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Assessing educational outcomes in South Africa relative to economically comparable countries: A comparative analysis

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The quality of education is a predictor of a country's economic performance – which is why comparative international education surveys are important. South Africa performed poorly in the Trends in International Mathematics and Science Study (TIMSS) in 2019. The score of 374 for mathematics and 324 for science is poor compared to the mid-point of 500 and the performance of other upper middle-income countries that participated in the TIMSS 2019 survey. Research indicates that the country's education performance is driven by a few key drivers. The aim with this study was to compare whether some of these key education performance drivers predicted performance of participating countries which are economically similar to South Africa. Only countries within one standard deviation of South Africa's per capita GDP were selected. The results show that factors such as instructional time, learner-teacher ratios and language diversity were very strong predictors of performance in the 2019 TIMSS survey, with correlations of more than +/-0.80. While some factors are structural and cannot be changed (language diversity, for example) and others are very expensive to implement (reducing learner-teacher ratio), I propose the improvement of education outcomes through focusing on cost-effective impactful approaches. These are using student teachers to reduce the learner-teacher ratio in poor schools, making home language compulsory in homogeneous mother tongue areas, better management of instructional time and improving teachers' continuous professional development in the short term.

Keywords: absenteeism; education outcomes; language of instruction; learning materials; learner-teacher ratio; teacher experience; Trends in International Mathematics and Science Study (TIMSS) survey

Introduction

Although comparative surveys like TIMSS, the Progress in International Reading Literacy Study (PIRLS) and the Southern and Eastern African Consortium for Monitoring Educational Quality provide a useful way to evaluate South African education, they do not take fundamental differences between countries into account. It is essential to consider other contextual factors that may influence education outcomes in South Africa and compare these to those in similar countries. The major challenges which often beset the education sector include limited resources, poor quality education, teacher shortages, poor education management and many other problems (Bashir, Lockheed, Ninan & Tan, 2018). An international survey such as TIMSS is important because it compares mathematics and science knowledge of Grade 4 and Grade 8 learners in participating countries, every 4 years. The results of TIMSS are reliable as it follows guidelines to minimise the influence of funding on results and are committed to following rigorous research standards.

Considering these challenges, it is not surprising that learners in South Africa significantly underperform compared to their well-resourced counterparts in developed countries. For instance, in international tests like the 2019 TIMSS, the South African results were significantly below the international centre point of 500 (Mullis, Martin, Foy, Kelly & Fishbein, 2020). At a score of 374 for mathematics and 324 for science, the results were the third lowest – only surpassed by Pakistan and the Philippines in both mathematics and science. However, based on the World Bank's 2020 classification, Pakistan and the Philippines were both lower middle-income countries while South Africa was an upper-middle income country (Serajuddin & Hamadeh, 2020). In the 2016 PIRLS, South Africa was last, even below some lower middle-income countries like Morocco and Egypt (Howie, Combrinck, Roux, Tshele, Mokoena & McLeod Palane, 2017).

Of greater concern is that South Africa has reversed progress in international surveys such as PIRLS in 2006, 2011 and 2016 and it significantly underperforms compared to other comparable upper middle-income countries for mathematics and science. Although the per capita gross domestic product (GDP) for countries like Armenia, Azerbaijan, Georgia, and Kosovo are more than 1,000 United States Dollar (USD) below South Africa, they significantly outperformed South Africa in both mathematics and science in the 2019 TIMSS. For instance, a country like Albania with a per capita GDP of USD5,220, which is comparable to South Africa's USD6,040, has an average score of 491.50 for both mathematics and science (only 8.5 points below the international centre point), while South Africa's average score for the same is 349.00 (151 points below the centre point).

Considering the above, I compare South Africa's key drivers of education outcomes to other economically similar upper middle-income countries that participated in the 2019 TIMSS. This specific comparison with other upper-middle income countries is premised on previous studies which found that socio-economic status strongly predicts education outcomes (Liu & Hannum, 2017) even after controlling for family and other structural effects (Huisman & Smits, 2009). The comparison is important because it highlights where economic resources could be better applied for a higher impact on education outcomes. Using other middle-income countries helps zero in

on what is economically affordable for the country and possible performance in education based on average wealth. To date, there has been no study in which South Africa's performance in basic education outcomes is compared to countries with similar economic characteristics.

