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policy brief

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Have we reached gender equity in mathematics education? Evidence from TIMSS South Africa 2011

Overview

This policy brief examines gender differences in South African education as documented in the 2011 Trends in Mathematics and Science Study (TIMSS). On average, across South Africa, gender differences in TIMSS mathematics test results were small or non-existent. When fee-paying, no-fee and independent schools were compared, boys and girls within each school grouping achieved similar results. By contrast, girls from independent and fee-paying schools were more academically advantaged than girls from no-fee schools. The same pattern applied to boys. The achievement gap favoured boys in no-fee schools when older learners were compared. However, the relationship between attitudes and achievement differed for boys and girls and was also dependent on the type of school that learners attended. Grade 9 girls had higher educational aspirations than boys in South African schools. Girls also reported a higher level of parental engagement than boys. Boys were overrepresented among learners who were victims of bullying. In some instances, boys in independent schools experienced bullying with equal frequency as boys in less affluent schooling environments. The results point to the on-going importance of gender considerations in mathematics education. However, new complexities in the schooling experience of South African boys and girls mean that gender targeted interventions recognise these shifting patterns.

Introduction

Questions about gender equity in education continue to receive global attention but for very different reasons to those that have prevailed in the past. There have been major shifts in achievement patterns among girls and boys in countries with varying cultural and national identities (3), raising questions about whether a gender convergence has been achieved or whether new complexities about gender inequalities are emerging (4 & 5). In 22 out of the 42 TIMSS countries, including South Africa, there was no statistical difference in average national test scores between boys and girls. There was a significant difference favouring boys in only 7 countries and favouring girls in a further 13.

South African government schools are grouped into one of five bands known as quintiles. Quintiles are based on the poverty level of the community in which the schools are situated. The quintile ranking determines how funds are allocated to schools by the Department of Basic Education. The most economically disadvantaged and resource-poor schools are grouped into Quintile 1 and the most affluent schools are assigned a Quintile 5 ranking. All schools in Quintiles 1 to 3 are also referred to as 'no-fee' schools and the top two quintiles of government schools are categorised as 'fee-paying' schools.

Beyond the state-controlled government schools is a growing group of independently governed schools. Independent schools are diverse and some even receive state subsidies but they generally have access to a substantially greater level of private resources because of the tuition fees that are paid by parents. Although mathematics achievement levels were significantly higher among learners in independent and fee-paying schools, gender patterns in achievement were strikingly similar within each of the three school categories (no fee, fee paying and independent). The average performance of boys and girls in independent schools was the same (474 for boys and 473 for girls). Boys and girls attending fee-paying schools also had comparable average achievement results (396 for boys and 398 for girls) as did boys and girls within no-fee schools (322 for boys and 326 for girls).

Achievement gaps in mathematics had less to do with gender and more to do with the educational environment. Girls from independent and fee-paying schools were more academically advanced than girls from no-fee schools. Eighty seven per cent of girls in no-fee schools, but only 27 per cent of girls in independent schools, were below the minimum TIMSS benchmark of 400 that represents a basic knowledge of whole numbers and decimals, operations and graphs. The same pattern was found for boys.

Table 1: Percentage of learners below the TIMSS 400 minimum benchmark

	Boys	Girls
Independent (*n* = 920)	31.35	27.07
Fee Paying (*n* = 4,233)	57.37	53.76
No Fee (*n* = 6816)	87.84	87.09

Wider gaps favouring boys typically appear among high achievers. Although South African boys outnumbered girls among the highest achieving learners based on TIMSS international benchmarks, there was only a fraction of all learners among the top achievers and the gender differences were not statistically significant.

The TIMSS 2011 results revealed that South African girls and boys progress through school at different paces. On average, Grade 9 boys were older than Grade 9 girls at the time of the study. The average age of Grade 9 girls and boys was 15.8 and 16.3 years respectively. This would suggest that either boys started school later or that they repeated a grade once or more. Older learners were at a distinct disadvantage. Beyond the age of 14, test scores began to decline for all learners, irrespective of gender. However, it emerged that the gender-age achievement gap in better-resourced independent and fee-paying schools was not significant. This is shown in the graph below (Figure 2) by the overlapping horizontal lines for boys and girls at different ages. In no-fee public schools, from about age 14, the average TIMSS mathematics scores of girls began to decline more rapidly than the average test scores of boys, leading to a significant disadvantage for girls. Research has shown that dropout rates are higher for boys than for girls (2), meaning that the pool of older girls who remain in school probably includes a wider range of ability levels.

