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Teacher Demographics Policy Dialogue

1 December 2022

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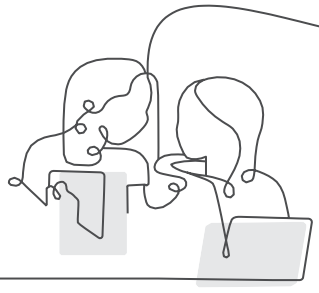

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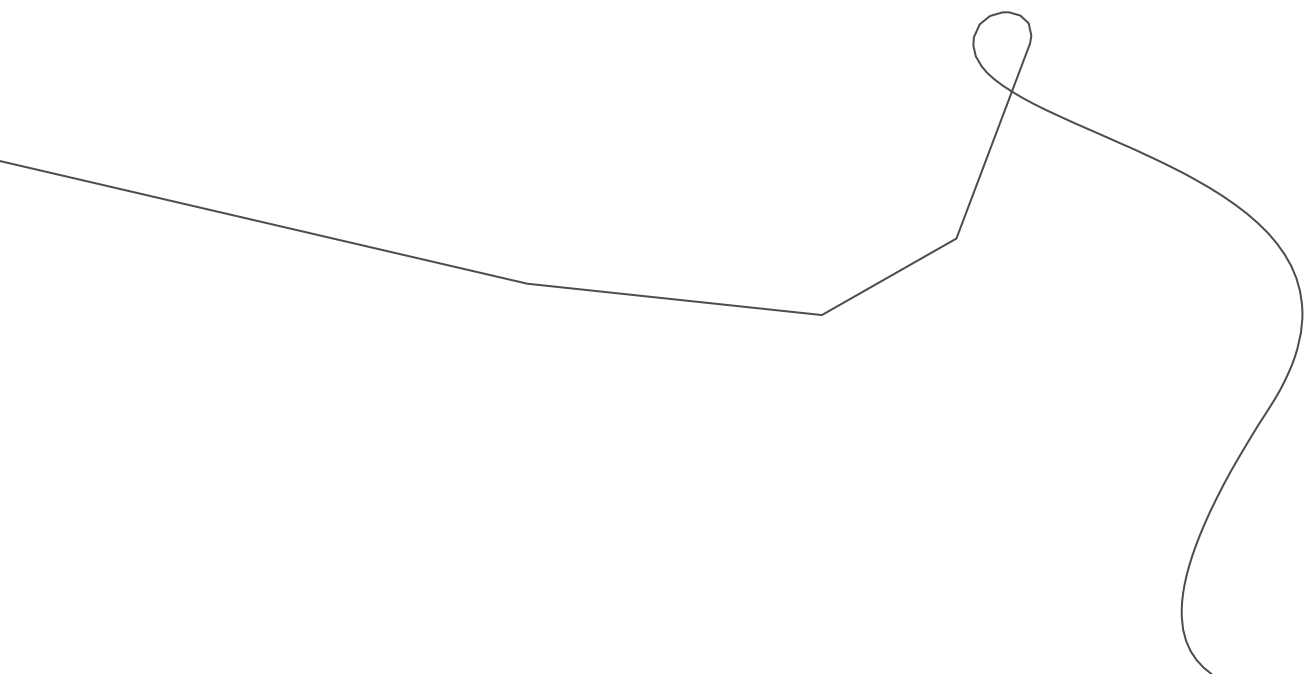
Teacher **D**emographic **D**ividend.



1

How many teachers will retire by 2030?

Servaas van der Berg & Martin Gustafsson (10 Nov 2022)

