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# Poor education, poor economy – and planning the escape

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*Education is the most powerful weapon we can use to change the world.*
Nelson Mandela,
Speech at the launch of the Mindset Network, 16 July 2003, University of the Witwatersrand

South Africa exited apartheid in 1994 with a fragmented and very unequal education system. The new democratic government had to integrate race-based education departments into a non-racial education system aimed at eradicating racial inequality and preparing learners for the world of work. Unfortunately, in the 27 years since the advent of democracy, the government has only been partially successful in achieving this aim. Although the democratic government registered progress in achieving access and even an improvement in the quality of education, most of the inequalities that existed in the

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mid-1990s still linger. Most township and deep rural schools still underperform former Model C schools (i.e., former white schools), failing to prepare learners for the 21st-century world of work.

This failure means that large numbers of young people end up unemployed, with many never having worked even by their late 20s or early 30s. This has serious implications that stretch further than just the unemployment numbers. Joblessness and the lack of income associated with it contributes to South Africa being the most unequal country globally and results in low intergenerational social and economic mobility. It is generally accepted that for a liberal democracy to be sustainable requires the existence of a strong middle class. If the school system fails to prepare the vast majority of learners for the future world of work, intergenerational social and economic mobility will be limited, thereby entrenching the social and racial divides of the apartheid-era decades after the fall of apartheid, and potentially undermining the stability of the still relatively young democratic order.

In this article I present data that provides (a) an overview of the quality of education in South Africa as measured by the Trends in Mathematics and Science Study of 2019 (TIMSS 2019) released in late 2020, and augment it with data from the Progress in International Reading Literacy Study of 2016 (PIRLS 2016), and (b) an overview of school dropout numbers and the educational attainment of people in their 20s (i.e. those who finished school). I subsequently discuss some of the problems the education system faces, problems that may explain the lack of performance and slow progress made over time. This is followed by a discussion of the broad economic implications of a weak education system, and a conclusion proposing some much-needed measures to improve educational outcomes.

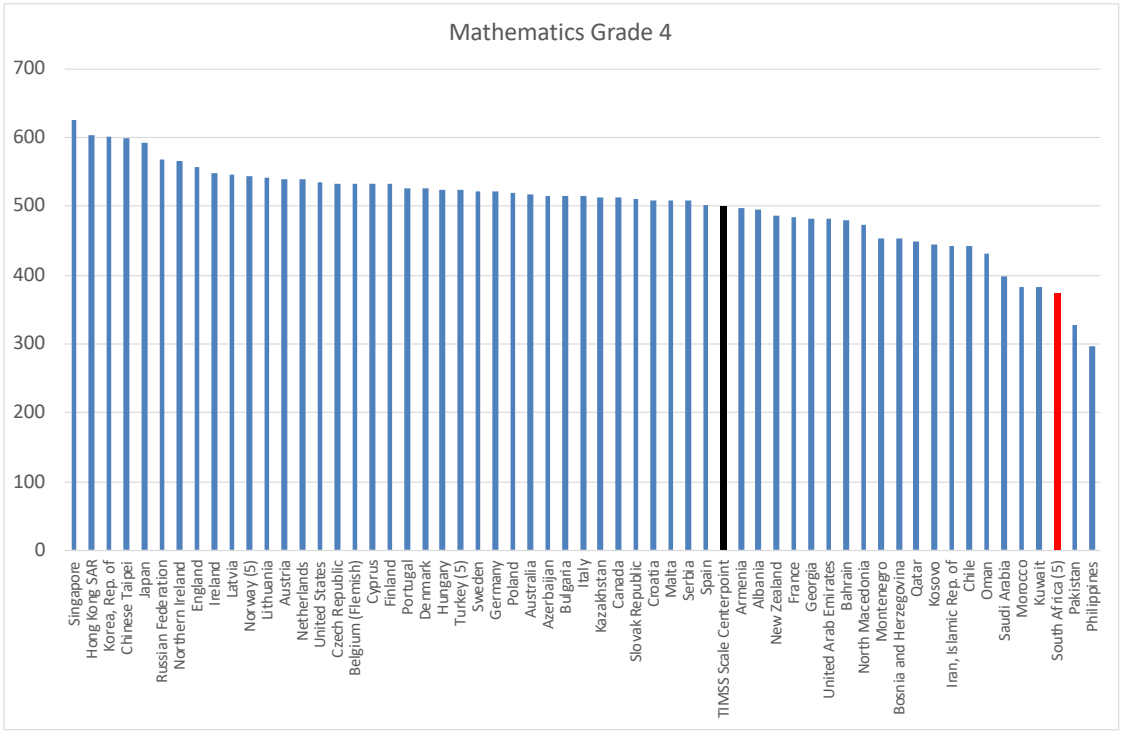
## 1. TIMSS 2019 and PIRLS 2016

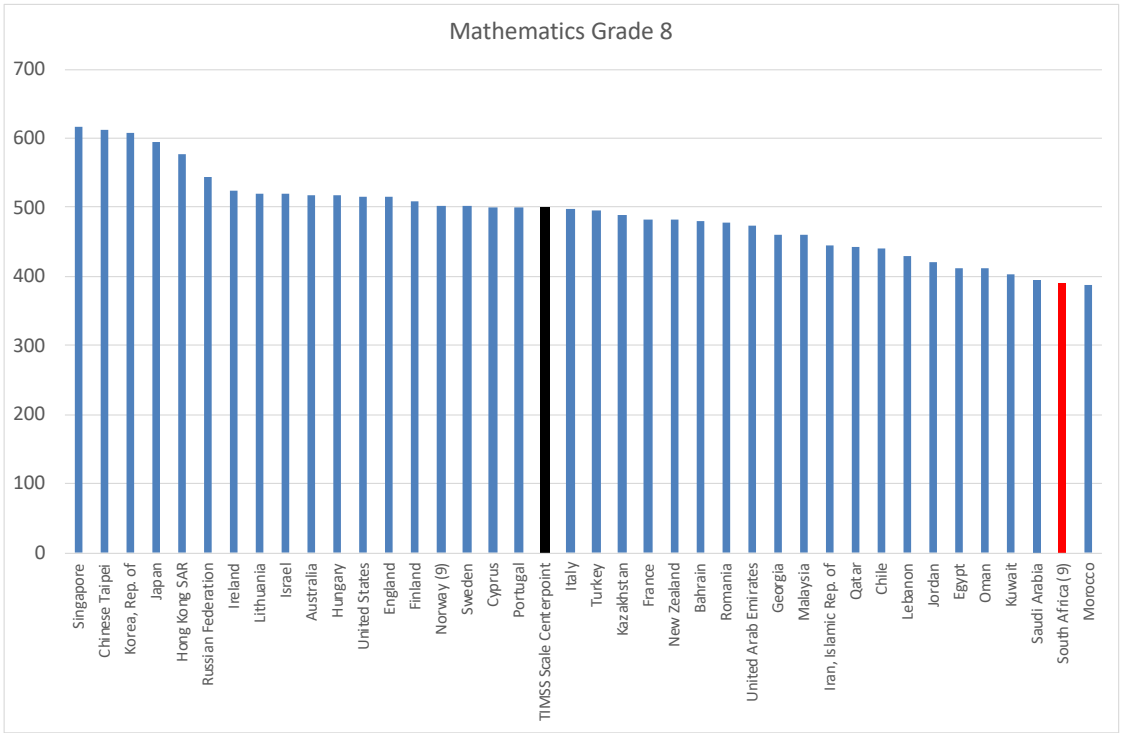
The TIMSS & PIRLS International Study Center at Boston College publishes the Trends in International Mathematics and Science Study (TIMSS) and the Progress in International Reading Literacy Study (PIRLS), covering almost 60 countries. Since 1995 the TIMSS study appeared every four years, measuring how learners in countries around the world in Grades 4 and 8 perform in Mathematics and Science. The 2019 results appeared in late 2020. PIRLS covers Reading Comprehension skills in Grade 4 and has been running every five years, starting in 2001, with the latest results available for 2016.

Both the TIMSS and PIRLS results are standardised, meaning that the results are ordered so that the centralised value for the list of countries is 500 and the standard deviation is 100. If a country's value falls between 400 and 475 that country is classified as 'low achieving', with higher score ranges used to define higher achievement categories.[2] Although South Africa's achievement for most grades have improved over time, even in the latest TIMSS and PIRLS results it does not make the cut for the 'low-achieving' group. In Mathematics Grades 4 and 8 in TIMSS 2019 it scored 374 and 389, while for Science Grades 4 and 8 it scored 324 and 370 (see Figures 1 and 2). In PIRLS 2016 Reading Comprehension Grade 4 it scored 320 points (see Figure 3).

