

TIMSS is dynamic and beneficial, placing countries in a position to quantify the impact interventions and policies have had on the quality of education and the performance of the learners over time.

All procedures are monitored by IEA-trained national and international representatives in selected and previously undisclosed schools. The quality assurance continues throughout the scoring of the assessment booklets, the double-marking of selected scripts, and exchanges between northern and southern hemisphere countries. This is to validate the scorer reliability within and across countries, once again strengthening the quality of the TIMSS data.

Additional verification is done at the data processing stage, whereby all of South Africa's collected data is captured twice and compared to the original data, to confirm the information is accurate and not contaminated by human

error. The rigorously cleaned data set is then sent to the Data Processing and Research Center (DPC) in Germany for further cleaning and verification. Once released, countries are able to undertake analysis and evaluate the changes that have occurred in their countries.

Overall, TIMSS is dynamic and beneficial, placing countries in a position to quantify the impact implemented interventions and policies have had on the quality of education and the performance of the learners over time. ■

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Solid foundations: the role of the home in education

The home environment should be an extension of the school learning environment. It is here that learners should be doing their homework and reflecting on what has been taught at school. *Andrea Juan* and *Mariette Visser* looked at the resources learners obtain at home that could help them perform better.

When considering the resources learners have access to within the home environment, three predominant factors were assessed: educational, general (socioeconomic status) and parents. Using data from the 2002 and 2011 Trends in International Mathematics and Science Study (TIMSS), several significant changes were observed.

Home educational resources

The presence of certain items in the home creates an atmosphere that promotes academic skills and motivation. Examples of educational resources at home are own books, a study desk, a computer, an internet connection and a separate, dedicated room.

Only 9% of South African grade 9 learners – compared to 25% internationally – had more than 100 books at home. A quarter (25%) of grade 9 learners had their own room and internet connection at home, while the comparable figure internationally was 53%. What was also evident from the analysis was that performance decreased with a decrease in home resources. In addition, a comparison of 2002 with 2011 public school data on the number of books at home of South African grade 9 learners showed no significant improvement.



Table 1: Percentage of learners and mathematics average achievement scores by the Home Educational Resources Index

Home Educational Resources Index	Many resources		Some resources		Few resources	
	% of learners	Average achievement	% of learners	Average achievement	% of learners	Average achievement
Maths (South Africa)	3	487	55	362	42	333
Maths (international average)	12	530	67	470	21	415

Source: Findings from IEA's 2011 Trends in International Mathematics and Science Study

To enable international comparison, an index called the Home Educational Resources Index was developed using the following components: the number of books at home, the availability of two specific home-study resources (own room and internet connection) and the highest level of education of either parent. Table 1 shows the percentage of learners and their average mathematics achievement scores, according to the 2011 Home Educational Resources Index.

The study suggested that there was a positive association between the number of resources at home and the achievement scores of learners – the more resources available, the higher the achievement scores (Table 1). It was further evident that almost half the grade 9 learners (42%) had very limited educational resources at home. The wide learner performance range (from 487 to 333 points) between learners who were not affected and learners who were affected a lot, pointed to inequity in the system.

Socioeconomic status

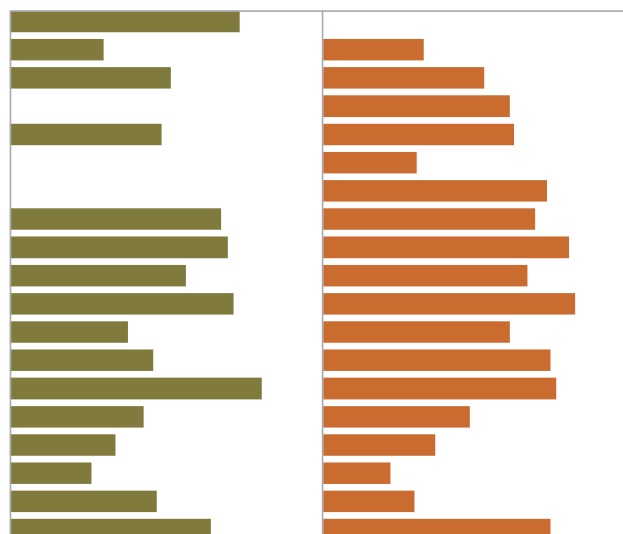
The socioeconomic status of a particular household is positively associated with educational performance. The presence of certain assets relates to the socioeconomic context in which the learner lives. These typically include items such as refrigerators, calculators, computers and internet access.