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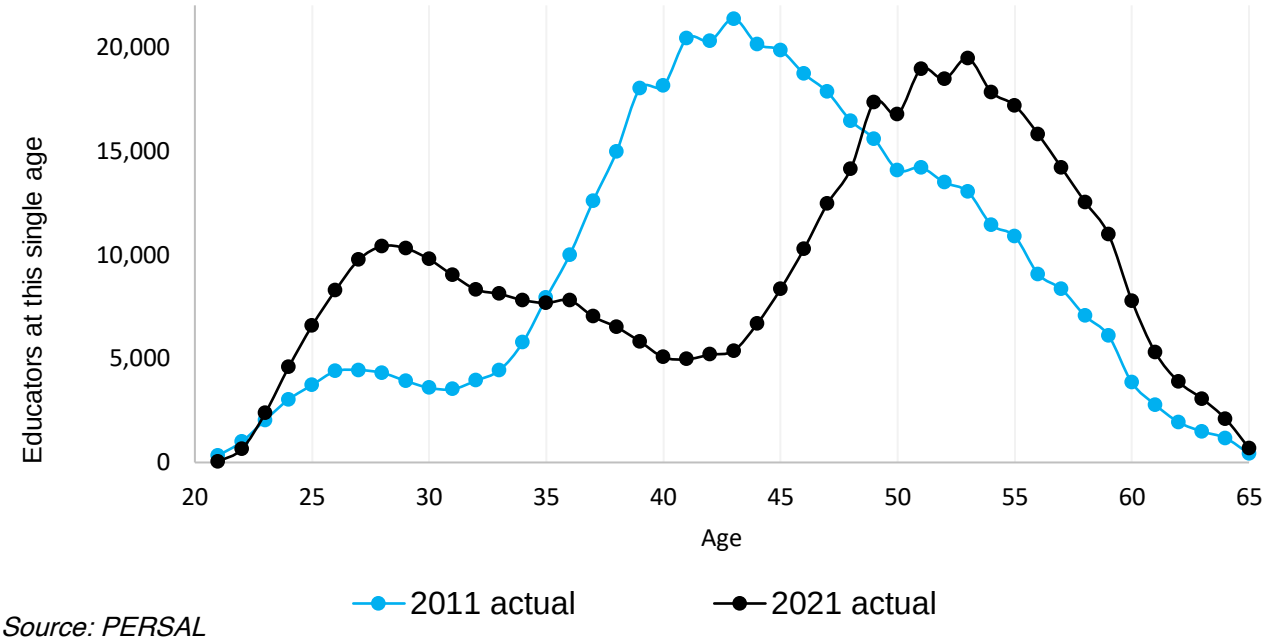
Half of South African publicly-employed teachers (49%) are aged 50+ in 2021 leading to an approaching wave of teacher retirements. Figure 1 shows how the age distribution of teachers has shifted over the past decade, with the age peak increasing from 43 years in 2011 to 53 years in 2021. Teachers can retire from age 55, and in most circumstances have to retire by age 60, though in some circumstances a limited number are allowed to remain in teaching until age 65. Altogether, 49% of teachers are 50 years or older, and 25% at least 55 years old. Thus a large retirement wave is inevitable.

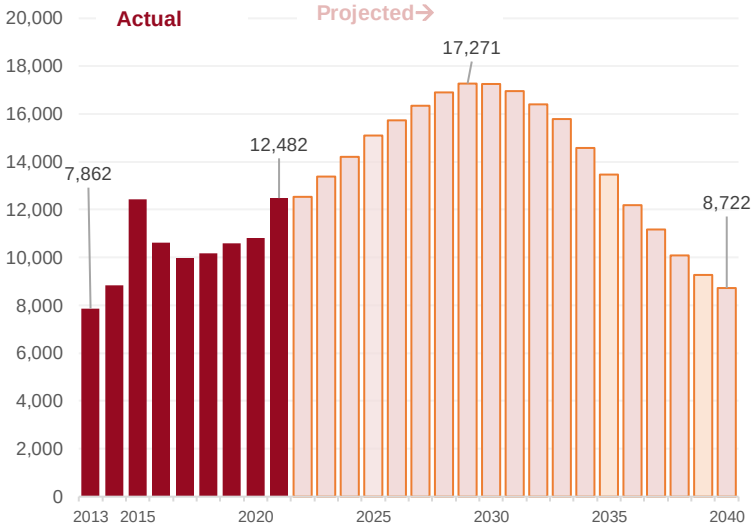
***Figure 1**: Age distribution of publicly-employed educators in 2011 and 2021*



Source: PERSAL

Retirements and other forms of departure from the public teaching sector will rise strongly in the age group 55 and above. In 2013, just over 7,800 public sector educators aged 55+ had left in the previous year, a number that rose to just under 12,500 in 2021. Projections beyond 2021 of these numbers used the 2021 age distribution and past patterns of attrition from whatever cause. These projections indicate that leavers in this age group will peak at around 2029, at almost 17,300, after more than doubling since 2013. After 2030, the number will again decline back to about 8,700 in 2040.