2 Countries falling in the 475 and 550 range are classified as 'intermediate achieving'; those between 550 and 625 as 'high achieving'; and above 625 as 'advanced achieving'.

**Figure 1 – Mathematics Grades 4 and 8**



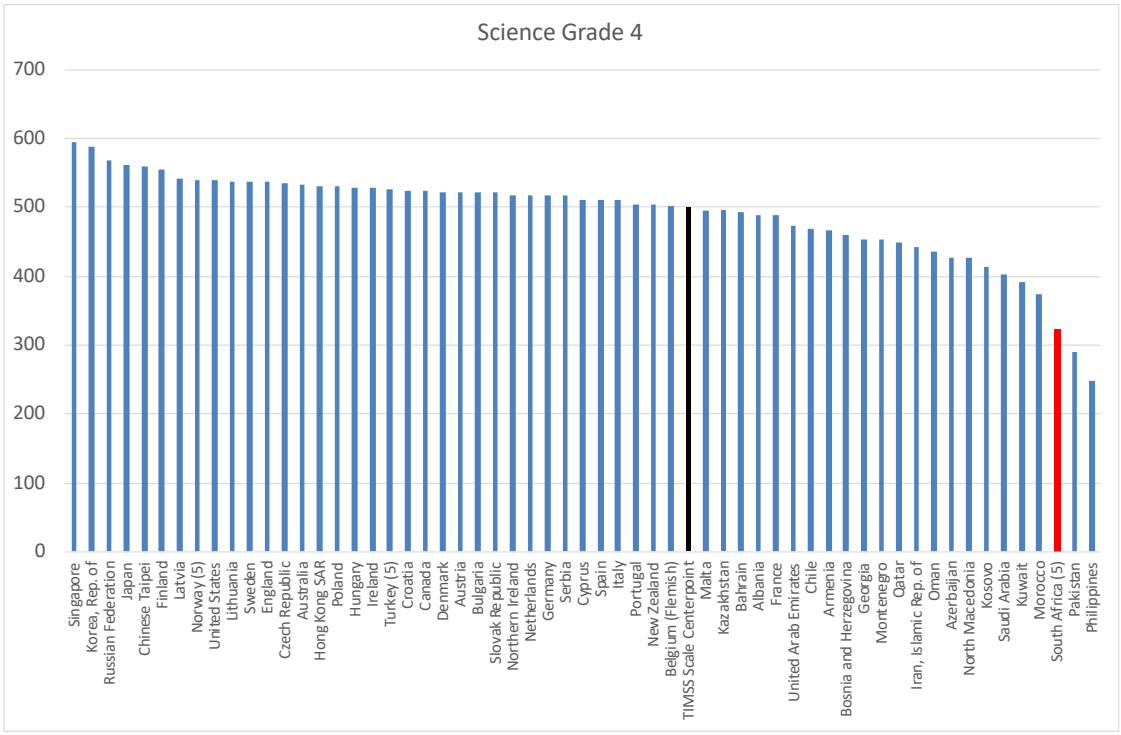



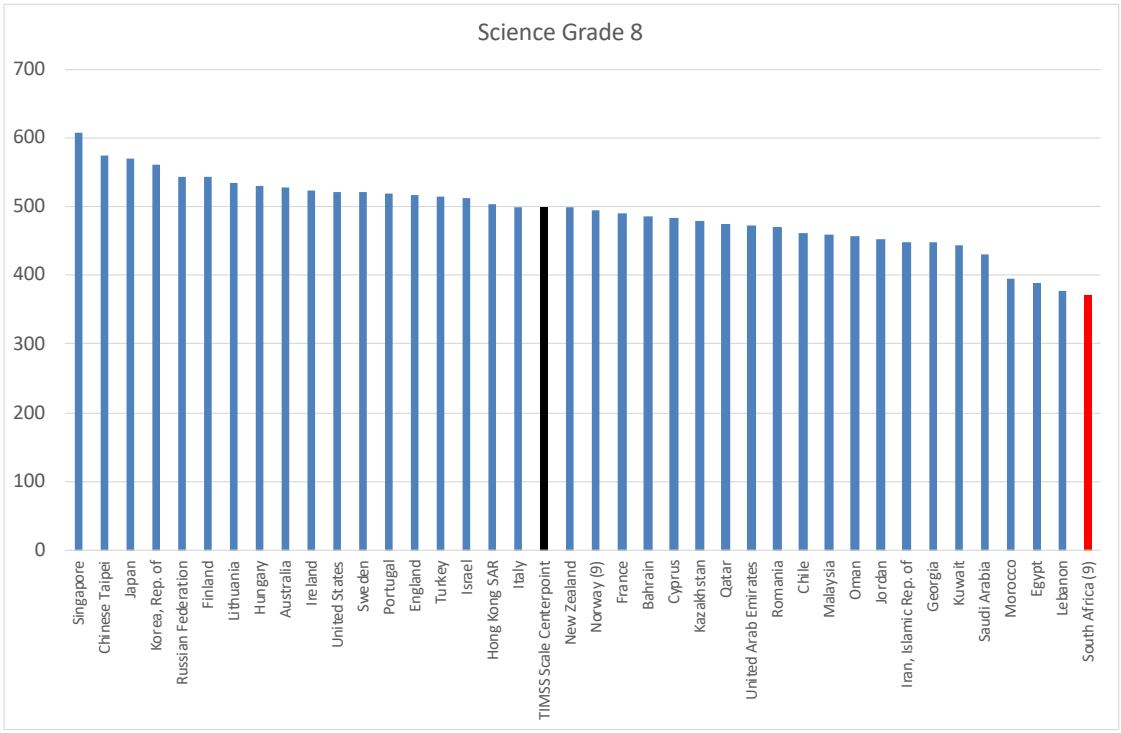

Source: TIMSS 2019 (2020)

Of the 58 countries that participated in the Mathematics and Science Grade 4 surveys, South Africa achieved only the third-last place in both surveys. Countries such as Morocco, Kazakhstan, Turkey and Chile outperformed it in Mathematics and Science Grade 4. For Mathematics and Science Grade 8 South Africa was respectively 38th and last out of 39 countries. It was outperformed by countries such as Turkey, Malaysia, Kazakhstan and Lebanon. In the case or PIRLS Reading Comprehension Grade 4, South

Africa was last out of 51 countries, with countries such as Chile, Georgia, Trinidad and Tobago, and Iran outperforming it. These results are further put in stark relief by the fact that whereas Grade 4 and 8 learners of other countries participated in the studies, in the case of South Africa's it was Grade 5 and 9 learners.

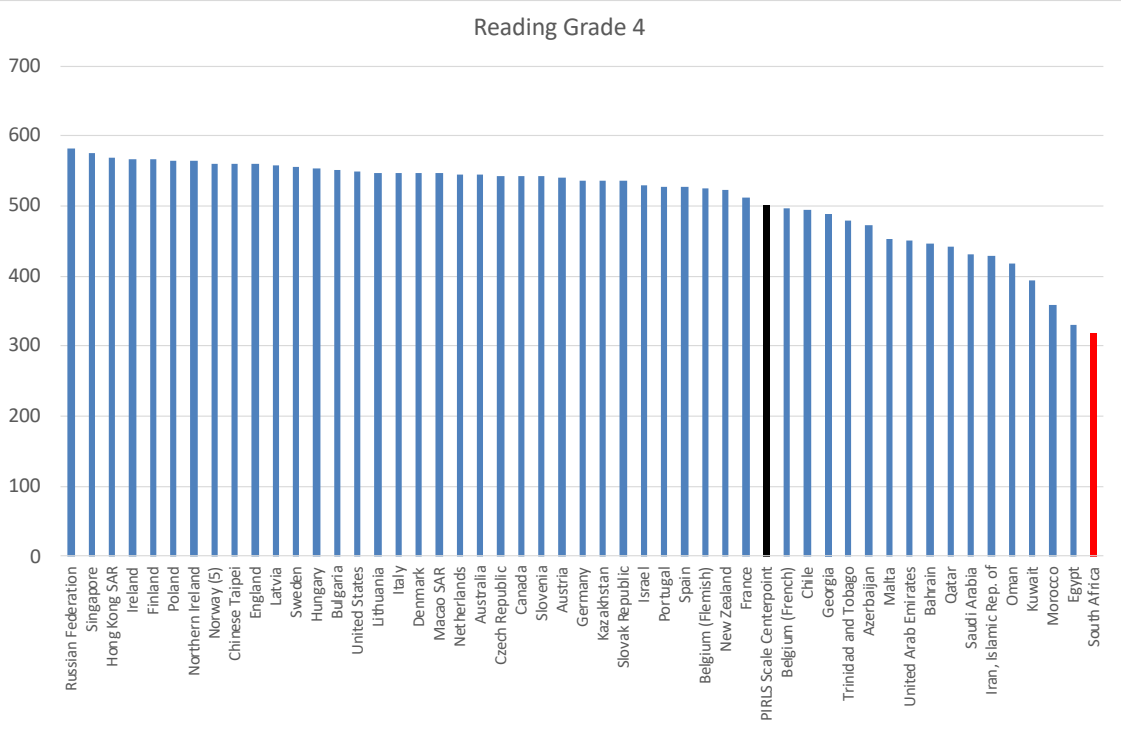
**Figure 2 – Science Grades 4 and 8**




Source: TIMSS 2019 (2020)

**Figure 3 – Reading Comprehension Grade 4**




Source: PIRLS 2016 (2017)

Table 1 shows that while the average for Mathematics Grade 9 was 389 points for South Africa as a whole, for Gauteng and the Western Cape it was much higher, at 421 and 441 points, while for the Eastern Cape and Limpopo it was much lower at 366 and 364. In the case of Science Grade 9 the average was 370 points for South Africa as a whole, but 422 and 439 points for Gauteng and the Western Cape, and a low 334 and 331 for the Eastern Cape and Limpopo. A similar picture emerges for Mathematics and Science Grade 5.

