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The **GENDERED COMPLEXITIES** of school mathematics achievement: Girls outperforming or boys underperforming?

Boys scored higher or the same mathematics averages as girls in most of the countries that participated in the 2019 Trends in International Mathematics and Science Study (TIMSS 2019). But this was not the case for South Africa. *Vijay Reddy, Catherine Namome* and *Palesa Sekhejane* explore gender achievement gaps in mathematics at grade 5 and grade 9 levels, also comparing secondary schools in the two most well-resourced provinces – Gauteng and Western Cape. They ask whether we should celebrate girls' higher performance or be concerned about boys' underperformance.

Global literature from high-income countries generally reports that boys outscore girls in mathematics. Using the TIMSS 2019 data, we explore the patterns for South Africa, a low-to-middle-income country with low and unequal educational achievement.

Gender educational inequalities intersect with race and social class. Historically, gender inequalities in education and labour markets have favoured boys and men. A recent study showed that girls' educational outcomes in relation to participation and performance, in both schools and universities, were higher than boys'. Nevertheless, in the labour market, women were still vastly under-represented in management, especially top management. African women, despite their educational successes, remained the most under-represented group at the higher occupational levels.

Internationally, the grade 5 TIMSS mathematics gender achievement patterns show that boys had higher average mathematics achievement than girls in almost half the participating countries, and there was gender equity in performance in almost half the countries. In four countries – Philippines, Saudi Arabia, South Africa and Oman, which are among the lower performers – girls achieved significantly higher mathematics scores than boys. At the grade 9 level, girls achieved significantly higher mathematics scores in seven countries, including South Africa (together with mostly Arabic-speaking countries), and gender equity in 25 countries. Boys had higher achievement than girls in six countries, which were mostly European.

In this article, we extend the analysis using TIMSS 2019 data to explore the gendered mathematics performance patterns at the grade 5 and 9 levels, and the intersection between gender and socioeconomic status in South Africa. We further report on the gender patterns by content and cognitive areas.

TIMSS 2019: gender and achievement

TIMSS 2019 collected nationally representative grade 5 and grade 9 data. In addition, we expanded the sample in the Gauteng and Western Cape provinces for more robust provincial estimates. The results for these provinces, which have the highest GDP per capita, provide insight into performance in better-resourced environments.

Nationally, there are about equal numbers of girls and boys in grade 5. Girls make up 52% of grade 9 learners, and the 4-percentage point difference between the number of girls and boys suggests that more boys may be dropping out of school. The gender participation gap is starker in Gauteng and the Western Cape, at 10 percentage points. It seems that more boys than girls drop out by grade 9 in these two better-resourced provinces.

Not only do girls generally stay longer in school, but they also outperform boys. At grade 5, girls outscore boys in mathematics by a statistically significant 20 points. At grade 9, for the first time in TIMSS 2019, we observed a significant gender achievement gap, with girls outscoring boys by six TIMSS points. The gender achievement gaps differ in each province. In the Western Cape, boys outperform girls, while in Gauteng girls outperform boys.

Extending the analysis to the intersectionality of gender and class, we used the school fee status (fee-paying or no-fee schools) as a proxy of socioeconomic status. Nationally, as well as in the two provinces, there are no significant gender differences in the better-resourced, fee-paying, schools. In no-fee schools, nationally in grade 5 and 9, and in Gauteng, girls outperform boys. This suggests that in low-resource contexts, boys are both dropping out of school at a higher rate and under-achieving in comparison to girls.

There are interesting, but as yet unexplained, gender achievement patterns by curriculum topic and the cognitive demand of the questions. The four case studies in Table 1 show inconsistent patterns in terms of gender advantage by content area. Similarly, gender differences related to the cognitive demand of the question were found. These areas require further research.

Table 1. TIMSS 2019 national and provincial mathematics achievement according to gender

	Grade 5 South Africa	Grade 9 South Africa	Grade 9 Western Cape	Grade 9 Gauteng
Gender participation patterns	• 50% girls • 50% boys	• 52% girls • 48% boys	• 55% girls • 45% boys	• 55% girls • 45% boys
Gender achievement gap	• Girls: 384* • Boys: 364 Girls score significantly higher	• Girls: 392* • Boys: 386 Girls score significantly higher	• Girls: 436 • Boys: 447* Boys score significantly higher (at 90% confidence level)	• Girls: 423* • Boys: 417 Girls score significantly higher
Gender achievement gap in fee-paying schools	• Girls: 455 • Boys: 449 No significant difference	• Girls: 445 • Boys: 439 No significant difference	• Girls: 461 • Boys: 472 No significant difference	• Girls: 448 • Boys: 443 No significant difference
Gender achievement gap in no-fee schools	• Girls: 352* • Boys: 332 Girls score significantly higher	• Girls: 341* • Boys: 329 Girls score significantly higher	• Girls: 396 • Boys: 396 No difference	• Girls: 387* • Boys: 383 Girls score significantly higher (90% confidence level)
Performance by curriculum topics	Girls score significantly higher in: • numbers • measurement and geometry • data	Girls score significantly higher in: • algebra • data and probability	Boys score significantly higher in: • numbers • geometry	Girls score significantly higher in: • algebra
Performance by cognitive demand	Girls score significantly higher in: • knowing • applying • reasoning	Girls score significantly higher in: • knowing • applying	Boys score significantly higher in: • reasoning	Girls score significantly higher in: • knowing

**Significance levels are reported at 95% confidence interval except where stated*

Conclusion

While we celebrate the successes of girls in the diverse South African educational landscape, we must raise a red flag about the extent to which boys are dropping out of school and underachieving in mathematics. The danger is that more boys will join the ranks of young people that educational and labour-market experts refer to as 'not in education, employment or training'. In other words, with dim life prospects. Schools, and the education system as a whole, must pay more attention to boys at risk.

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