However, before the comparison results are presented, it is critical that key education interventions are discussed. This is important because not all education interventions are equally efficacious. In the next section I discuss the key drivers which, in previous studies, have been found to have a significant impact on education outcomes.

Drivers of Education Outcomes

There is growing interest among policy-makers to adopt educational interventions with high impact (Ganimian & Murnane, 2014) as they lead to better education outcomes and improved resource allocation. The interest in impact evaluation has led to a proliferation of research into educational intervention coupled with scholars who attempt to summarise results from these studies (Ganimian & Murnane, 2014) to determine what is truly effective over many studies. This article benefited from other studies and I selected the drivers which have been found to have a significant impact on education outcomes. These outcome drivers are discussed in this section, starting with availability of schools.

Availability of Schools

Schools have a critical impact on education outcomes, as they are the infrastructure in which education occurs. For instance, in Afghanistan girl enrolments increased by 52% and the scores in mathematics and language increased by 0.65 standard deviations when more schools were built (Burde & Linden, 2013). In Argentina, construction of pre-primary schools from 1993 to 1999 increased Grade 3 Spanish and mathematics scores among beneficiaries by 0.23 standard deviations (Berlinski, Galiani & Gertler, 2009).

More schools make it possible to reduce the number of learners allocated to a teacher. The lower the number of learners allocated to a teacher, the more effective the teaching. This is consistent with a study by Koc and Celik (2015) who found that there was a strong negative correlation (-0.561) between the number of learners per teacher in Turkey and their school performance in a government administered examination.

In the South African context, the learner-teacher ratio varies per quintile. Quantiles are the classification of schools into five groups based on the socio-economic status of the surrounding community, with lower quantiles receiving more government funding. For instance, Spaull's (2011) calculation shows that the learner-teacher ratio reduces as the quintiles increase. While the learner-teacher ratio is 36.3 for quintile 1, it decreases to 30.5 for quintile 4. Ogbonnaya and Awuah (2019) propose that the reduced learner-teacher ratio in quintile 4 and 5 schools can be attributed to the fact that most fee-paying schools use their extra resources from school fees to employ more teachers, thus improving the quality of teaching.

In addition, school infrastructure is still a challenge in many schools in South Africa (Amnesty International, 2020). The 2018 government statistics show that of the 23,471 public schools, 86% had no laboratory, 77% no library, 72% no internet and 42% no sports facilities (Department of Basic Education [DBE], Republic of South Africa [RSA], 2018). With this article I explore how the South African school and infrastructure situation compares to those in schools in other upper middle-income countries. More specifically, I explore how the learner-teacher ratios in different countries reasonably predicted the education outcomes in their 2019 TIMSS performance. However, the learner-teacher ratio is only one education driver; language policy and language of instruction is another.

Language Policy and Language of Instruction

Language policy implementation and language of instruction has an impact on educational outcomes. Significant evidence highlights the importance of teaching in a language that learners understand, especially during the early literacy stages (Bashir et al., 2018). Research by Trudell (2016) shows that using mother tongue in the classroom increases learner participation, decreases attrition, increases community engagement, and enhances learners' cognitive learning.

Countries which effectively implement mother-tongue policies perform better than those with poor implementation. For example, in the African context, Ethiopian children do relatively better in reading comprehension tasks, because schools are obligated to teach children in their mother tongue up to at least Grade 5 (Bashir et al., 2018). This contrasts with countries with no clear policy on the use of mother tongue (like Ghana, Mali and Zambia) where 70 to 90% of children could not answer even a single reading comprehension question (Bashir et al., 2018). Schools in these countries do not use mother tongue in class or use it ineffectively in the early school grades (Bashir et al., 2018).

Using the mother tongue as language of instruction is a special challenge for countries facing linguistic diversity, like South Africa, because learning resources must be translated into many languages. In South Africa, the Language in Education policy allows a learner to choose a language of instruction within the confines of the 11 official languages (Trudell, 2016). This is

premised on the reality that it takes up to 7 years of good instruction for learners to acquire a second language (Bashir et al., 2018).

