LANGUAGE development and SCIENCE achievement

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While there is clear agreement that proficiency in the language of testing will influence educational outcomes, we know less about how this relationship is influenced by the socioeconomic status of learners and the schools they attend. *Vijay Reddy* and *Jaqueline Harvey* use grade 9 data from the 2019 Trends in International Mathematics and Science Study (TIMSS) to explore language dynamics in South Africa – nationally and in the Gauteng and Western Cape provinces. They look at how the different conditions influence science achievement, a subject where language skills are important.

It is widely understood that learners who are proficient in the language of the test are better able to successfully answer the questions and achieve higher scores. That is, learners perform best in their home languages. However, simply administering tests in learners' home language in South Africa, with its high levels of poverty and inequality, will not necessarily lead to improved results. While language proficiency is a contributor to higher performance, there are other factors at play. Using the TIMSS 2019 grade 9 data, we present further insight into the debate around language of instruction.

South Africa is a multilingual country where the Constitution enshrines the official status of 11 languages. Of these, the most common home languages reported by learners were isiZulu (28%), followed by isiXhosa (17%). The next most common languages were Afrikaans, English, Sepedi, and Setswana, which were each spoken in approximately 10% of homes. These figures correlate with other national statistics. Furthermore, provinces have their own unique

linguistic profiles. Here, we focus on two provinces that, while included in the South African sample, had additional schools sampled as part of standalone studies. In Gauteng, all 11 official languages are listed as home languages, with isiZulu spoken in 22% of households, followed by Setswana (16%), Sesotho (15%), English (11%), and Afrikaans (10%). Western Cape, on the other hand, is more linguistically homogenous, with 40% of learners listing Afrikaans as their home language, followed by isiXhosa (33%) and English (25%). The results for these provinces, which have the highest GDP per capita, provide insight into learner performance in better-resourced environments.

According to South Africa's official language policies, school governing bodies are responsible for determining the school language policy. The grade 1 to 3 literacy curriculum allocates 70% of the learning time to home language development and 30% to the development of a first additional language, generally English or Afrikaans. From grade 4 onwards, most schools choose English or Afrikaans as the language of learning and teaching.

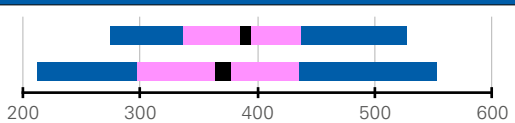
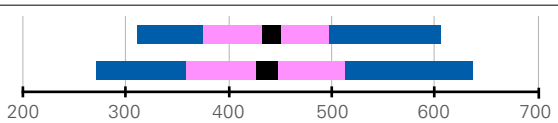
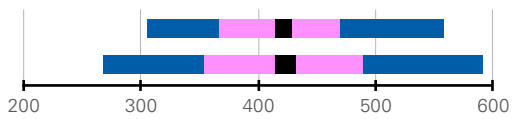
While English or Afrikaans is the prescribed language of instruction from grade 4, in reality, many teachers employ code-switching practices. This involves alternating and blending English with the African home language to assist learners in understanding concepts. English is often seen as a language of power with economic and social benefits. Many parents, therefore, prefer English for their child's education. This may explain why schools continue to choose a language that is at odds with learners' backgrounds and classroom practices.

According to the curriculum documents, the objective of language development is to promote '(i) Thinking and Reasoning and (ii) Language Structure and Use, which are integrated into all four language skills (listening, speaking, reading, and writing)'. School language development goes beyond the ability to communicate socially, aiming to enable learners to use language for academic purposes, such as reading for meaning. However, the level of South African language skills development is of concern. The 2016 Progress in International Reading Literacy Study (PIRLS) assessed learners' reading comprehension at the grade 4 and 5 level. Their results showed that only 22% of learners were able to read for meaning in their home language. Further, PIRLS reported that learners whose home language was English or Afrikaans achieved the highest scores and their achievement was significantly greater than that of learners who wrote the test in an African home language.

Factors other than proficiency in the language of the test contribute to low achievement. Previous reports show that South African educational outcomes are best described as low and socially graded. For example, about one-third of learners come from more advantaged backgrounds, attend better-resourced fee-paying schools, and generally attain higher achievement scores. An interpretation from the PIRLS results is that factors such as inadequate school resources, poor teaching and learning practices, and unsafe school environments, which are more common in the more disadvantaged no-fee schools, contribute to lower educational outcomes.