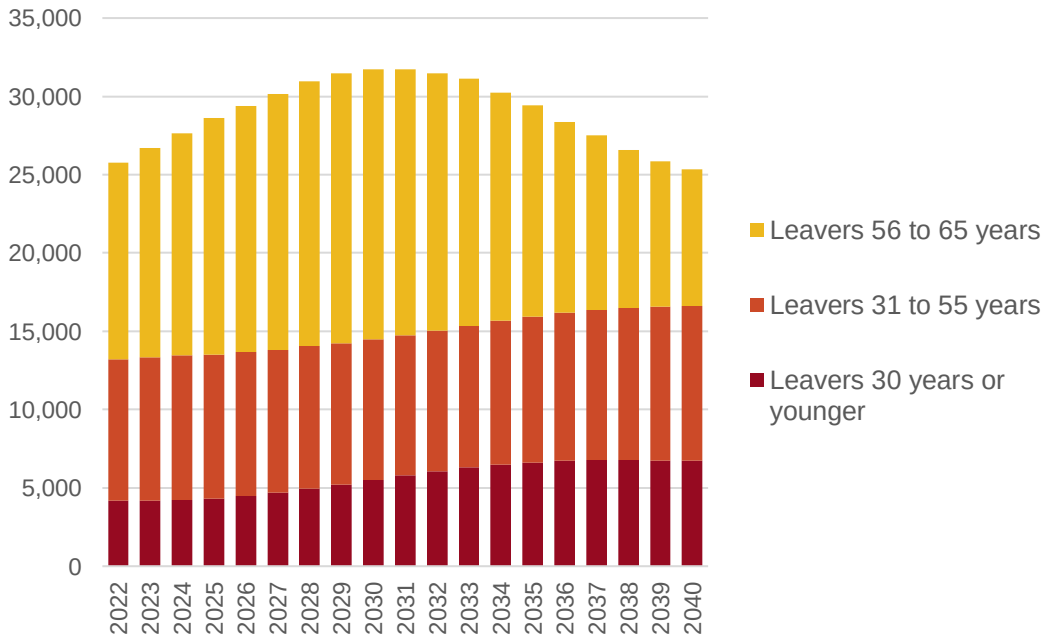
***Figure 2:** Actual & projected retirements/ leavers from the public sector teaching corps for the age group 55 and older, 2013 to 2040*



Note: These numbers refer to teachers from the previous year no longer teaching in the public sector.
Source: PERSAL and Resep projections.

Around half of the teachers leaving public teaching each year are below the initial official retirement age of 55. Attrition before qualifying for retirement is affected by many factors, such as: (a) many women leaving the labour market when starting a family; (b) financially attractive options for teaching abroad; (c) moving to private schools or into School Governing Body (SGB) posts; (d) availability of alternative jobs outside of teaching; and for some (e) frustration with a teaching job. It is difficult to project how such attrition would evolve in future – factors such as the state of the economy and consequent demand for more skilled workers in other fields, or the growth of private schools, are difficult to predict. Alternative projections are based on past attrition rates from the teacher salary database (PERSAL). These projections were then compared and their sensitivity to alternative assumptions was tested for two age groups, younger teachers (30 years or younger), and teachers over 30 but below 55 years, the age at which teachers become eligible for retirement. Figure 3 shows projected numbers of leavers in these two age groups and in the potential retirement age group 55 and above that was shown in the previous figure. Unsurprisingly, attrition numbers are projected to grow less in the younger two age groups than for potential retirees, with the share of leavers 55 and older set to rise slightly from 49% in 2022 to 55% in 2031, before declining sharply thereafter. The increase in younger leavers seen in Figure 3 is due to two factors: attrition rates are relatively high for younger teachers, and projections indicate that younger teachers will account for a growing share of all educators.