Most schools in South Africa choose English as their language of instruction in response to globalisation and parents' lack of trust in using an African language for instruction (Kruger, 2009). In practice though, many Black schools in South Africa use mother tongue for Grades 1 to 3 with the transition to English (Manyike, 2013) in Grade 4. Taylor and Coetzee (2013) found that mother-tongue instructions in the early grades significantly improved acquisition of English as measured in Grades 4 to 6. In a secondary analysis of data from TIMSS 2011, Prinsloo, Rogers and Harvey (2018) found that language and contextual factors contributed significantly to educational outcomes in science, specifically, more than half.

In the study reported on here I sought to evaluate whether the number of languages spoken in a country and official languages of instruction had any relationship to education outcomes in selected countries. I specifically explored how the number of languages spoken in a country and languages of instruction reasonably related to the performance of a country in the TIMSS 2019 survey. Instructional time as another important driver of education outcomes is discussed in the next section.

Instructional Time

Instructional time refers to the time that learners are formally taught per day. In many low-income countries, learners attend school for about 4 hours per day, which is deemed inadequate to develop important skills (Ganimian & Murnane, 2014). Many countries are working on increasing instructional time, and when Orkin (2013) investigated the impact of increasing instructional time in Ethiopia from 4 to 6 hours for learners in the third grade, it was accompanied by increased proficiency in mathematics and writing.

It is not the absolute number of hours planned for instructional time that matters, it is the actual instructional time spent and how it is spent. Schools that achieve excellence in literacy have effective instructional practices which make maximum use of instructional time available (Van Staden & Bosker, 2014). Pretorius and Klapwijk (2016) claim that teachers in South Africa spend more time on mechanical skills like decoding passages instead of improving comprehension. This goes against empirically validated strategies and interventions which should be used to improve learner comprehension (McNamara, 2007).

In a study of South African schools Wittenberg (2005) found that learners spent an average of 5.87 hours at school per day. In typical South African fashion, poorest learners were more likely to arrive at school late compared to learners from more affluent circumstances (Wittenberg, 2005). In explaining this, Wittenberg (2005) speculates that the late arrival at school was most likely driven by the chores that poorer learners had to do before they went to school and by the poor school transport situation.

Of interest in my study was whether the average school hours in a country predicted their performance in the TIMSS 2019. In other words, does a longer school day lead to better performance in the TIMSS? Longer school days should translate to more instructional and learner practice time. Not only schools, language of instruction and instructional time impact education outcomes. Absenteeism is another driver of education outcomes as it reduces learning time.

Absenteeism

Learners lose learning time due to their own absence and the absence of their teachers. In South African rural schools, learners often miss school days working on the farm and their parents or guardians do not encourage them to attend school (Du Plessis & Mestry, 2019). Parents with limited education do not see the value of education and learners also find the curriculum irrelevant to their lived experience (Du Plessis & Mestry, 2019) as their immediate challenges are not being resolved by going to school.

On the flip side, despite a huge national budget allocation to basic education of about 16.5%, South Africa has the highest teacher absenteeism in Southern Africa, pegged at an average of 19 days per teacher per year, compared to 9 days in other Southern African countries (Msosa, 2020). Causes of teacher absences in South Africa range from permissive policy conditions (Msosa, 2020), illness, transport problems, job stress and many others (Mkhwanazi, 1997). The major impact of teacher absence is the loss of learning time by learners (Msosa, 2020) and loss of respect for teachers (Stoica & Wamsiedel, 2012). In short, teacher absenteeism means lower teacher productivity and poorer learner outcomes (Ganimian & Murnane, 2014).

A related matter of teacher education and experience is discussed in the next section.

Teacher Education and Experience

Effective education systems depend on the education and experience of teachers. Although not the panacea to all that ails education, an effective education system is built on effective management of teacher recruitment, training, and deployment (Aslam, Rawal, Kingdon, Moon, Banerji, Das, Banerji & Sharma, 2016). The lowering of the quality of teacher education leads to a corresponding reduction in learner education outcomes (Aslam et al., 2016), but results on teacher education are mixed. Some studies found a

positive relationship between teacher qualification and mathematics achievement in 37 high-income countries (Akiba, LeTendre & Scribner, 2007), while others found no relationship to learners' learning outcomes in 18 middle-income countries (e.g., Luschei & Chudgar, 2011, Organisation for Economic Co-operation and Development [OECD], 2013).