Cross-national studies have often shown that girls experience higher levels of anxiety and lower levels of confidence in mathematics, even when they are equally as capable as boys (6 & 7). In 2011, TIMSS asked learners a series of questions to determine how much they enjoyed and valued mathematics and how confident they were in the subject. As with earlier results, the national pictures revealed few differences

Figure 1: Performance at international benchmarks for South African boys and girls by school type[1]

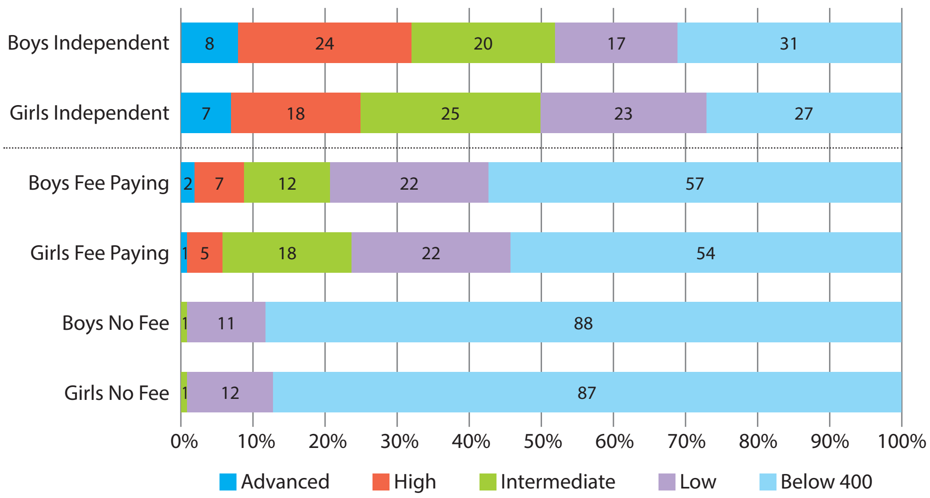
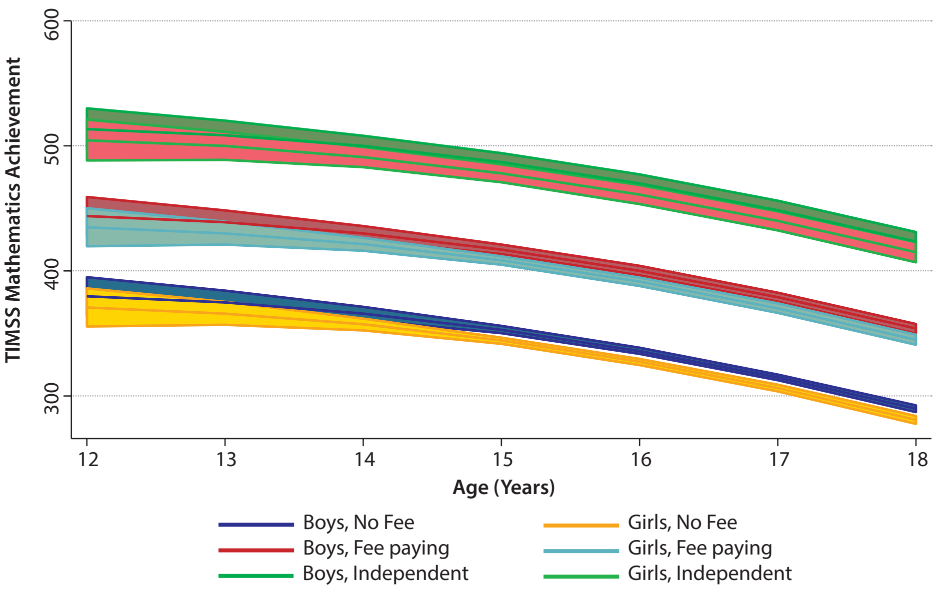


Figure 2: Mathematics achievement by age, gender and school type



1 **Advanced** – Reason, draw conclusions, make generalizations and solve linear equations ; **High** – Apply knowledge and understanding in a variety of relatively complex situations; **Intermediate** – Apply basic knowledge in a variety of situations; **Low** – Some knowledge of whole numbers and decimals, operations and basic graphs; **Below 400** – Learners who have not demonstrated a knowledge of the most basic skills in mathematics.

but a closer analysis unveiled some unexpected conclusions.