**Table 1 – Provincial results**

| | WC | GT | FS | SA | NC | KZN | EC | NW | MP | LP |
|---|---|---|---|---|---|---|---|---|---|---|
| Grade 5 | | | | | | | | | | |
| Mathematics | 441 | 410 | 387 | 374 | 372 | 360 | 357 | 355 | 343 | 331 |
| Science | 415 | 379 | 333 | 324 | 330 | 302 | 297 | 299 | 284 | 274 |
| Grade 9 | | | | | | | | | | |
| Mathematics | 441 | 421 | 396 | 389 | 377 | 378 | 366 | 383 | 375 | 364 |
| Science | 439 | 422 | 380 | 370 | 358 | 352 | 334 | 358 | 350 | 331 |

Source: Reddy et al. (2020a) and Reddy et al. (2020b)

The inequality of educational outcomes in South Africa becomes apparent when comparing the spread of results in TIMSS and PIRLS for South Africa to the spread in other countries. Table 2 shows that in South Africa learners in the 95th percentile for Mathematics Grade 4 scored 178 points higher than the average, compared to 128 points for all countries. The difference between the 75th and 25th percentiles is 138 points, compared to 110.3 points for all countries. The difference between the 95th and 25th percentiles is 251 points, compared to 181.7 points for all countries. This pattern persists for Science Grades 4 and 8 and Reading Comprehension Grade 4 (see Table 2). The exception is Mathematics Grade 8 (9 for South Africa). Considering the results for Gauteng and the Western Cape, the differences are even starker. Like the case for South Africa on the whole, in Gauteng the exception is Mathematics Grade

9. However, in Mathematics Grade 9 in the Western Cape the inequality is also much higher than is internationally the case on average. The inequality is also quite apparent when considering Science Grade 9, both in Gauteng and the Western Cape. For instance, whereas the difference between the 95th and 5th percentiles internationally on average is 298 points, in Gauteng and the Western Cape it is 429 and 366 points. Though the result is encouraging for Mathematics Grade 9 in South Africa as a whole and Gauteng specifically, the poor result for Mathematics Grade 5 is concerning, indicating a deterioration in education compared to the education Grade 9s received.

**Table 2 – Distribution of results**

| | Average | (75pc-25pc) /Average | 75pc-25pc | 95pc-5pc | 95pc-25pc | 2SE Interval | 95pc-Average |
|---|---|---|---|---|---|---|---|
| Mathematics Grade 4 (5 for SA) | | | | | | | |
| South Africa | 374 | 0.37 | 138 | 330 | 251 | 14 | 178 |
| Average of countries | 500 | 0.23 | 110.3 | 267.3 | 181.7 | 12.0 | 128.0 |
| Mathematics Grade 8 (9 for SA) | | | | | | | |
| South Africa | 389 | 0.26 | 100 | 253 | 191 | 9 | 138 |
| Gauteng | 421 | 0.24 | 102 | 253 | 191 | 12 | 137 |
| Western Cape | 441 | 0.28 | 122 | 295 | 230 | 17 | 165 |
| Average of countries | 500 | 0.25 | 119.0 | 284.1 | 198.4 | 12.9 | 139.6 |
| Science Grade 4 (5 for SA) | | | | | | | |
| South Africa | 324 | 0.58 | 189 | 434 | 338 | 19 | 239 |
| Average of countries | 500 | 0.24 | 112.5 | 273.7 | 183.1 | 13.0 | 129.1 |
| Science Grade 8 (9 for SA) | | | | | | | |
| South Africa | 370 | 0.37 | 137 | 341 | 254 | 12 | 182 |
| Gauteng | 422 | 0.51 | 215 | 429 | 316 | 14 | 209 |
| Western Cape | 439 | 0.35 | 153 | 366 | 278 | 20 | 199 |
| Average of countries | 500 | 0.26 | 123.3 | 298.0 | 200.6 | 13.4 | 141.1 |
| Reading Grade 4 (5 for SA) | | | | | | | |
| South Africa | 320 | 0.45 | 144 | 351 | 252 | 17 | 178 |
| Average of countries | 500 | 0.22 | 106.2 | 263.3 | 171.9 | 10.7 | 121.6 |

Source: TIMSS 2019 (2020) and author's calculations

**Table 3 – TIMSS quintile results**

| | Quintile 1 | Quintile 2 | Quintile 3 | Quintile 4 | Quintile 5 | Independent |
|---|---|---|---|---|---|---|
| Grade 5 | | | | | | |
| Mathematics | 331 | 337 | 354 | 390 | 487 | 463 |
| Science | 263 | 270 | 299 | 352 | 483 | 448 |
| Grade 9 | | | | | | |
| Mathematics | 357 | 366 | 370 | 407 | 464 | 478 |
| Science | 320 | 337 | 345 | 399 | 475 | 490 |

Source: Reddy et al. (2020a) and Reddy et al. (2020b)

Inequality is also apparent when considering the differences in performance between various quintiles of schools in South Africa (see Table 3).[3] Quintiles 1 to 3 represent schools in poorer areas. These are

3 The Department of Basic Education categorises South African schools in quintiles, using a composite index based on average income, unemployment and literacy rates in the areas where schools are located. In principle the poorest 20% of schools constitute Quintile 1, while the richest constitute Quintile 5. Although in principle a quintile should only contain 20% of schools, in practice

also no-fee schools. The data shows that Quintile 5 schools outperform by far schools in lower quintiles, but especially Quintiles 1 to 3. For instance, while the average score in Science Grade 9 is 375 for Quintile 5 schools (which is still below the 'low achieving' international category), Quintile 1 schools only attain an average score of 320.

TIMSS 2019 also includes a breakdown of data in terms of the proportion of learners in more affluent schools, more disadvantaged schools, or schools in between. Table 4 shows that 10% of Mathematics Grade 9 learners in South Africa are in more affluent schools. These are schools where more than 25% of the student body comes from economically affluent homes and not more than 25% from economically disadvantaged homes. These learners have an average of 463 points. Compare this to the 77% of learners who are in more disadvantaged schools, where more than 25% of the student body comes from economically disadvantaged homes and not more than 25% from economically affluent homes. Their average is significantly lower, at 379 points (compared to South Africa's overall average of 389 points). Similar profiles appear for Mathematics Grade 5 and Science Grades 5 and 9. Provincial inequality is again visible, with a larger percentage of Gauteng and Western Cape learners classified as being in more affluent schools, compared to the country as a whole. However, also note the within-category inequality. For instance, while Mathematics Grade 9 learners in more disadvantaged schools in South Africa achieved an average of 379 points, those in more disadvantaged schools in Gauteng and the Western Cape achieved averages of 402 and 418 points.