Against this backdrop, we explored the intersection of English (or Afrikaans) language proficiency and achievement. We first examined the mathematics and science achievement distributions in three 'case studies' – South Africa, Gauteng and Western Cape. Although the mathematics and science scores were constructed on different scales, the percentile graph patterns provide insights into the impact of language on achievement. In the graphs for all three case studies, distribution was wider for science achievement than for mathematics (Figure 1). This implies a higher level of variance for science scores. In addition, science scores at the fifth percentile were much lower than the mathematics scores at the same point.

Figure 1: TIMSS 2019 Grade 9 mathematics and science achievement and distribution in South Africa, Gauteng and Western Cape

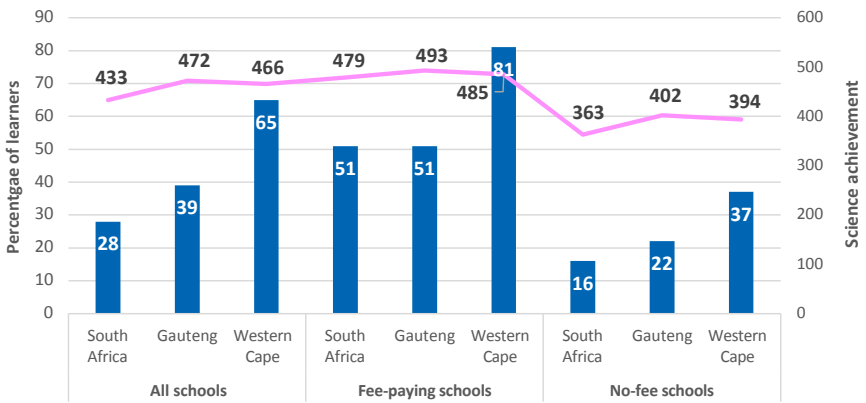
Case	Achievements	Achievement distribution
South Africa	Mathematics 389 (2.3) Science 370 (3.1)	
Western Cape	Mathematics 441 (4.4) Science 439 (5.1)	
Gauteng	Mathematics 421 (3.0) Science 422 (3.9)	

The lower performance in science could be due to many factors, including higher language proficiency requirements, higher difficulty levels of science items, and inadequate teacher knowledge or resources to teach science in schools.

We next explored how test language proficiency influenced science achievement scores. As expected, learners who never spoke the language of the test at home achieved a significantly lower score of 311 points on the science assessment, compared with the 433 points scored by their peers who spoke the test language at home more frequently. We then extended the analyses by examining science achievements for learners who indicated that they 'always' or 'almost always' (frequently) spoke the language of the test at home in our three case studies. We compared frequency patterns and science achievement for all schools, fee-paying schools, and no-fee schools (Figure 2).

The results showed that the frequency with which learners spoke the language of the test at home varied across contexts. Two-thirds of Western Cape learners frequently spoke the language of the test at home, compared with 39% in Gauteng and 28% for South Africa as a whole. Not unexpectedly, this was the case for more learners in fee-paying than in no-fee schools. Comparing the achievement scores for learners who frequently spoke the language of the test at home revealed that there were no significant differences in achievement for fee-paying schools across the three contexts. In the case of no-fee schools, learners in Gauteng and Western Cape achieved significantly higher scores than the countrywide average. This implies that fee-paying schools anywhere in the country are fairly similar and learners have the same chance of success. However, learners attending no-fee schools in the Gauteng or Western Cape province have an opportunity for better achievement. Better-resourced provinces offer a higher quality of education in no-fee schools.

Figure 2: Extent of the language of the test being frequently spoken at home and science achievement scores in different contexts



In conclusion

The TIMSS 2019 results for South African learners show that levels of language proficiency and development continued to impact learner achievement. Learners who were fluent in the test language and who were regularly exposed to this language outside of school were at an advantage. Steps should be taken to improve test language proficiency. This includes sound bilingual instruction in the foundation years to ensure that all learners are proficient in their home language and in a second language.

However, the socioeconomic context in which learners attend school is also a crucial aspect of the relationship between language development and achievement. Improved language proficiency in the language of the test alone will not lead to the desired results. To improve the education outcomes, all learners should receive a high-quality education. In no-fee schools, this will necessitate infrastructural and other resource improvements, as well as improved educator knowledge and pedagogy. Unless all learners can read with meaning, and write coherently (in any language), the impact will continue to be felt through low science achievement scores.

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