Figure 3: *Projected numbers of teachers that will leave the public sector by age group, 2022 to 2040*



Source: PERSAL and Resep projections
Note: These numbers refer to teachers from the previous year no longer teaching in the public sector

Although modelling includes uncertainty, demographic effects on retirement are clear. Modelling of this nature is inherently uncertain and includes assumptions. However, the inexorable demographic effect on retirement means that the broad contours of these projections must be correct. The country has already entered a period in which many more teachers are required than had been the case in the past, simply to fill previous positions. In addition, the number of learners in schools is still growing, in part because of reduced dropout and greater flows to Grade 12. This further expands the need for more teachers. Moreover, to improve the learner-educator ratio at
least back to the levels that applied in 2011 would require even more additional teachers (see Note 2).

The need for more education graduates will thus grow in this decade, even just to maintain current teacher numbers. Increases in two types of leavers will drive this. Firstly, increases in retirements and departures of older educators in general, shown in Figure 2, will mean that by 2030 some 6,000 additional newly graduated teachers will have to be drawn into the system, compared to the current situation. Moreover, having more younger educators in the system results in more young leavers, as historically young teachers display relatively high attrition rates. However, because universities have already increased the output of graduates in recent years, for instance by 70% between 2014 and 2020, there would only be a limited need for additional graduates above recent outputs to maintain current teacher numbers.

Depending on assumptions made regarding the attrition behaviour of younger teachers, teacher graduate output may have to be around 4,000 higher in 2030 than in 2020 to maintain the current stock of publicly paid educators. However, these figures assume no growth in the teacher workforce. Even to maintain current learner-educator ratios in public schools, the stock of teachers would have to increase due to rising enrolment. Taking the ratio back to its more favourable 2011 level would mean a considerable increase in graduate output.

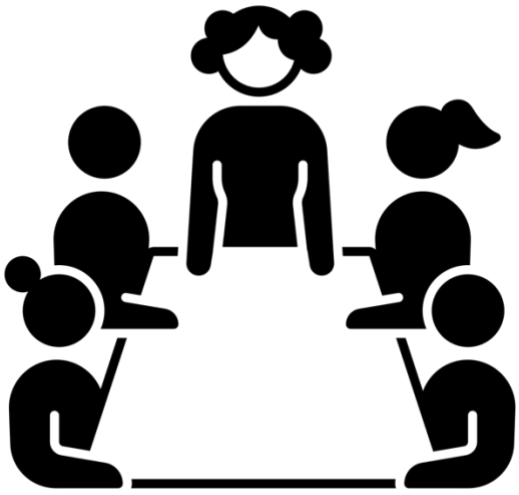
Modelling done so far suggests that by 2030 graduate output would have to be between 6,000 and 13,000 higher than it currently is, depending on the attrition rates of younger educators. The success universities have achieved in increasing graduate output in recent years makes the situation less worrying than if universities had not achieved this. To illustrate, in 2020 universities added around 28,000 teachers to the country's stock of teachers. Over ten years, this would be a total output of 280,000. This should be seen against a current total stock of publicly paid educators of around 400,000. Even if graduates not entering the public service are taken into account, the outputs of universities are on a sound trajectory, and should be able to deal with a demand for a larger teacher workforce to reduce the LE ratio, reduce class sizes somewhat, and put the country back on an improvement trajectory in the international testing programmes. What emerges as the greatest constraint is a lacking commitment to increasing the teacher workforce, in line with a substantial increase in the child population, an increase which was not anticipated even ten years ago, when it was believed that this population would continually decline for the foreseeable future. Growing the existing teacher workforce obviously has serious financial implications, and for this reason much of the modelling focuses on different financial scenarios.

2

Teacher production, class size & learner population growth

How many teachers will be required for South Africa to maintain or reduce LE ratios given increases in learner population numbers?