However, of concern is the questionable teacher competence revealed by some studies in South Africa. For example, the 2007 Southern and Eastern African Consortium for Monitoring Educational Quality (SACMEQ) found that for Grade 6 mathematics teachers evaluated, 79% had content knowledge at Grade 4 or 5 level and below (Venkat & Spaull, 2015). The percentage of teachers with low content knowledge increase with reducing school quintiles: quintile 1 (89%), quintile 2 (86%), quintile 3 (92%), quintile 4 (77%) and quintile 5 (50%) (Venkat & Spaull, 2015). This is notwithstanding the fact that teachers must hold a 4-year bachelor's degree or an advanced diploma in education and must be registered with the South African Council of Educators (SACE). Over and above, a teacher must complete 150 continuous development points every 3 years, which must be captured on the SACE website.

Of interest to this study is how effectively teacher training predicts learner performance. More specifically, the relationship between the level of education required for teachers, measured in years and the TIMSS education outcomes for the select countries. However, it is also important to discuss the impact of the availability of textbooks and learning materials on education outcomes.

Textbooks and learning materials

There is significant agreement on the impact of textbooks and learning materials in enhancing learning outcomes (Boissiere, 2004). In a meta-analysis of 60 studies by Glewwe, Hanushek, Humpage and Ravina (2011), 36 of the studies showed that textbooks had a positive effect on learning outcomes and only four found a negative impact. However, the effectiveness of materials in leading to positive outcomes depends on effectiveness of use of the same by teachers in classrooms (Ganimian & Murnane, 2014). For instance, in Kenya, free textbooks in English and mathematics in Busia and Teso had no impact on average scores in English and mathematics because learners could not read the English – the learners' third language (Glewwe, Kremer & Moulin, 2009).

In the South African context, it has been shown that textbooks have a significant impact on learning outcomes (Gustafsson, 2007; Van der Berg & Louw, 2007). Although textbooks are available in South African schools, Spaull (2011) reports that reading textbooks are shared by 36.8% of learners among the poorest 20% of learners. A comparative figure on the sharing of textbooks among learners from more affluent circumstances is 20%.

Having discussed the six key drivers of education outcomes, the conceptual framework of this study is presented in the next section.

Conceptual Framework

A conceptual framework exposes related concepts of a study and paves the way for comprehensive understanding (Tamene, 2016). The main theme covered in this article is that learning outcomes are to a large extent influenced by specific macro factors. Improving these macro factors will lead to improved learning outcomes. These factors can be isolated and compared between countries, with special emphasis on comparing economically similar countries. This is unlike current international surveys and reports which compare South African education to countries vastly different from it in terms of per capita GDP.

For example, the SACMEQ research compares South African education to 15 schooling systems in Southern Africa, however, only Namibia and Botswana have comparable per capita GDP. With a population of under 2.5 million each, compared to South Africa's 60 million, the implementation scope is vastly different to be comparable. The TIMSS and PIRLS studies compare South Africa to other participating countries worldwide, but most of the participating countries are developed countries with per capita incomes not comparable to that in South Africa. With a per capita GDP of over US$60,000 for the United States of America (USA) or about US$30,000 for the United Kingdom (UK), it is not logical to compare education outcomes with South Africa where the per capita GDP is about US$6,000, which is one-tenth and one-fifth, of that in the USA and UK respectively.

In fact, Prinsloo et al. (2018) report that some effective education intervention in high-income countries have a negative impact in middle- and low-income countries. For instance, research into the impact of school autonomy, school accountability and competition lead to opposite conclusions between developed and developing countries (Bashir et al., 2018). This highlights the need to compare countries at a similar level of economic development.

What makes the correct comparison of South Africa more difficult is that it has a unique and complex education history (Prinsloo et al., 2018). For a long time in South Africa, apartheid largely determined the type of education a child received, underpinned by race-based government resource allocation (Dass & Rinquest, 2017). This has created a schooling system which is complicated to manage using a single school policy, as it is characterised by a few well-functioning, well-

resourced schools alongside the majority of schools dependent on the state for guidance and financing.

