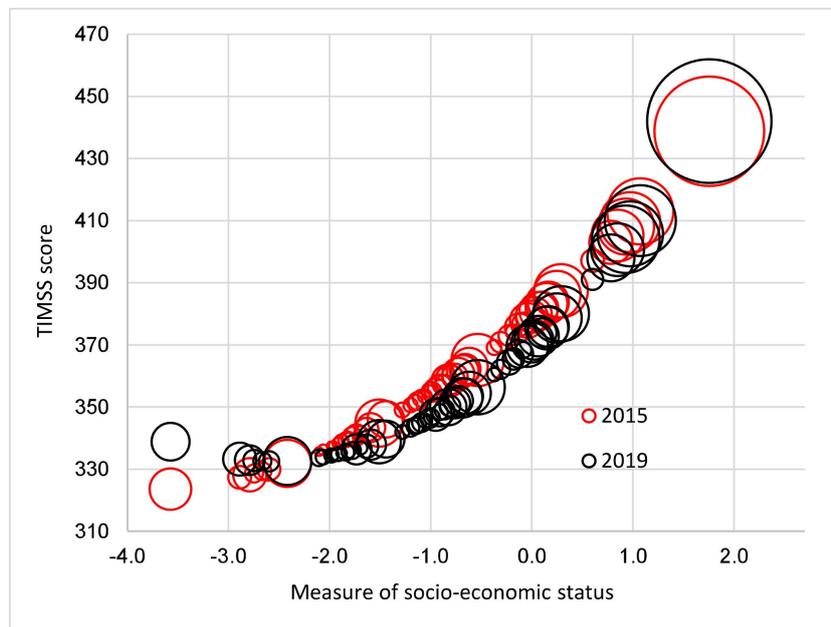
Table 3: Home possessions in South Africa

Home possession	% in 2015	% in 2019
Computer or tablet	57	56
Study desk/table for your use	58	58
Your own room	53	58
Dictionary	67	67
Electricity	83	84
Running tap water	64	66

Note: Averages use weights.

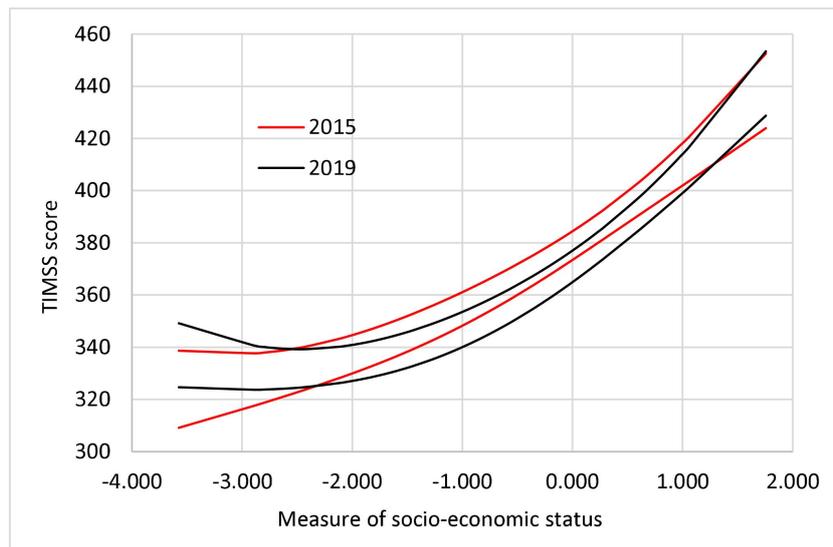
Figure 5 explores the relationship between socio-economic status (SES) and South Africa’s TIMSS scores in the two years. Using the 2019 data, a composite SES measure produced through a principal components analysis was regressed on the six binary asset variables seen in Table 3. The same regression coefficients were thereafter applied to the 2015 data to produce a comparable composite measure. The pattern points to improvements at the very top and bottom ends of the socio-economic distribution, but a deterioration in the middle. Figure 6 suggests that hard conclusions around this pattern should be avoided given overlaps between the confidence intervals, at the 5% level, between 2015 and 2019.

Figure 5: TIMSS achievement and socio-economic status in South Africa (A)



Note: The area of each bubble is proportional to weighted learners.

Figure 6: TIMSS achievement and socio-economic status in South Africa (B)



Note: Curves indicate the 95% confidence interval. A quadratic regression was used for each year. In Stata 'pv' followed by 'predict' used, with the options 'xb' and 'stdp' run separately.

References

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