In general, positive attitudes about the subject were related to higher test scores for all learners, regardless of gender. In better resourced fee-paying and independent schools, boys who saw no value in learning mathematics achieved lower test scores than girls with similar views. In fact, this group of boys achieved average test scores that were equivalent to boys and girls in no-fee schools who attached a higher value to studying the subject.

The TIMSS 2011 survey also asked learners how far they expected to progress in their studies. Girls generally expressed greater motivation about their academic prospects compared to boys. Girls in independent and fee-paying schools were particularly optimistic about their educational careers. Of the learners attending independent schools, 88% of girls planned at least to complete a first degree compared to 77% of boys.

Although the percentage of girls and boys who aspired to tertiary studies was lower in public schools, the aspiration

Figure 3: Attitudes, achievement and school type

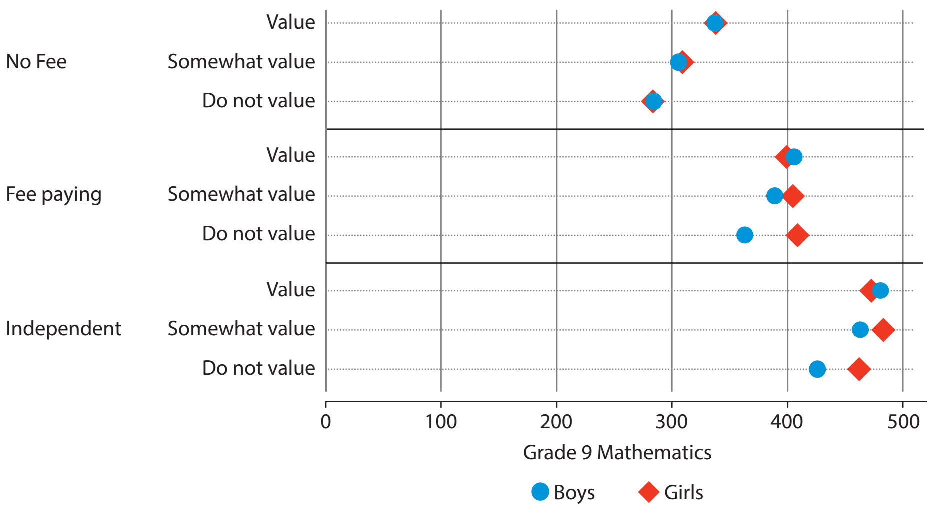


Figure 4: Aspirations and achievement in independent schools

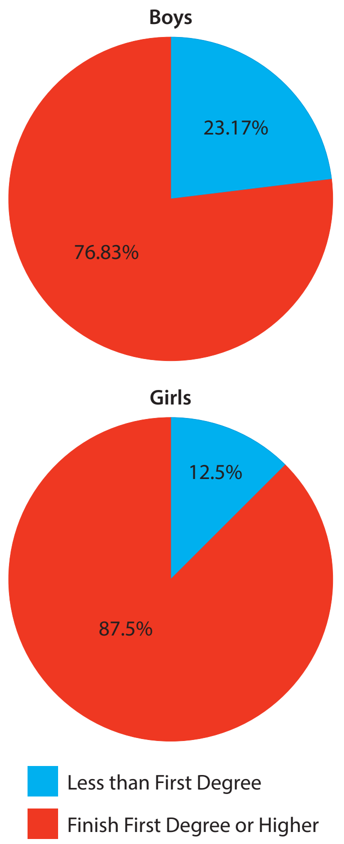


Figure 5: Aspirations and achievement in fee-paying public schools

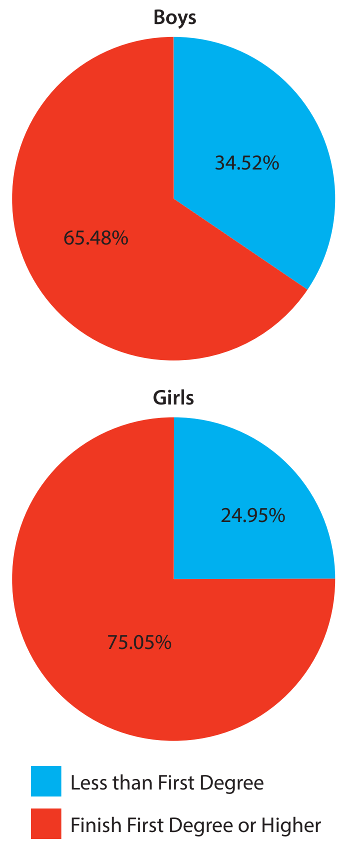


Figure 6: Aspirations and achievement in no-fee public schools

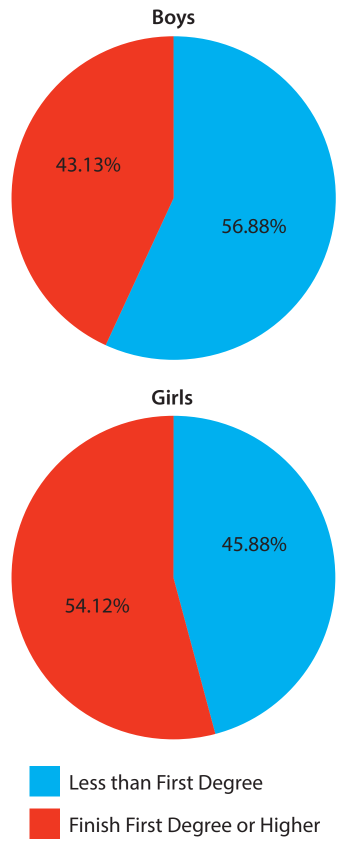


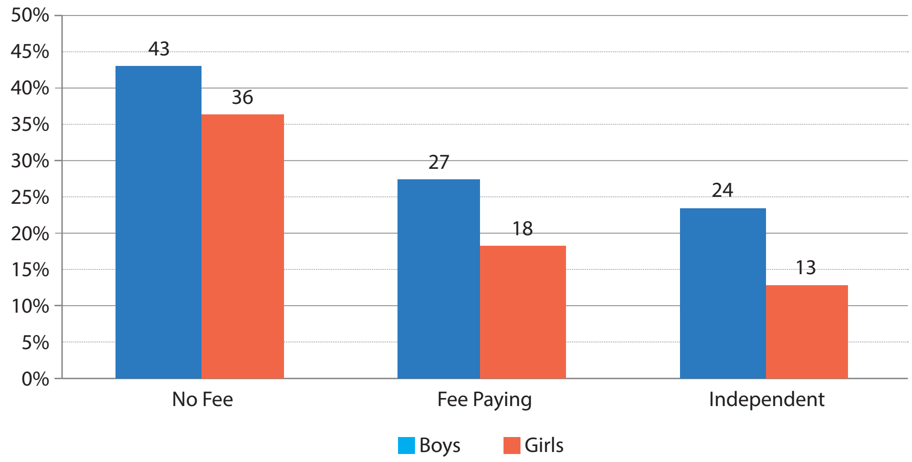
Table 2: Parental involvement, gender and school type

School Type	Parents Ask Boys	Parents Ask Girls	Talk About School Boys	Talk About School Girls	Time for Homework Boys	Time for Homework Girls
No fee						
Less Often	35%	30%	43%	34%	33%	27%
Every Day	57%	62%	47%	56%	58%	64%
Omitted/invalid	8%	8%	10%	10%	9%	9%
Total	100%	100%	100%	100%	100%	100%
Fee paying						
Less Often	41%	42%	52%	44%	34%	32%
Every Day	54%	54%	42%	52%	60%	64%
Omitted/invalid	5%	4%	6%	4%	6%	4%
Total	100%	100%	100%	100%	100%	100%
Independent						
Less Often	49%	51%	60%	49%	39%	37%
Every Day	48%	47%	38%	49%	59%	61%
Omitted/invalid	2%	2%	2%	2%	2%	2%
Total	100%	100%	100%	100%	100%	100%