Although numerous comparative studies have been done (e.g. Aslam et al., 2016; Boissiere, 2004; Glewwe et al., 2011), in no such studies has the South African education system been compared to countries with similar economic status. Using economic development status as a basis for selecting qualifying countries is important because research has shown that economic background is associated with educational achievement (Visser, Juan & Feza, 2015).

Research Design and Methodology

Research Design

A descriptive research design was used in this study with the aim to investigate the situation as it naturally exists without any attempt to change the variables, and then provide a detailed account (Leavy, 2017). This research design was deemed the most appropriate due to the complex nature of the subject and the existence of high-quality data which can be obtained from multilateral organisations like The World Bank and the United Nations Children's Fund (UNICEF). A descriptive research design is also appropriate because no definite answer is available on the subject due to the complexity and multi-faceted nature of the problem. This study provides insight into potential areas of focus to improve education outcomes in South Africa.

Research Methodology: Factor Selection

In the literature review I evaluated macro factors that impact education outcomes. This was based on articles in which previous studies on the impact of different interventions on education outcomes had been reviewed. The factors which had the highest impact were selected, namely, availability of schools, language policy, textbooks and learning materials, instructional time, absenteeism and teacher education and experience. For each selected comparative country, relevant information was obtained from different sources, mostly UNICEF, the World Bank, and other reports. Information on absenteeism and availability of textbooks and learning materials could not be found for the comparative countries, which led to no further analysis of these factors.

Research Methodology: Selection Criteria for Countries to Compare

Research has shown that economic background is associated with educational achievement (Visser et al., 2015). The Coleman Report of 1966 highlights the importance of a person's economic status in defining education outcomes (Coleman, Campbell, Hobson, McPartland, Mood, Weinfeld & York, 1966). Based on this, I used per capita GDP to select countries to compare. As a first step, countries that the World Bank categorises as upper middle-income countries were identified. Upper middle-income countries are those countries with nominal per capita incomes of between US$3,996-US$12,375 in 2019 (Serajuddin & Hamadeh, 2020).

The next step was to identify upper middle-income countries that participated in the TIMSS 2019 international education survey. Only 17 qualifying countries were left, and South Africa was close to the centre of that grouping, at US$6,040 per capita GDP.

To compare the economic similarity of these countries to South Africa, only countries within half a standard deviation from South Africa's per capita GDP were selected, namely, Albania, the Islamic Republic of Iran, North Macedonia, Bosnia and Herzegovina, and Serbia.

Results

Per Capita GDP for Qualifying Countries

Of the upper middle-income countries, five countries were economically within half a standard deviation from South Africa's GDP. Their details are presented in Table 1.

Table 1 GDP for qualifying countries with similar economies, 2019 (author's compilation from The World Bank, 2024)

			Purchase power parity int$	
Country	Nominal US$ GDP	Nominal US$ per capita GDP	International Monetary Fund (IMF) (per capita)	World Bank
Albania	15,279,183,289.94	5,220.00	13,651.00	14,496.00
Bosnia and Herzegovina	20,164,193,806.88	6,170.00	14,895.00	15,883.00
Iran, Islamic Republic (Rep.)	454,000,000,000.00	5,506.00	11,963.00	12,938.00
North Macedonia	12,547,040,498.91	5,840.00	16,609.00	17,608.00
Serbia	51,475,016,532.13	7,030.00	18,840.00	19,013.00
South Africa	351,431,649,241.44	6,040.00	11,911.00	13,034.00

Although the nominal per capita GDP in Table 1 are similar, four of the countries' economies were much smaller than that of South Africa and only Iran had a larger economy. In terms of purchase power parity GDP per capita in international dollars, those of Serbia and Northern

Macedonia were much higher than that of South Africa, while Iran and Albania were most similar to South Africa.

Comparative Results from TIMSS 2019

In 2019, 58 countries participated in the TIMSS. The results for the shortlisted countries and their relative position to the total list are presented in Table 2. Based on the combined scores, a rank was computed for the qualifying countries.

