When it comes to school science, language can determine success

Learners who have access to tangible educational resources, such as books and computers at home, tend to perform better in science than those who do not. This has been proved by a great deal of international research. It is also true in South Africa, but our research has found that intangible factors also play a role in learners' science achievement. These factors include parental education levels, parental involvement in homework – and, crucially, home language, write *Dr Andrea Juan* and *Mariette Visser*.

Successive apartheid governments used language as a tool to create socio-economic and educational division in South Africa. This history means that language as a home resource cannot be overlooked when it comes to understanding learners' performance in science at school.

Today still, the language of teaching and learning in our schools often differs from the language spoken in a learner's home. Only 26% of learners who participated in the 2011 Trends in International Mathematics and Science Study (TIMSS) spoke the language of the test at home.

For our research, we studied data from 11 969 Grade 9 learners – who were, on average, 16 years old – who were part of that study. Our results proved just how important language is: the language most often spoken in a learner's home was the most important predictor for science performance. We therefore believe tackling language policy can improve learners' performance in this subject.

Our findings suggest that by the time learners are in Grade 9, they have not mastered the language of instruction.

Poor science achievement

In developing countries such as South Africa, science, technology and innovation have become forces that drive economic growth and competitiveness and have the potential to improve quality of life. The number of skilled people (such as scientists, engineers and other technically skilled personnel) in a country is associated with its economic growth and ability to compete in the global economy.

The development of these skilled people begins at the school level. Therefore, it is cause for concern that the 2011 TIMSS found the average science achievement of Grade 9 South African students is well below the international centre point of 500 points.

The resource problem

Historically, the state provided educational resources in an unbalanced way. Schools designated for white learners were well resourced, while those for black learners were under-resourced. Today, these imbalances persist. There are vast differences in physical resources at poor schools compared to affluent schools.

The school resources we included in our study were the condition of the school building; the use of workbooks or worksheets as the basis of instruction and class size. We also explored the capacity of the school to provide instruction based on the availability of resources such as textbooks, science equipment and computer software.

For home resources, we asked the learners to report on how often the language of the test was spoken in the home, the number of books at home, and the number of home assets, parental education levels, and parental involvement in school homework.

The findings

Language emerged strongly as a success factor. Learners who used the language most frequently spoken at home in the TIMSS test, scored on average 62 points higher than those who seldom spoke the language of the test.

The number of home assets present in a learner's home had the second strongest positive association with science achievement. We found that for each additional asset (such as a fridge, television, computer etc.) in a learner's home, they scored an average of 11 points higher in science than their peers.

The third most important predictor of science achievement was the condition of the school building. Learners who attended schools with minor problems with the building performed 24 points higher, on average, than those who attended schools that reported moderate to serious problems with the buildings.

Implications

Language development is recognised as crucial for all other learning to take place. Our findings suggest that by the time learners are in Grade 9, they have not mastered the language of instruction (and of testing). In essence, most of the learners who were tested using the TIMSS were learning science through a foreign language.

This means that learners are likely to be at a disadvantage because their knowledge of the language of instruction is below the expected level for their age and grade. The implication is that education policies must seek to improve the manner in which the language of instruction is taught to students who do not speak that language at home, and concurrently, the policies that promote instruction in the home language must be strengthened.

It is important that we understand the determinants of science achievement for South African learners. This has far-reaching implications for the country's broader growth and development. This is because successful interventions at school level may contribute to increasing the pool of matriculants who are eligible to study science-related subjects at a tertiary level and who will later join the skilled workforce.

Disregarding these environmental factors may hinder the success of policies designed to improve achievement and further economic growth.

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