Nic Spaull (10 Nov 2022)



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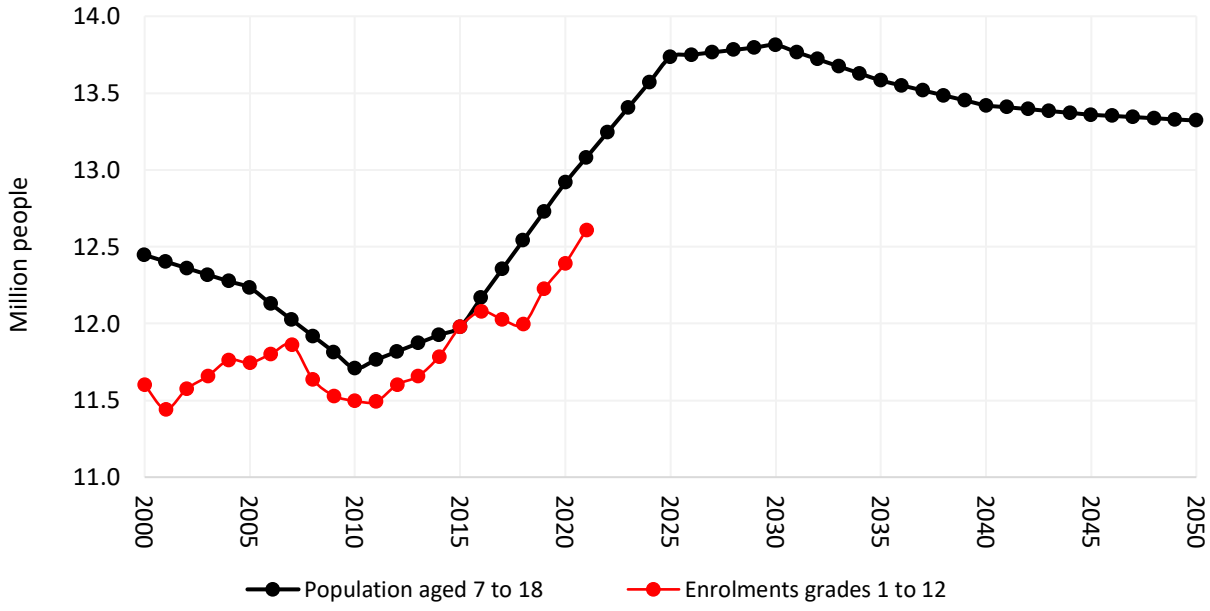
This report summarises some of the analysis from Gustafsson, M. (2022). Projections of Educators by Age and Average Cost to 2070. RESEP Unpublished report. Stellenbosch.

Factors other than teacher retirements will also require more teachers to be produced and employed, notably population increases and addressing Learner-Educator ratios. While the incoming wave of teacher retirements will require more teachers to be produced by universities and hired by provinces just to maintain teacher headcounts, two other factors are likely to drive further demand for teacher production: (1) increases in enrolment, and (2) reducing Learner-Educator (LE) ratios.

Between 2021 and 2030 the school-age population is projected to increase by 5,6%. Figure 1 below reports the United Nations population estimates for 7-18 year olds in South Africa from 2000 to 2050, as well as enrolment numbers in Grades 1 to 12 from the DBE. Two trends are immediately clear, firstly that since 2007 the enrolment numbers have tracked the UN population estimates fairly consistently. And secondly, the population of 7–18-year-olds is projected to continue to increase to 2030. The increase in the school age population between 2021 and 2030 comes to 5,6%. This suggests that enrolments can be expected to increase substantially to 2030.

If reductions in dropout are also accounted for, enrolment is projected to increase by 6,2%. Apart from the actual number of children in a cohort, if fewer children drop out of school then enrolment numbers also increase. Historically there has been an improvement in retention rates to matric, with public Grade 12 enrolment as a percentage of the 18 year old population increasing by 1,4 percentage points per year between 2012 and 2020. If this trend of higher survival to Grade 12 continues, then enrolments are projected to increase by 6,2% between 2021 and 2030. To maintain Learner-Educator (LE) ratios and prevent class sizes from rising, teacher headcount will also have to increase by 6,2%. This is over and above the teachers needed to replace retiring teachers or other attrition.