Table 2 TIMSS 2019 results for qualifying countries and relative positions (author's compilation from Mullis et al., 2020:38, 109*)*

Country	Mathematics score	Mathematics position	Science score	Science position	Rank
Serbia	508 (3.2)	36	517 (3.5)	29	1
Albania	494 (3.4)	39	489 (3.5)	39	2
North Macedonia	472 (5.3)	45	426 (6.2)	51	4
Bosnia and Herzegovina	452 (2.4)	47	459 (2.9)	44	3
Iran, Islamic Rep.	443 (3.9)	50	441 (4.1)	48	5
South Africa	374 (3.6)	56	324 (4.9)	56	6

Table 2 shows a strong positive correlation between performance in mathematics and science. The computed correlation for the participating countries is 0.91, which means that countries that did well in mathematics tended to also do well in science. Of the selected countries, Serbia performed the best and above the international TIMSS centre point of 500, while South Africa performed poorly and was placed last compared to the other selected countries. South Africa only outperformed two other countries (Pakistan and the Philippines) on the entire list of participating countries with a much lower nominal GDP per capita at US$1,410.00 and US$3,850.00, respectively.

Availability of Schools

Studies have shown that the availability of schools positively impact education outcomes (Berlinski et al., 2009; Burde & Linden, 2013). It was difficult to find statistics about school availability, however, learner-teacher ratio (see Table 3) is a good proxy for the availability of schools.

Table 3 Learner-teacher ratio in 2017 (The World Bank, 2024)

Country	Primary	Secondary
Albania	17.94	11.60
Bosnia and Herzegovina	17.20	9.34
Iran, Islamic Rep.	28.52	19.01
North Macedonia	14.91	8.74
Serbia	14.28	8.08
South Africa*	30.33	27.62

Note. *South Africa learner to teacher ratio is for the year 2015.

All the selected countries had lower learner-teacher ratios in secondary school than in primary schools. South Africa (followed by Iran) had the highest learner-teacher ratio for both primary and secondary schools. Serbia and North Macedonia had the lowest comparable ratios for both primary and secondary schools. However, Marais (2016) found that, although the South African learner-teacher ratio was 30.33 for primary, and 27.62 for secondary schools, those averages masked the fact that the learner-teacher ratio in more than half of the classrooms was higher (40:1 in primary schools and 35:1 in secondary schools) than the recommended ratio.

Language of Instruction

Bashir et al. (2018) show that the language of instruction is important – especially during the early schooling stages. They also demonstrate that countries in which fewer languages are spoken perform better in terms of education outcomes (Bashir et al., 2018). Table 4 shows a comparison of the languages spoken and official languages of instruction in the selected countries.

Table 4 Official language and language of instruction (LOI)

Country	Official languages and percent speaking the language		LOI
Albania	Albanian	98%	Albanian in all public schools
Bosnia and Herzegovina	Bosnian	52.86%	Bosnian, Serbian, Croatian
	Serbian	30.76%	
	Croatian	14.6%	
Iran, Islamic Rep.	Persian (Farsi)	53%	Persian or Farsi Only
North Macedonia	Macedonian	More than 67%	Macedonian, learners can opt to study in Albanian, Turkish or Serbian
Serbia	Serbian	88%	Serbian at all levels
South Africa*	Zulu	22.70%	Schools must choose a language of learning. Most schools choose English. In actual classrooms teachers use blended languages to help learners understand. Some schools use mother tongue for Grades 1 to 3 and then transition to English.
	Xhosa	16.00%	
	Afrikaans	13.50%	
	English	9.60%	
	Sepedi	9.10%	
	Tswana	8.00%	
	Southern Sotho	7.60%	
	Tsonga	4.50%	
	Swazi or SiSwati	2.50%	
	Venda	2.40%	
	Ndebele	2.10%	

The table above shows that South Africa has the most official languages of all the selected countries. It also provides a wider choice for learners in terms of LOI. In Albania 98% of the population speak Albanian and it is also used as LOI. The same applies to Serbia where 88% of the population speak Serbian, which is also used as LOI. Iran is very linguistically diverse, however use one official language and one LOI.

Instructional Time

Research shows that more instructional time usually leads to increased proficiency in mathematics and writing. This is because more instructional time provides more learning opportunities for learners. The average instructional time in the countries of interest is shown in Table 5. However, in interpreting Table 5, the reader should keep in mind that it is not the absolute number of instructional hours that matters, but how effectively the available time is spent.