Table 3: Bullying, achievement and school type

	Almost Never		About Monthly		About Weekly	
	% learners (SE)	Average Achievement (SE)	% learners (SE)	Average Achievement (SE)	% learners (SE)	Average Achievement (SE)
Mathematics (SA)	25 (0.7)	393 (3.9)	42 (0.8)	362 (2.3)	33 (1.0)	322 (3.0)
Mathematics (Int. Avg.)	59 (0.2)	473 (0.6)	29 (0.1)	467 (0.7)	12 (0.1)	441 (1.0)
Science (SA)	25 (0.7)	392 (5.1)	42 (0.8)	346 (3.4)	33 (1.0)	287 (4.4)
Science (Int. Avg.)	59 (0.2)	483 (0.6)	29 (0.1)	478 (0.7)	12 (0.1)	452 (1.1)

Figure 7: Percentage of bullying on a weekly basis by gender and school type



gap favouring girls within these schools was also about ten percentage points.

Boys in no-fee schools had the lowest aspirations for traditional tertiary studies. Only two in five had this goal in mind. It could be that these boys had alternative career pathways in mind. Further investigation would be required for a clearer interpretation.

In 2011, Grade 9 learners were asked how often they interacted with an adult outside of school regarding their studies. Girls were consistently at an advantage in all forms of engagement with parents. They were more likely to speak to an adult on a daily basis about school. Girls also reported that parents set aside time for them to do homework on a regular basis. It is worth noting that girls in no-fee schools reported receiving as much, if not more, parental support than girls in more resource-rich environments. On average, 62% of girls in no-fee schools compared to only 47% of girls in independent schools reported that parents asked them what they were learning at school on a daily basis.

Studies have shown that boys are more likely than girls to be the victims of bullying, particularly when physical forms of bullying are considered (1). The TIMSS 2011 study collected information on how frequently students experienced physical and verbal forms of bullying. The options provided ranged from 'on a weekly basis' to 'never'. Less frequent bullying was related to higher average achievement. What is particularly worrisome is that the percentage of learners who were exposed to bullying on a weekly basis in South Africa was three times as high as the international estimate.

In terms of gender, bullying was experienced more regularly by South African boys in all types of schools. In no-fee schools, 43% of boys and 36% of girls reported being bullied on a weekly basis.

In fee-paying public schools 27% of boys and 18% of girls were bullied on a weekly basis and in independent schools it was 24% of boys and 13% of girls.

Recommendations

So what can we do to help South African boys and girls have successful educational careers?

1. Raise Performance: Engage both boys and girls in activities that help them to build their competence in mathematics. Ensure that teachers respond to the different learning needs of girls and boys and are aware of how these needs may change for age-specific groups.
2. Transform Attitudes: Nurture an awareness of the utility of mathematics for both boys and girls, especially those with weak academic backgrounds. Provide opportunities for boys to connect with male role models and mentors so that their commitment to their studies increases.
3. Improve the Educational Environment: Encourage schools to develop and communicate their school safety policies. Where bullying is embedded in school culture and codes of silence, provide independent outlets for learners (especially boys) to raise issues without being isolated or jeopardising their academic careers.

Conclusion

This policy brief on gender gaps in mathematics among South African learners highlights the complexity of the issue of gender inequality in education and the need for deeper and on-going analysis. At first glance, it would appear that gender gaps have narrowed sufficiently and that South African girls and boys are afforded equal opportunities in their educational careers. Indeed there was much that was similar among Grade 9 boys and girls in 2011. Girls and boys attending different categories of schools in equal numbers, achieved comparable test scores, and were equally represented amongst the lowest and highest achievers. They were also alike in their knowledge of specific areas of mathematics.

However, there are several important results that confirm that maintaining a gender focus on education remains warranted and that new gender gaps may have opened. Although gender gaps within school types were narrow, gender gaps across school types remained wide. The relationship between age and achievement mattered more for boys and girls attending no-fee public schools, with girls being at a disadvantage when older learners were compared. Boys were found to have lower aspirations about their academic careers and were also at a higher risk of being victims of bullying than girls, irrespective of the type of school that they attended.

Taken together, these findings suggest that part of the gender policy constellation in the future needs to consider the different challenges faced by boys and girls in particular educational environments.

Acknowledgements
All tables and graphs are based on the 2011 TIMSS data archive. (Authors' calculations).

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