**Table 4 – Distribution according to affluence**

| | More affluent | | Neither more affluent, nor more disadvantaged | | More disadvantaged | |
|---|---|---|---|---|---|---|
| | % of Students | Average | % of Students | Average | % of Students | Average |
| Math Grade 5 | | | | | | |
| South Africa | 9 | 502 | 13 | 379 | 78 | 364 |
| Math Grade 9 | | | | | | |
| South Africa | 10 | 463 | 13 | 413 | 77 | 379 |
| Gauteng | 17 | 481 | 14 | 467 | 69 | 402 |
| Western Cape | 17 | 558 | 6 | 497 | 77 | 418 |
| Science Grade 5 | | | | | | |
| South Africa | 9 | 501 | 13 | 334 | 78 | 311 |
| Science Grade 9 | | | | | | |
| South Africa | 10 | 469 | 13 | 401 | 77 | 356 |
| Gauteng | 17 | 501 | 14 | 480 | 69 | 398 |
| Western Cape | 17 | 584 | 6 | 516 | 77 | 410 |

Note: More affluent: Schools where more than 25% of the student body comes from economically affluent homes and not more than 25% from economically disadvantaged homes

More disadvantaged: Schools where more than 25% of the student body comes from economically disadvantaged homes and not more than 25% from economically affluent homes

Source: TIMSS 2019 (2020)

Inequality also exists depending on whether a school is in a rural or urban area, a township, small town or village, or in a city. Table 5 shows results for PIRLS on reading ability of Grade 4 learners, classified according to where their schools are located. The results show that learners in schools located in medium cities and small towns on average outperform learners in suburban and urban areas, who in

Quintiles 1 to 3 are larger. Schools in Quintiles 1 to 3 are no-fee schools, which means that over time schools in Quintiles 4 and 5 have an incentive to get reclassified as Quintile 1 to 3 schools. Notwithstanding this reclassification, Quintile 1 to 3 schools still underperform relative to Quintile 4 and 5 schools.

turn outperform learners in townships. Learners in townships, in turn, outperform learners in small towns, villages and remote rural areas.

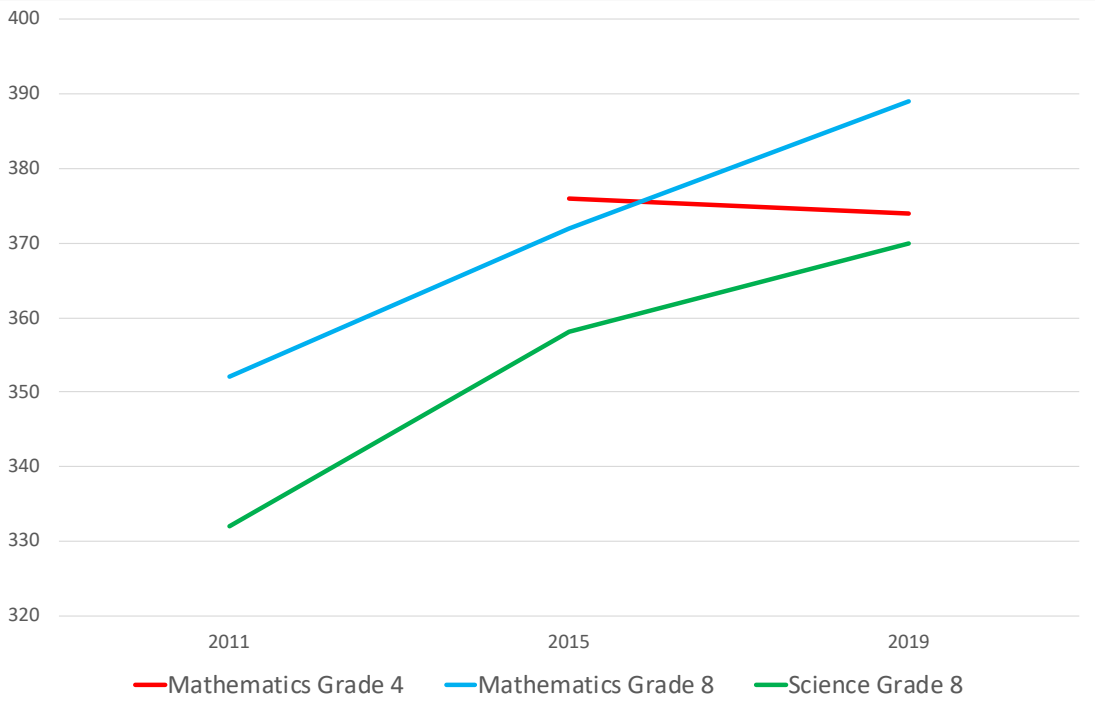
**Table 5 – PIRLS 2016 – Performance and area school is located**

| | Average score |
|---|---|
| Remote rural | 291 |
| Small town or village | 302 |
| Township | 312 |
| Urban | 384 |
| Suburban | 393 |
| Medium city and large town | 417 |

Source: Howie et al (2017)

South Africa's 95th percentile result for Mathematics and Science Grade 9 are 527 and 552. In the case of Science Grade 8, the *average scores* for Singapore, Taiwan, Japan and Korea outperform even the 95th percentile score for Grade 9 for South Africa, while the Grade 8 average scores for these same four countries together with Hong Kong and Russia outperform even South Africa's 95th percentile for Mathematics Grade 9. In Reading for Comprehension Grade 4 the results are even more stark. At 498 points, the 95th percentile point in South Africa does not even exceed the international average of 500, with the *average score* in 34 countries outperforming the score for the 95th percentile in South Africa.

**Figure 4 – Performance in Mathematics and Science in South Africa over time**




Note: South Africa participated in the 1995, 1999 and 2003 TIMSS, however, according to TIMSS 2019 these earlier data are "...not comparable for measuring trends to 2019, primarily due to countries improving translations or to differences in population coverage".

Source: TIMSS 2019 (2020)

Though still below the 400-points lower boundary of the 'low achieving' category, South Africa's performance in both Mathematics and Science Grade 8 improved between TIMSS 2011 and 2019 (see

Figure 4). If South Africa registers the same point improvement in Mathematics and Science Grade 8 in future years, it will exit the 'low achieving' category (which has an upper boundary of 475 points) only after 2039 in the case of Mathematics Grade 8 and 2053 in the case of Science Grade 8. However, what does not bode well for future improvements in Mathematics Grade 8 is the performance in Mathematics Grade 4, which has remained stagnant (it even slightly deteriorated) between 2014 and 2019. This reiterates the concern mentioned above with regard to Mathematics Grade 4.

**Table 6 – South Africa compared to international benchmarks**

| | Advanced Benchmark (625) | High Benchmark (550) | Intermediate Benchmark (475) | Low Benchmark (400) |
|---|---|---|---|---|
| Mathematics Grade 4 | | | | |
| South Africa (5) | 1 | 5 | 16 | 37 |
| International Median | 7 | 34 | 71 | 92 |
| Mathematics Grade 8 | | | | |
| South Africa (9) | 1 | 3 | 13 | 41 |
| Gauteng (9) | 1 | 6 | 23 | 58 |
| Western Cape (9) | 3 | 13 | 32 | 64 |
| International Median | 5 | 25 | 56 | 87 |
| Science Grade 4 | | | | |
| South Africa (5) | 2 | 6 | 14 | 28 |
| International Median | 6 | 32 | 71 | 92 |
| Science Grade 8 | | | | |
| South Africa (9) | 1 | 5 | 15 | 36 |
| Gauteng (9) | 2 | 11 | 29 | 57 |
| Western Cape (9) | 6 | 17 | 35 | 60 |
| International Median | 7 | 29 | 61 | 85 |

Source: TIMSS 2019 (2020)

TIMSS 2019 also presents data on the proportion of learners who outperform a number of benchmarks. These are 'advanced benchmark' (achieving at least 625 points), 'high benchmark' (550 points), 'intermediate benchmark' (475 points) and the 'low benchmark' (400 points). Table 6 presents the results for South Africa compared to the international median values. It shows that compared to an international median of 7% of Mathematics Grade 4 students who outperform the 'advanced benchmark', in South Africa only 1% outperform that benchmark. What is of more concern is South Africa's poor performance in the 'intermediate' and 'low benchmark' groups. With an international median of 56% of students outperforming the 'intermediate benchmark' of 475 points in Mathematics Grade 8, in South Africa only 13% succeeded in doing so. In none of the four groups (i.e. Mathematics and Science Grades 4 and 8) did more than 41% of South African students outperform even the 'low benchmark'.

There are however provincial differences (also see Table 6). Results for Mathematics Grade 8 show that whereas only 41% of learners nationally outperformed the 'low benchmark', in the case of Gauteng and the Western Cape it is 58% and 64%. And in the case of Science Grade 8, whereas only 36% of learners outperform the 'low benchmark' for South Africa as a whole, in the case of Gauteng and the Western Cape it is 57% and 60%. Note that in the case of the 'advanced benchmark' for Science Grade 8, the Western Cape at 6% performs very close to the international median of 7%, on par, more or less, with New Zealand (8%), Portugal (7%), Qatar (7%) and Norway (6%). (These four countries, however, far exceed Gauteng and the Western Cape in terms of outperforming the 'low benchmark' (New Zealand (85%), Portugal (95%), Qatar (76%) and Norway (86%)).