Table 5 Instructional time

Country	Instructional time
Albania	• 6 hours per day (30 hours per week)
Bosnia and Herzegovina	• Primary school: 5 hours per day (25 hours per week)
	• Secondary school: 5 to 7 hours (25–35 hours a week)
Iran, Islamic Rep.	• Elementary: 4.8 hours a day (24 hours a week)
North Macedonia	• Secondary: about 5.25 hours (26.25 hours a week)
Serbia	• Secondary: 7 to 8 hours (35–40 hours a week)
South Africa	• Foundation Phase: 4.6 to 5 hours (23–25 hours a week)
	• Thereafter: 5.5 hours (27.5 hours)

Table 5 shows that Serbia has the longest school day of 7 to 8 hours. This is followed by Bosnia and Herzegovina with 5 to 7 hours. Iran has the shortest school days of 4.8 hours while in South Africa the school day is 5.5 hours or 27.5-hour weeks of learning. Although the learning hours in South Africa are shown as 5.5 hours a day, the 2018 Teaching and Learning International Survey found that teachers spent on average only 66% of time teaching – especially in those schools serving learners from disadvantaged socio-economic backgrounds (OECD, 2019). This would reduce the effective school day for those learners to 3.63 hours, far shorter than in any of the other selected countries.

Teacher Education and Experience

An effective education system is underwritten by effective training and continuous professional development of teachers. Table 6 presents the minimum education requirements and professional development practices in the selected countries.

Table 6 Minimum teacher qualifications and professional development time

Country	Minimum	Professional development
Albania	• Master's degree. • Teaching practice, and • Passing state exam	Teachers are expected to obtain 18 hours of professional development every year
Bosnia and Herzegovina	• Bachelor's degree, plus • Professional exam	No formal programme but continuing professional development (CPD) points are used for teacher promotion
Iran, Islamic Rep.	• In-service, 2-year associate degree • Four-year bachelor's degrees programmes	Optional short-term training courses to improve specific teacher and educational staff competencies
North Macedonia	• Four-year bachelor's degree • One-year practice, and • Passing professional exam	Teachers are expected to obtain 60 hours every 3 years
Serbia	• Master's degree • Two years' teaching practice • Professional exam	Teachers are required to obtain 120 points every 5 years
South Africa	• Four-year Bachelor of Education, plus • Advanced Diploma in Education, plus • Registration with SACE	• 150 points in every 3 years • Must be captured on the SACE website • Not to be used for punitive or promotion purposes

Table 6 shows that Albania and Serbia have the highest minimum education requirements for teachers – a master's degree. South Africa has the highest requirement for professional development, namely 150 points every 3 years. However, despite the high number of points required in South Africa, the process is fraught with fundamental challenges. While Iran and Bosnia and Herzegovina have no formal CPD point system, in Bosnia and Herzegovina CPD points contribute to a teacher being promoted.

Correlation Analysis

To further analyse the results, I present correlations between the selected country's TIMSS performance and a few drivers of education outcomes. Only drivers with a numerical measure were computed, namely, learner-teacher ratios, LOI and instructional time.

Table 7 Correlational analysis of a select measures

Education drivers	Correlation
Learner-teacher ratio	-0.84
Number of languages	-0.88
Instructional time	0.59 (*0.93)

Note. *Correlation considering South Africa's effective instructional time.

The computable results in Table 7 all show strong correlations with the countries' performance in the TIMSS survey. As was expected, learner-teacher ratio is strongly negatively correlated to TIMSS performance and so is the number of languages. It may be argued that the language situation in Serbia and Albania is advantageous as a large percentage of their populations speak one language and their comparative performance in TIMSS is high. Instructional time has a strong positive relationship with the countries' performance in the TIMSS survey. If we adjust South Africa's recommended instructional time to the actual instructional time, the overall correlation between instructional time and TIMSS survey performance increases to an almost perfect positive correlation (0.93).

Discussion and Recommendations

With this study I sought to compare South Africa's performance in the 2019 TIMSS survey with countries with similar per capita GDP that participated in the same survey. I explored the differences in key education drivers, namely learner-teacher ratios, LOI, instructional times and teacher education and experience. These factors were selected because studies have demonstrated that these factors had a significant bearing on education outcomes over time. The findings are discussed below.