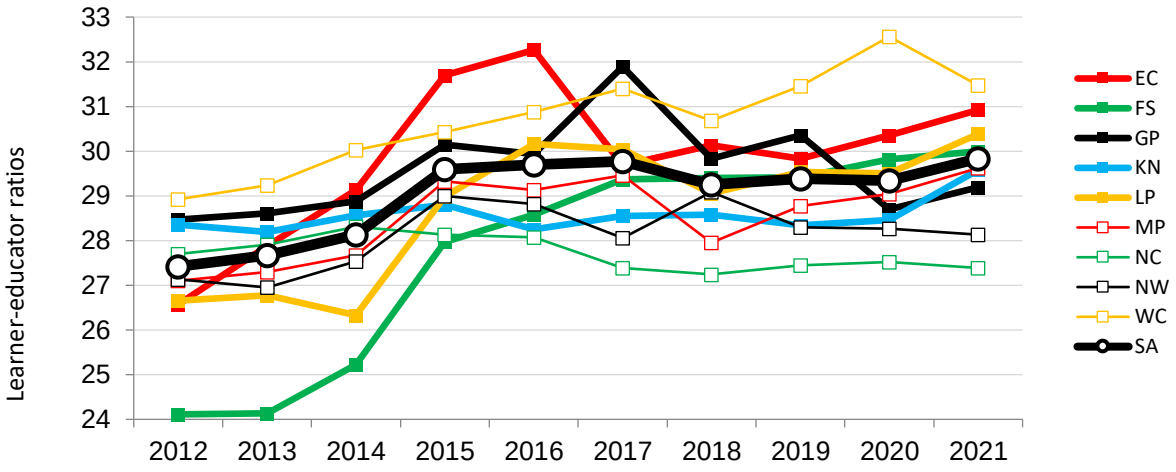
Figure 1: *Child population estimates (2000-2050) and Grade 1-12 learner enrolments (2000-2021)*



Sources: The source for population is the World Population Prospects 2019 of the United Nations, available through https://population.un.org. Figures for ages 7 to 18 were derived, using the UN data and Stats SA's Sprague tool to derive single age values and a simple linear trend to derive years between the every fifth year of the UN data. Stats SA's Sprague tool was last released online together with the 2016 Mid-year Population Estimates files. The source for the enrolment values is published reports of the National Department of Basic Education. These values include both public and independent ordinary schools.

Learner-Educator (LE) ratios have been increasing from 27:1 (2012) to 30:1 (2021), a large increase given that these are national averages. Combining data on publicly-employed teachers and enrolment in public schools, one can generate LE ratios from 2012 to 2021[1]. Figure 2 below reports the LE ratios for public schools by province from 2012 to 2021 showing that the national average LE ratio increased from 27,4 in 2012 to 29,9 in 2021. It is immediately clear that some provinces have experienced much larger LE ratio increases than others. For example, the LE ratio increased by more than 4 learners per teacher in less than 3 years in the Free State, Limpopo and the Eastern Cape between 2013 and 2016. Since 2019 six of the nine provinces have seen increases in their LE ratios (the exceptions are North West, Northern Cape and Western Cape whose LE ratios were constant over the period.

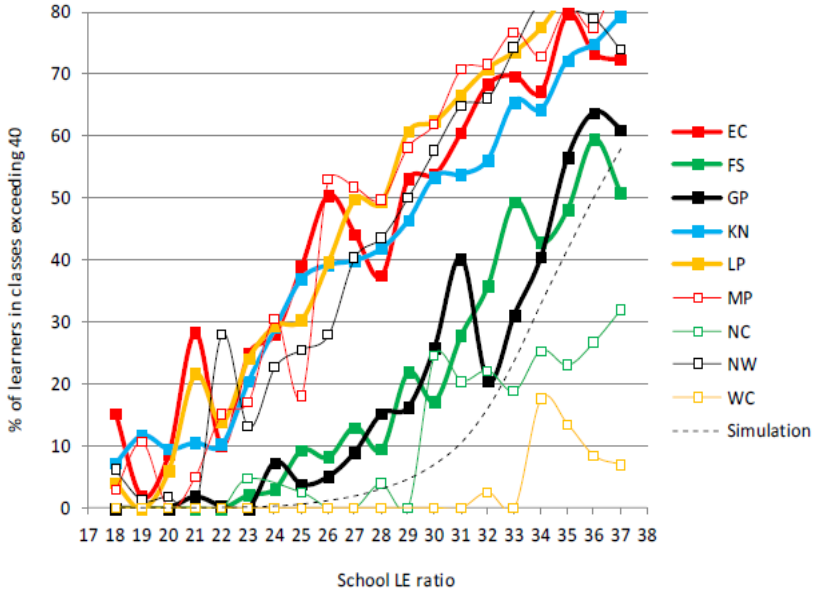
Figure 2: *Public learner-educator ratios from 2012 to 2021*