## 2. Dropout rates – a cause for concern

In the last number of years, the Department of Basic Education reported matric pass rates of over 70%, or even 80% (My Broadband 2020). These numbers can create a false perception that the education system is performing relatively well. A closer inspection, however, reveals continuing reason for concern. First, students pass matric if they score as little as 30% in three subjects, and 40% in three other subjects (of which one needs to be a home language). A learner can therefore pass matric with an overall average of 35%. Secondly, almost half of all learners drop out of school before reaching matric. In response to a question in Parliament in 2019, the Minister of Education reported that in pooled data for 2016 to 2018, for learners born in the period 1992 to 1994, from pre-school to Grade 9, 10.2% of learners dropped out (Parliamentary Monitoring Group 2019). The drop-out rate then increased significantly, with a further 37.8% having dropped out from Grades 10 to 12. In total 48% of all learners dropped out before the end of matric (Grade 12). This statistic is borne out by the findings of Statistics SA's 2018 General Household Survey, which found that in 2018 only 53.8% of 22–25-year-olds have completed Grade 12 or above (see Table 7) (Statistics SA 2019). Note that this nevertheless represents a significant improvement compared to 2009 when that figure was only 44.9% for 22–25-year-olds. There are also still wide racial disparities present, with Table 7 showing that in 2018 only 51.6% and 52.5% of African and coloured 22–25-year-olds have completed matric, compared to 81.1% and 81.9% of white and Indian 22–25-year-olds. Note that for African and coloured 22–25-year-olds the 2018 values represent an improvement compared to 2009, when the corresponding values where 40.1% and 45.2%, while for whites and Indians the values represent a deterioration, with the 2009 values being 85.9% and 83.2%.
A further indicator of the large dropout numbers is the large proportion of 16–18-year-olds who are not attending educational institutions. Table 8 shows that in 2018, 13.4% of 16–18-year-olds did not attend any educational institutional. This number, though, is an improvement when compared to the 16.4% of 16–18-year-olds who did not attend educational institutions in 2009. The data also shows that the compulsory school attendance up to 16 years of age and access to schooling is effective, with only 1% of 7–15-year-olds not attending any educational institutions (see Table 8). Though already low, this number too represents an improvement compared to the 1.6% of 2009.

**Table 7 – Percentage of 22–25-year-olds who completed Grade 12 or above, 2009–2018**

| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|---|
| African | 40.1 | 41.1 | 43.2 | 43.6 | 44.4 | 48.4 | 47 | 46.7 | 48.8 | 51.6 |
| Coloured | 45.2 | 48.8 | 43.9 | 46.7 | 45.5 | 47.6 | 49.7 | 51.5 | 45.8 | 52.5 |
| Indian | 83.2 | 80.3 | 84.6 | 74.6 | 81.8 | 81.2 | 78.5 | 86.5 | 81.3 | 81.9 |
| White | 85.9 | 85.6 | 89.1 | 89 | 86.9 | 87.9 | 85.6 | 83.4 | 79.2 | 81.1 |
| Total | 44.9 | 45.6 | 47.1 | 47.4 | 47.9 | 51.4 | 50.1 | 50 | 50.7 | 53.8 |

Source: Statistics SA (2019)

**Table 8 – Percentage not attending educational institutions, 2009–2018**

| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|---|
| 7-18 years | 5.2 | 5.3 | 4.8 | 4.5 | 4.5 | 4.3 | 4.6 | 4.6 | 4 | 3.8 |
| 7-15 years | 1.6 | 1.3 | 1.2 | 1.2 | 1.2 | 1 | 1.2 | 1.1 | 1 | 1 |
| 16-18 years | 16.4 | 17 | 15.3 | 14.1 | 13.9 | 13.9 | 15 | 14.9 | 14 | 13.4 |

Source: Statistics SA (2019)

As the discussion above has demonstrated, South African education does not prepare learners to perform at the same achievement levels as learners in a long list of other countries. Two direct reasons for this weak performance are teachers with insufficient skill levels, and the weak state of school infrastructure. I discuss these in turn.

## 3. Skill levels of teachers

The world of work requires increasing numbers of people with so-called STEM (i.e. Science, Technology, Engineering and Mathematics) skills. For instance, the Royal Bank of Canada (2018) indicated that 70% of all job openings in Canada require mathematical skills. With countries competing in a globalised world, countries where workers possess such skills will have a competitive advantage over those who do not possess large numbers of such skills.

However, despite the need to prepare larger numbers of learners for a world of work that requires larger numbers of people with STEM skills, South Africa does not even have a sufficient number of Mathematics teachers with such skills. Venkat and Spaull (2015) have found that 79% of Mathematics Grade 6 teachers have a content knowledge of Mathematics lower than what Grade 6 learners should possess. An additional 5% have content knowledge on par with what a Mathematics Grade 6 learner should possess. And 17% of Mathematics Grade 6 teachers have a content knowledge on par with what Grade 4 to 5 learners should possess. Venkat and Spaull (2015) also show that the proportion of Mathematics Grade 6 teachers with content knowledge on par with the knowledge of what a Mathematics Grade 8 to 9 should know differs sharply among school quintiles. In Quintile 5 it is 45%, which is low, but significantly better than the 4% to 8% in Quintile 1 to 3 schools.

The reason South Africa has a limited number of skilled Mathematics teachers can be traced back to the apartheid era and its system of job reservation that allocated skilled jobs to whites and thus notoriously saw no need to provide black children with a proper education in Mathematics. Many of those children are today's Mathematics teachers. However, since the fall of apartheid and the advent of democracy in 1994, there has not been enough intervention from the government to rectify the situation. This is largely as a result of the government not being fully in control of its own education system, leaving it limited in its capacity to manage quality, unable to test teachers to assess their skill levels, and the country's main teachers' union, the South African Democratic Teachers Union (SADTU), playing an outsized political and management role in the management of schools and provincial education departments.

Following allegations in City Press in April and May 2014 about corruption in the filling of posts at public schools, the Minister of Basic Education appointed a Ministerial Task Team chaired by Professor John Volmink to investigate these allegations. The Task Team reported back in May 2016 and found evidence of widespread corruption and irregularities that warranted further police investigations into SADTU officials playing a key role in the selling of teacher and principal positions at schools (Ministerial Task Team 2016).

Aside from the corruption, the Task Team also found that the government was not in control of the management of at least six of the nine provincial education departments, and that SADTU effectively ran these departments. Provincial education departments and their subordinate education districts oversee the running of schools, including the appointment of teachers and principals. The Task Team found that in many districts administrative and management capacity is so weak that SADTU effectively runs these districts. This was aggravated in provinces where SADTU is the dominant labour union.

In addition, the Task Team reported that human resources (HR) practices allow school principals and senior departmental managers to remain SADTU members. In principle, these officials represent the interest of the employer, which, when they remain SADTU members, leaves them with a conflict of interest when they have to deal with their employees who are represented by SADTU. The Task Team therefore proposed that senior officials such as school principals should not be allowed to be SADTU members, but rather have a labour union of their own. That would eliminate the conflict of interest and remove SADTU's influence over these senior positions.

The Task Team also proposed stripping school governing bodies (SGBs) of their power to appoint heads of department, deputy principals and principals. SGBs are parent representatives, and rarely possess the

human resource expertise to properly appoint senior management at schools. This weakness allows SADTU to control the appointment process.
Almost none of the Task Team's proposals were implemented. Minister Motshekga in 2017 stated that in the cases of corruption she dealt with, though the officials were corrupt, she saw no proof that SADTU itself was guilty. In more recent time, rather than a conflictual relationship between SADTU and the department, the relationship became more cooperative. However, the minister still cannot, in effect, implement any significant decision without the agreement of SADTU.