In terms of learner-teacher ratio, I found that South Africa had the highest learner-teacher ratio compared to the selected countries. I also found that there was a strong negative correlation, between learner-teacher ratio and the TIMSS survey results. This result is consistent with a study by Koc and Celik (2015) in which they found a strong negative correlation (r = -0.561) between the number of learners per teacher and school performance. In fact, the strong negative correlation in this study (r = -0.84) is much higher than that in Koc and Celik's (2015) study. Research has shown that learners from previously disadvantaged backgrounds benefited from smaller class sizes (Schanzenbach, 2014). However, in South Africa those same learners are likely to be in very large classes (Spaull, 2011). I thus recommend that the government explores cost-effective ways to reduce the learner-teacher ratio, especially in poor schools. This can be done by compelling student

teachers to be deployed only to quantile 1 to 4 schools for their 1-year teaching practice.

I also found that countries with a few dominant languages performed better in the 2019 TIMSS survey. More specifically, in Albania 98% of the population speaks Albanian and Serbian is spoken by 88% of the population in Serbia. In South Africa with 12 official languages, the most dominant language, isiZulu, is only spoken by 22.7% of the population. Serbia, followed by Albania, performed best in the 2019 TIMSS. This implies that part of South Africa's poor performance in TIMSS can be attributed to the complex language environment. According to Bashir et al. (2018), countries with high linguistic diversity struggle to find suitably qualified teachers who speak learners' mother tongue. What further complicates the issue in South Africa is that Black schools, to satisfy community preferences, choose English as their LOI even though the learners' mother tongue is different (Kruger, 2009). To increase the language dividend in South African schools, it is recommended that government schools in homogeneous mother tongue areas are compelled to use that language for instruction. This would put into effect the findings by Trudell (2016) that using mother tongue in the classroom increases learner participation, decreases attrition, increases community engagement, and enhances learner cognitive learning.

From the comparative results presented in the previous section, learners benefit from more instructional time. Countries with the highest instructional time (Serbia and Albania) performed better in the TIMSS survey. This is consistent with Orkin's (2013) investigation into the impact of increasing instructional time in Ethiopia. The increased instructional time resulted in increased proficiency in mathematics and writing. The correlation between instructional time and performance in the TIMSS 2019 survey is close to a perfect positive correlation (r = 0.90), if one considers the finding from the OECD (2019) that only 66% of instructional time is effectively used in South African schools. This is consistent with Van Staden and Bosker's (2014) finding that it is not instructional policy that matters, but actual instructional time. I recommend that the government increases instructional time to at least 6 hours per school day for all levels. In addition, schools should be obliged to report on learners' late arrival to school. This would encourage schools to implement policies aimed at helping learners to arrive at school on time.

The results on teacher education show that South Africa has comparatively high requirements for minimum teacher training. In addition, at 150 hours every 3 years, South Africa has the highest expectation for continuous professional teacher development. However, two aspects weaken continuous professional teacher development in South Africa, namely, poor implementation, and the inconsequential nature thereof (that it cannot be used for promotion). Gomba (2019) found that teachers lacked the technical skills to upload their CPD points, and a lack of management support like the provision of free internet access and a lack of interest by educators. It is recommended that the management of continuous professional development be improved by making it easy for teachers to submit CPD points and that such professional development be considered for teachers' promotion.

As highlighted by the correlational analysis one can argue that the selected education drivers impact educational outcomes. All factors are within the influence of the government, albeit at different costs. Even factors such as reducing the learner-teacher ratio, which is potentially costly, can actually be approached cost effectively by changing teacher training policies. Other factors such as increasing effective instructional time and an effective management of teacher CPD are not high-cost interventions.

Conclusion

With this study I sought to determine how South Africa compared to other upper middle-income countries in terms of drivers in educational outcomes. Upper middle-income countries that participated in the 2019 TIMSS survey within half a standard deviation of the South African per capita GDP were selected. From the results, it is apparent that educational drivers reasonably predicted performance in the 2019 TIMSS survey. For instance, in a correlational analysis, it was clear that the percentage of people speaking the same language in a country, the learner-teacher ratio and instructional time all had a strong correlation of more than +/- 0.80. From these results, the Department of Education can start working on low-cost, high-impact interventions like increasing effective instructional time and effective management of teacher CPD to improve educational outcomes in primary and secondary schools.

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