An overview of resources at grade 9 learners' homes as self-reported in 2002 and 2011 provided background information on the home environment, and showed positive change over time in learners' home environments. The existence of own books, own cellphone and an internet connection at home was not investigated in 2002, while the existence of a calculator was not investigated in 2011 (Figure 1).

From learners' reports, the presence of electricity and water supply increased since 2002. The percentage of learners with electricity at home increased by 6%, while the percentage increase in the number of learners with running tap water at home grew by 7%. The presence of electronic devices such as televisions, video players, computers and CD players in learners' homes also increased during this time. In 2002, almost all public school grade 9 learners had a radio at home. In 2011, television took the place of the radio, with 88% of public school grade 9 learners having a television at home. In addition, the percentage of learners

with their own room, access to a motor car in the household and a fridge at home also increased since 2002. Conversely, the data showed that the percentage of learners with resources such as a study desk, dictionary and their own bicycle decreased since 2002. It was encouraging that a third of students (31%) indicated they had ready access to the internet.

Figure 1: Percentage of public school learners that reported having the selected resource at home in 2011 TIMSS compared to the same figures reported in 2002 TIMSS



Source: Derived from IEA's 2011 Trends in International Mathematics and Science Study

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Parents as resources

There is a strong relationship between learner achievement and parental education, especially that of female guardians. In 2011, 19% of parents had completed a university degree. This was a substantial increase from 2002, where 11% of parents had completed a university degree. The qualification levels of parents positively affected learner performance in mathematics. The corresponding figure for international learners was almost twice the South African figure of 32%.

Parents themselves are resources that learners can use to supplement what is taught at school. Learners were asked various questions related to parental involvement and interest in learners' schoolwork at home. The study suggested that parental involvement in learners' schoolwork was relatively high; more than 80% of learners' parents spoke to them about their schoolwork or checked if they had enough time to do their homework once or more times per week. Furthermore, 66% of learners' parents made sure that their children set time aside for their homework on a daily basis; 61% of learners' parents asked them every day what they were learning in school; and 54% of learners' parents checked daily if their homework had been done.

Conclusion

Although South Africa's average household income increased nominally by 113% in 2011 compared to the last census in 2001, a comparison of available selected educational resources in 2002 and 2011 in learners' homes did not show remarkable changes. The evidence showed considerable resource limitations and shortages at most of learners' homes and their school environments compared to international standards. However, there have been improvements in terms of parental education levels and home conditions since 2002. A continuation of this trend may eventually lead to improved educational outcomes. ■

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A climate of achievement: factors that impact scholarly performance

The school environment is the main setting for educational instruction. *Mariette Visser* and *Andrea Juan* examined the resources, both tangible (school environment) and intangible (school climate), that influence school performance. They found that around 95% of grade 9 learners in the sample group were affected by inadequate educational resources at school.

For purposes of the study, we drew data from questionnaires that formed part of the 2011 Trends in International Mathematics and Science Study (TIMSS). These included questionnaires completed by learners, teachers and schools. The findings depicted considerable resource limitations and shortages at most of South African school environments compared to international standards. We addressed the following questions:

- What is the effect of well resourced schools on mathematics performance?
- What is the effect of a safe, orderly and disciplined school climate on mathematics performance?

School resources

Tangible elements of the school environment refer to physical resources. Schools with physical assets and infrastructure, such as libraries, laboratories and computers, exhibit more positive educational outcomes, while indicators of inferior infrastructure and assets tend to be negative.

In South Africa, 95% of learners were affected by inadequate resources for mathematical instruction at school (Table 1). The average achievement of South African learners (510) that were not affected by resource shortages was higher than the international average (488), but such conditions applied to only 5% of local learners.