## 4. School infrastructure

Not only do schools suffer a lack of skilled teachers, but most schools also lack the infrastructure needed to provide quality education. The Department of Basic Education publishes a summary of infrastructure each year entitled the National Education Infrastructure Management System (NEIMS) Standard Report. The latest report presents the state of school infrastructure as of August 2020. Table 9 presents some of the main findings. It shows that there are 23,267 public schools in South Africa, of which 3415 are so-called micro schools. The report covers various aspects of infrastructure, among other the continuing presence of pit toilets, the availability of water, electricity, the internet, cell phone and landline coverage, and the presence of computer centres, science laboratories and libraries.
Compared to earlier years, conditions have improved (see for instance the NEIMS reports for earlier years (2012 to 2019), as well as Passmark (2018) for 2018 statistics on pit toilets). Nevertheless, the report shows that in 2020, 5771 schools, or 24.8% of the 23,267 public schools in South Africa, still had pit toilets, while 3164 of these schools, or 13.6% of all public schools, had only pit toilets. Not only are pit toilets less hygienic, but they pose a danger to especially small children. In 2014 five-year-old Michael Komape fell into a pit toilet at a Limpopo school and died. The same happened in 2018 in an Eastern Cape school to five-year-old Lumka Mketwa. In late December 2020 Minister Angie Motshekga stated the government's intention to eradicate the last pit toilets at schools by March 2022 (Nkosi 2020).
Pit toilets are not the only problems schools put up with. The NEIMS report shows that 25.1% of all schools (5839 schools) have unreliable water supply and 14.4% (3345 schools) have unreliable electricity supply. The problem with unreliable water supply was especially highlighted in early 2020 when, with the outbreak of the Covid-19 pandemic and hence the increased need to wash hands, the government scrambled to supply schools with water tanks (Harper 2020). Yet, as the report shows, by August 2020 a quarter of schools still had an unreliable water supply.
While 94.6% of schools had cell phone coverage, only 46.1% had a landline. In an increasingly globally connected world, only 4723 schools (20.3% of schools) had access to the internet for teaching purposes, while 6852 schools (29.4% of schools) had access to the internet for administrative purposes. And in an era where literacy is increasingly understood to include basic computer literacy, only 7212 schools (31% of schools) had a computer centre. South Africa's dismal performance in the TIMSS Science assessments, discussed above, is also better understood when considering that only 3428 schools (14.7% of schools) have science laboratories. In addition, only 5129 schools (22% of schools) have libraries. With no libraries, schools will find it very difficult to encourage a reading culture among learners, more so since, as Table 10 shows, up to 24% of learners are in households with few resources. Such households, according to the TIMSS 2019 definition, have fewer than 25 books. The average TIMSS scores for children in these households were 349 and 287 points for Mathematics and Science, compared to the 385 and 340 points for children in households with some resources (and thus, households with between 25 and 100 books).

**Table 9 – The state of school infrastructure (2020)**

| | Number of schools | Micro schools | Pit toilets | Only pit toilets | Unreliable water supply | Unreliable electricity | Cell network | Landline | Internet for Teaching & Learning | Internet for Admin | Computer centre | Laboratory | Library |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Eastern Cape | 5291 | 1051 | 1616 | 1243 | 2621 | 1900 | 5161 | 1276 | 570 | 1170 | 528 | 377 | 331 |
| Free State | 1084 | 231 | 127 | 122 | 62 | 49 | 1032 | 869 | 304 | 387 | 421 | 328 | 418 |
| Gauteng | 2073 | 98 | 0 | 0 | 81 | 105 | 1762 | 1867 | 1327 | 1441 | 1597 | 693 | 1261 |
| KwaZulu-Natal | 5803 | 761 | 1272 | 1099 | 1629 | 693 | 5609 | 2443 | 536 | 998 | 1837 | 667 | 1339 |
| Limpopo | 3833 | 437 | 2226 | 472 | 821 | 320 | 3781 | 882 | 150 | 342 | 548 | 230 | 309 |
| Mpumalanga | 1716 | 196 | 385 | 107 | 239 | 60 | 1636 | 910 | 88 | 185 | 646 | 215 | 163 |
| North West | 1469 | 263 | 145 | 121 | 278 | 159 | 1442 | 641 | 274 | 649 | 589 | 296 | 240 |
| Northern Cape | 544 | 128 | 0 | 0 | 98 | 50 | 502 | 419 | 217 | 395 | 254 | 128 | 316 |
| Western Cape | 1454 | 250 | 0 | 0 | 10 | 9 | 1091 | 1420 | 1257 | 1285 | 792 | 494 | 752 |
| **Total** | **23267** | **3415** | **5771** | **3164** | **5839** | **3345** | **22016** | **10727** | **4723** | **6852** | **7212** | **3428** | **5129** |
| **Percentage** | | | | | | | | | | | | | |
| Eastern Cape | | 19.9 | 30.5 | 23.5 | 49.5 | 35.9 | 97.5 | 24.1 | 10.8 | 22.1 | 10.0 | 7.1 | 6.3 |
| Free State | | 21.3 | 11.7 | 11.3 | 5.7 | 4.5 | 95.2 | 80.2 | 28.0 | 35.7 | 38.8 | 30.3 | 38.6 |
| Gauteng | | 4.7 | 0.0 | 0.0 | 3.9 | 5.1 | 85.0 | 90.1 | 64.0 | 69.5 | 77.0 | 33.4 | 60.8 |
| KwaZulu-Natal | | 13.1 | 21.9 | 18.9 | 28.1 | 11.9 | 96.7 | 42.1 | 9.2 | 17.2 | 31.7 | 11.5 | 23.1 |
| Limpopo | | 11.4 | 58.1 | 12.3 | 21.4 | 8.3 | 98.6 | 23.0 | 3.9 | 8.9 | 14.3 | 6.0 | 8.1 |
| Mpumalanga | | 11.4 | 22.4 | 6.2 | 13.9 | 3.5 | 95.3 | 53.0 | 5.1 | 10.8 | 37.6 | 12.5 | 9.5 |
| North West | | 17.9 | 9.9 | 8.2 | 18.9 | 10.8 | 98.2 | 43.6 | 18.7 | 44.2 | 40.1 | 20.1 | 16.3 |
| Northern Cape | | 23.5 | 0.0 | 0.0 | 18.0 | 9.2 | 92.3 | 77.0 | 39.9 | 72.6 | 46.7 | 23.5 | 58.1 |
| Western Cape | | 17.2 | 0.0 | 0.0 | 0.7 | 0.6 | 75.0 | 97.7 | 86.5 | 88.4 | 54.5 | 34.0 | 51.7 |
| **Total** | | **14.7** | **24.8** | **13.6** | **25.1** | **14.4** | **94.6** | **46.1** | **20.3** | **29.4** | **31.0** | **14.7** | **22.0** |

Source: Department of Basic Education (2020)

**Table 10 – Household resources**

| | Many Resources | | Some Resources | | Few Resources | |
|---|---|---|---|---|---|---|
| | Percent of Students | Average Achievement | Percent of Students | Average Achievement | Percent of Students | Average Achievement |
| Mathematics and Science Grade 4 | | | | | | |
| South Africa (5) and (9) | 2 | ~ (M)<br>~ (S) | 74 | 385 (M)<br>340 (S) | 24 | 349 (M)<br>287 (S) |
| International Average | 17 | 562 (M)<br>557 (S | 75 | 498 (M)<br>488 (S) | 8 | 433 (M)<br>414 (S) |
| Mathematics and Science Grade 8 | | | | | | |
| South Africa (5) and (9) | 2 | ~ (M)<br>~ (S) | 63 | 396 (M)<br>381 (S) | 35 | 373 (M)<br>345 (S) |
| International Average | 14 | 546 (M)<br>549 (S) | 73 | 488 (M)<br>489 (S) | 13 | 433 (M)<br>431 (S) |

Note: Many Resources: households with more than 100 books, including 25 children's books, own room for the child, access to internet at home, at least one parent finished university, at least one parent in professional occupation.

Few Resources: households with 25 or fewer books, including 10 or fewer children's books, no own room for the child, no access to Internet at home, neither parent have beyond upper secondary education, neither parent is a small business owner or work as in clerical or professional occupation,

Some Resources: In between 'Many Resources' and 'Few Resources'.

(M): Mathematics

(S): Science

~: Not sufficient data to make calculation.

Source: TIMSS 2019 (2020)

Table 9 also shows the vast inequalities among provinces. For instance, while 13.6% of schools in the country have only pit toilets, in the Eastern Cape it is 23.5%, and in KwaZulu-Natal it is 18.9%. Of the 3264 schools nationally that only have pit toilets, 1243 are in the Eastern Cape and 1099 are in KwaZulu-Natal. The three provinces with the largest proportion of schools with unreliable water supply are the Eastern Cape (49.5% of schools), KwaZulu-Natal (28.1%) and Limpopo (21.4%). In addition, 35.9% of schools in the Eastern Cape have unreliable electricity supply and only 24.1% have a landline. Whereas 20.3% of schools nationally have access to the internet for teaching purposes, it is a low 10.8% in the Eastern Cape, 9.2% in KwaZulu-Natal, and an almost negligible 5.1% and 3.9% in Mpumalanga and Limpopo. These low levels contrast starkly with the 86.5% in the Western Cape. Only 10% of schools in the Eastern Cape and 14.3% in Limpopo have computer centres, while 7.1% of schools in the Eastern Cape, 11.5% in KwaZulu-Natal, 6% in Mpumalanga and 12.5% in Limpopo have science laboratories. A similar picture emerges for libraries, with only 6.3% of schools in the Eastern Cape, 8.1% in KwaZulu-Natal, 9.5% in Mpumalanga and 16.3% in Limpopo with libraries.

The Eastern Cape, KwaZulu-Natal, Limpopo and Mpumalanga stand out as the provinces experiencing most school infrastructure backlogs. The vast majority of these backlogs are to be found in the deep rural areas of these four provinces, and mostly in areas that constituted the former bantustan areas of the apartheid era (see for instance the map provided by Passmark (2018) pertaining to the situation in 2018, in which the geographical distribution of schools clearly trace the outlines of the former bantustan areas such as the Transkei, Ciskei and Venda, (the situation has improved somewhat when comparing 2018 to 2020, but still most of the large backlogs persist)). Most of the land in these areas are communal land areas under traditional leadership (for more on this, as well as on education, see Burger 2018).

## 5. Economic impact of education

Economic output depends on, among other, the amount of physical capital and labour used to produce output as well as what economists call 'total factor productivity'. Total factor productivity is the productivity of the combination of capital and labour used to produce output. Improvements in

technology increases the rate at which total factor productivity increases, and therefore, raises the economic growth rate. Improvements in technology require sustained research and development (R&D) and investment, including foreign direct investment that is accompanied by the transfer of skills and knowledge across borders (e.g. a German automaker training South African workers in its South African plant). R&D as well as the transfer of skill and knowledge require minimum levels of schooling in workers, which means that in the absence of these levels of schooling such R&D, foreign direct investment and skills transfer will be limited. This, in turn, will limit the extent to which total factor productivity and thus the economic growth rate can be raised. Fedderke and Simkins (2012) noted that the underperformance of the South African school system resulted in too few learners leaving school with the mathematical and scientific skills needed to support R&D.

International evidence bears out the need for a quality education system. In a panel of countries that include South Africa, Hanushek (2015) and Hanushek and Woessmann (2015; 2012; 2008), demonstrate that after taking other factors into account, it is the quality of education, and not the number of years of schooling, that determines the economic growth rate of a country. Arguing why quality and not the number of years should be used to assess the impact of education on economic growth, Hanushek (2015: 34) remarks that it is implausible to assume that "... a year of school in Japan has the same value in terms of skills as a year of school in South Africa". Using international test scores for Mathematics and Science (TIMSS data) to proxy education quality, Hanushek (2015) and Hanushek and Woessmann (2015; 2012; 2008) find that countries with higher quality education tend to also have higher economic growth.

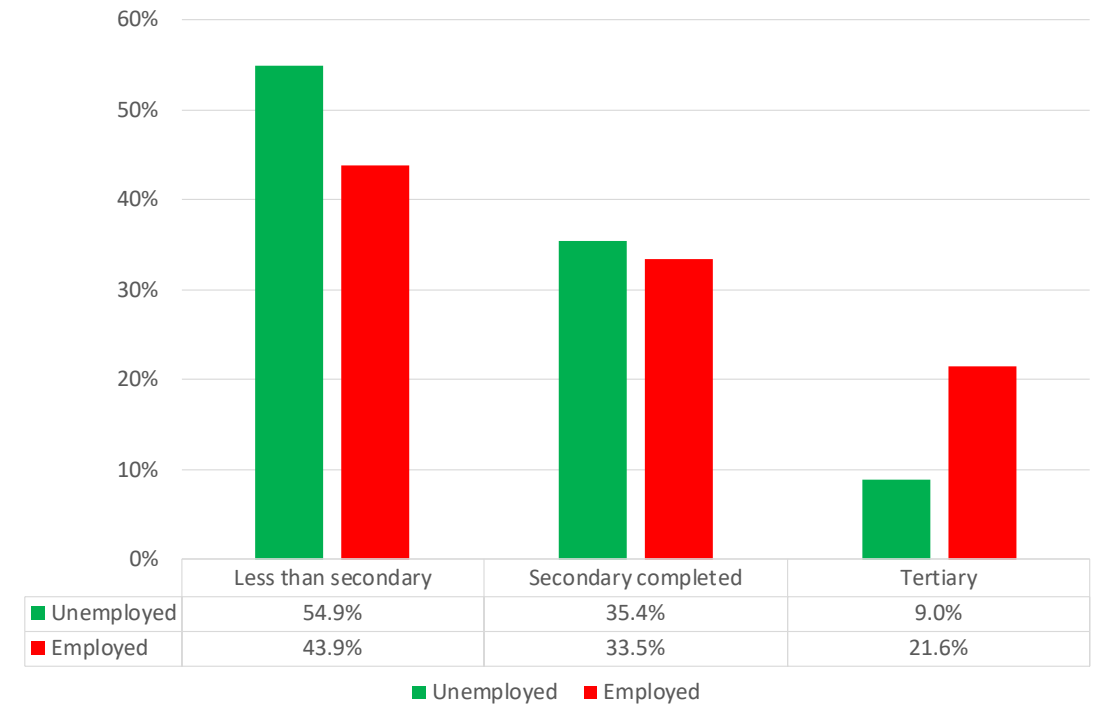
South Africa's skills mismatch can be seen in Figure 5, which shows the highest educational attainment of the employed and unemployed in the first quarter of 2020.4 It shows that whereas 21.6% of the employed had a tertiary qualification, in the case of the unemployed it was only 9%. Workers who did not matriculate – an important category given the large school dropout rates discussed above – constitute almost 55% of unemployed, but almost 44% of the employed. Put differently, the unemployment rate for workers with less than secondary education was 35.1%, compared to 31.4% for those who completed secondary education, and 15.2% for those with a tertiary qualification. These numbers demonstrate the difficulty the economy has to absorb poorly educated workers into employment. Given the country's economic structure and setup, these workers are unemployed because they are unemployable.

Skilled workers whose skills raise productivity will also be required for an export-driven policy, mostly because the labour cost of relatively unskilled labour in South Africa raise the unit labour cost of output (meaning the cost of labour to produce a unit of output) to a level that prevents South Africa from competing internationally on the basis of cheap labour.[5] An export-driven economic growth policy has formed part of South Africa's overall growth policy since the introduction of the Growth, Employment and Redistribution (GEAR) strategy of government in 1996. It also formed part of the Accelerated and Shared Growth Initiative for South Africa (ASGISA) in 2006, and the National Development Plan (NDP) in 2012. However, except for the period 2003 to 2008 when economic growth attained levels of between 3% and 5.5%, economic growth since 1994 was relatively low (and certainly lower than was needed to eradicate the country's unemployment problem). Exports therefore did not serve as a continuous, sustained growth engine.

4 Later data is available, but distorted by the impact of Covid-19 on the economy.

5 To lower unit labour cost requires either an improvement in productivity or the lowering of wages. However, according to Rodrik (2006) lowering wages would politically be out of the question in South Africa given the expectations associated with the political transition of the mid-1990s that followed the dismantling of apartheid. That leaves the improvement of productivity and therefore skills as the only option to lower unit labour cost.

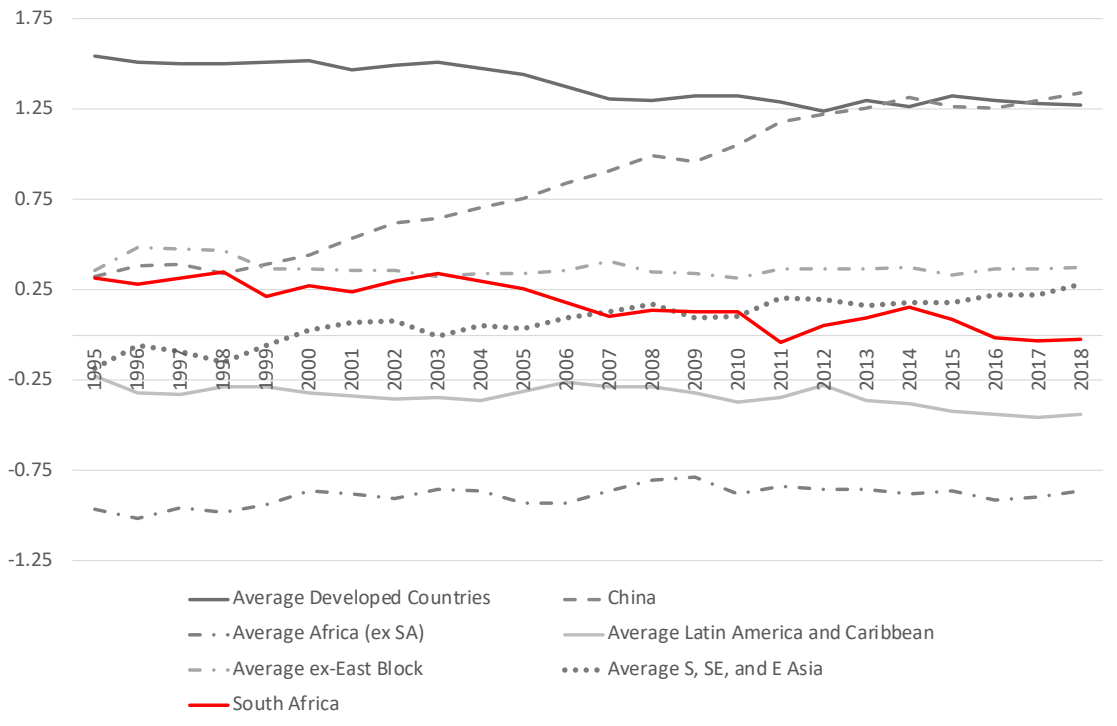
**Figure 5 – Education levels of the employed and unemployed (2020Q1)**




| | Less than secondary | Secondary completed | Tertiary |
|---|---|---|---|
| Unemployed | 54.9% | 35.4% | 9.0% |
| Employed | 43.9% | 33.5% | 21.6% |

Source: Statistics SA (2020)

**Figure 6 – Economic Complexity Indices (ECI) for groups of countries**

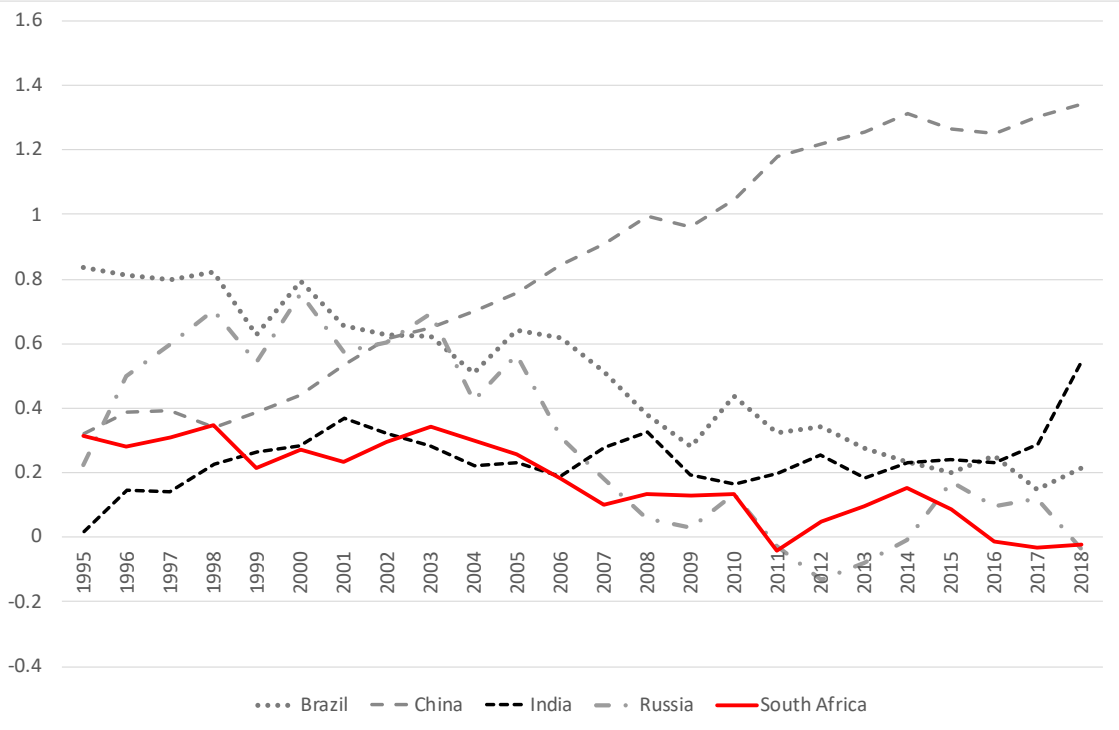



Source: Center for International Development (2020)

The Economic Complexity Indices (ECI), published by Harvard University's Center for International Development (CID) under the leadership of Professor Ricardo Hausmann, might assist to understand why South Africa's export performance was so lacklustre and the role low levels of education play in its

export performance. The CID publishes the ECI for a long list of countries (Center for International Development 2020). According to the CID, economic complexity "expresses the diversity and sophistication of the productive capabilities embedded in the exports of each country" and that the ECI explains differences in income across countries. Lack of skills will limit the productive capabilities embedded in exports. Figure 6 shows that the ECI for South Africa fell from 0.32 in 1995 to -0.02 in 2018. This indicates the deterioration in the complexity of the country's exports and reflects the limited skills base that results from South Africa's schooling system. Also note that at 0.32 in 1995 China had the same ECI level as South Africa, but its ECI and therefore level of productive capabilities embedded in its exports, increased to 1.34 by 2018. Furthermore, note that South, South East and East Asian economies also registered significant improvements in their ECI index, surpassing South Africa since 2010. As Figure 7 shows, among the BRICS countries, South Africa's ECI is similar to that of Russia, with the ECI of both Russia and Brazil deteriorating along that of South Africa since 1995. India's ECI remained relatively stable.

**Figure 7 – Economic Complexity Indices (ECI) for BRICS countries**




Source: Center for International Development (2020)

Not only is education necessary to improve productivity, but it also contributes to lower levels of inequality and improved intergenerational social and economic mobility. Thus, higher levels of education will improve intergenerational mobility (Corak 2013a; 2013b). With low intergenerational mobility the children of the rich will probably also be rich, while children of the poor will probably also be poor. If intergenerational mobility is high the children of the poor are less likely to remain poor. Corak further shows that an improvement in intergenerational mobility is associated with lower levels of inequality. This means that higher levels of education are also associated with lower levels of inequality; the child of a poor person, when getting educated, stands a better chance of securing a higher income, thereby reducing income inequality.

Education therefore fulfils a double function. It assists in creating opportunities for upward social and economic mobility and the reduction of inequality in society, and it creates the skills pool necessary for the improvement in productivity and economic growth.

## 6. Conclusion and recommendations

In the long run, higher economic growth, the reduction of inequality and an improvement in social and economic intergenerational mobility will largely depend on whether or not South Africa succeeds in substantially lifting the quality of its education system. Without such improvements in the quality of education, an increase in economic growth and a reduction in inequality will probably be short lived and unsustainable. South Africa will find it increasingly more difficult to compete internationally, with countries such as China, India and other South, South East and East Asian economies outcompeting South African exports. Education therefore requires a number of substantial interventions to improve the quality of education.

The quality of teaching Science, Technology, Engineering and Mathematical (STEM) skills as well as reading and comprehension skills need to improve. Mechanisation and digitisation of the modern, future economy will require substantially larger numbers of workers with STEM skills. This will also require a major upskilling of the corps of Mathematics and Science teachers. As Venkat and Spaull (2015) have shown, most of the Mathematics Grade 6 teachers do not even have the competency level required from their learners. And as Spaull (2017) noted, PIRLS 2016 showed that 78% of Grade 4 learners cannot read for meaning. Teaching learners from pre-school level to read with comprehension will require special attention and interventions from policy-makers, as reading with comprehension is the foundation of most learning, including in Mathematics and Science. Based on the maxim that 'you cannot manage it if you cannot measure it', teacher training will also have to incorporate the testing of teacher skills and competency. Measurement then needs to be followed up by training those teachers who fall short of the required competence levels, and after having had a fair opportunity to improve their skills, exiting those who are unable to improve their competency to required levels from the education sector.

South Africa frequently in the past imported doctors from Cuba. It did so again to augment the shortage of doctors during the Covid-19 pandemic. Using the same principle, it could import Mathematics and Science teachers from English-speaking and English-medium-of-education countries.

As part of the improvement of the quality of education, the marks learners should obtain to pass subjects should be gradually increased to 50%. Both learners and teachers will experience a gradual increase to 50% as disruptive, but in time expectations will adjust and send a signal to both learners and teachers about required performance.

The recommendations of the Ministerial Task Team (2016) chaired by Professor John Volmink should also be implemented. This includes prohibiting principals, deputy principals, heads of department at schools, and the management at school district and departmental levels from belonging to the same labour union as teachers (ideally, they should not belong to a labour union at all, since they represent management and not workers). This will remove the conflict of interest for school and district managers when engaging teachers employed in their schools. It will also prevent SADTU from interfering with the appointment of school principals. In addition, SGBs should not play a role in the appointment of management staff at schools, again to prevent abuse by SADTU.

Improving education in South Africa will take time, planning and the right interventions. It will also take a number of politically unpopular decisions. Of particular importance, but politically likely difficult, is limiting the power of labour unions to represent only the interests of their members and not interfere in the management of schools. Such limitation is necessary to allow the national and provincial education departments and schools to operate in the interest of South Africa's children. Failing to improve education will condemn yet another generation to poverty and unemployment. Successful improvement, though, will plot an escape path to a better economic future and strengthen democracy.

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