Source: DBE. 2022. What are our learner-educator (LE) ratio trends? Unpublished report. 18 June 2022.

Learner-educator ratios do affect class size but the impact depends on other factors as well. While the overall learner-educator ratio is relatively straightforward (learners divided by teachers), how this manifests at the school level is complicated and the subject of ongoing research in the Teacher Demographic Dividend project (see Wills et al., forthcoming). Differences in teacher absenteeism, timetabling, subject-choices and classroom availability can all influence realized class sizes over and above the constraints placed by the LE ratio. The LE ratio is certainly not the same as class size. For example, previous analysis has shown that *for a given LE ratio* different provinces have different levels of crowded classrooms. For example, a school LE ratio of about 32 learners to one teacher in Gauteng leads to 30% of learners in classes over 40, but 65% of learners in classes over 40 in Limpopo, Eastern Cape, KwaZulu Natal, Mpumalanga and North West (Figure 3). This is even though there are the same number of learners per teacher in these schools.

Figure 3: LE ratio required and actual provincial situations (Source: DHET, 2022: p.40)



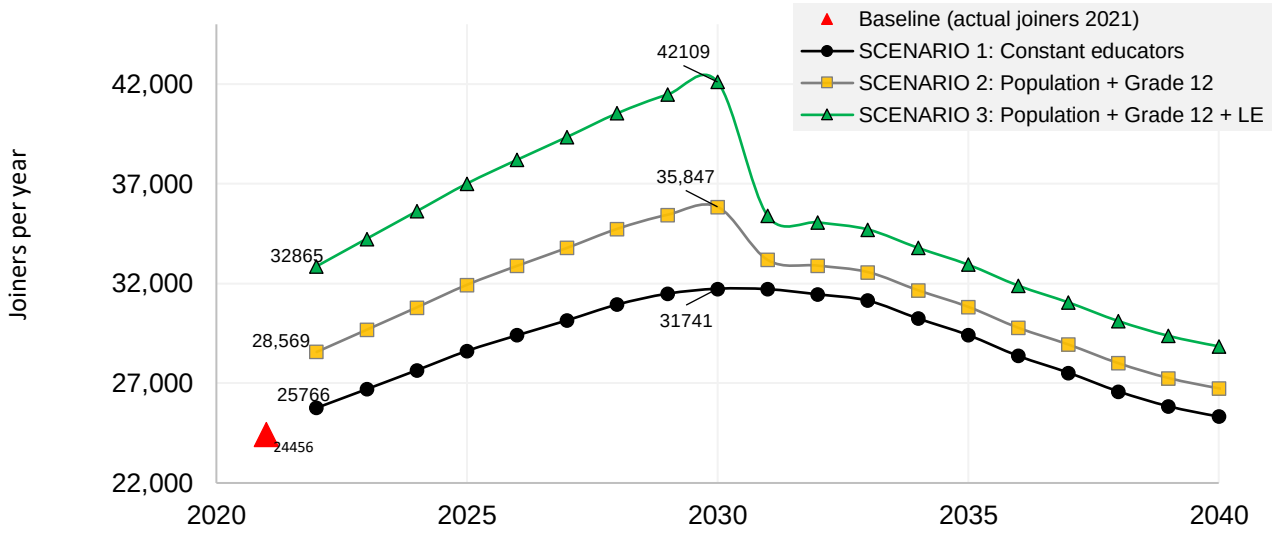
Returning to South Africa's 2012 LE ratio of 27,4 by 2030 would increase the additional teacher demand from 6,2% mentioned above to 15.8%. Whether South African policymakers continue to allow the LE ratio to increase will influence the number of teachers needed to be trained and employed. If the decision is made to return to South Africa's 2012 LE ratios (and even that ratio is higher than comparable countries internationally[2]) it will require many more teachers to be trained and employed. In Figure 4 below, Gustafsson (2022) estimates the projected number of teachers required under three different scenarios:

- **Scenario 1: Constant educators.** This assumes that the total headcount of teachers will need to stay constant. The increase needed in joiners is primarily driven by retiring teachers and other 'leavers.'

- **Scenario 2: Population + Grade 12**. In this scenario, in addition to accounting for retiring/leaving teachers, the growth in the school-going population and Grade 12 survival rates are taken into account. Therefore, in this scenario more teachers are hired to prevent the LE ratio rising further from its 2021 level. This scenario maintains the LE ratio in spite of the increased school-going population and greater throughput to matric (as described above).

- **Scenario 3**: **Population + Grade 12 + LE.** In this scenario, in addition to taking into account (a) retirements/leavers, (b) the growth in the school going population and retention to Grade 12, it also (c) improves the LE ratio gradually in such a way that by 2030 the LE ratio is back to its 2012 level of 27,4 by 2030. The big decline after 2030 in both Scenario 2 and 3 is driven by both teacher demographics (older teachers leaving) *and* learner demographics (enrolments increasing), both of which coincidentally and unrelatedly peak at 2030 and decline thereafter

Figure 4: *Number of teachers ('all joiners') required to join the public schooling sector under different scenarios 2021-2040*

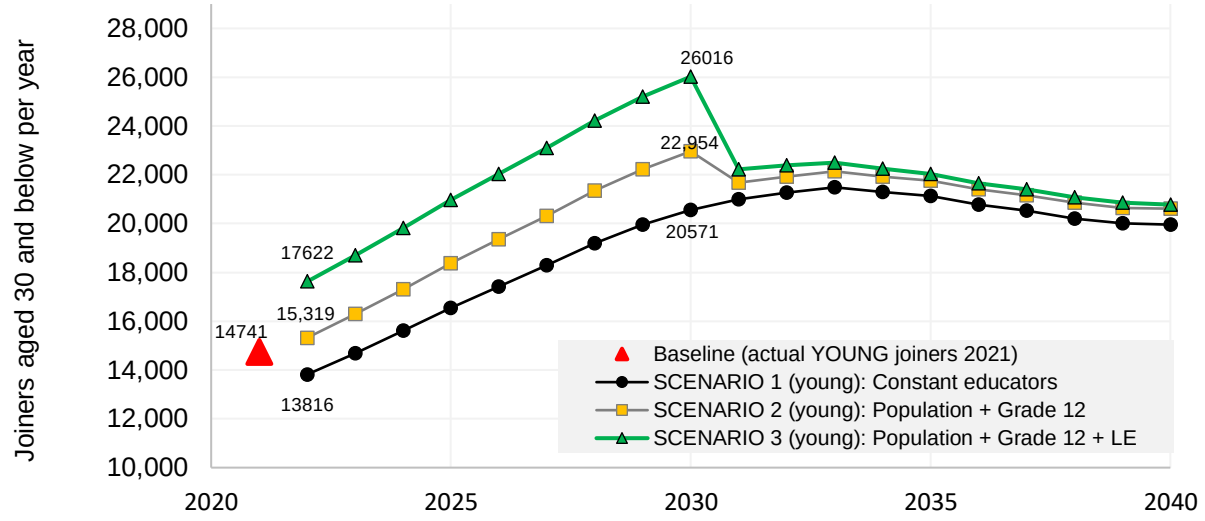


Source: Gustafsson, 2022 Projections

Additional teachers required will increase from about 25,000 (2021) to 32,000 (Scenario 1), 36,000 (Scenario 2), or 42,000 (Scenario 3) depending on policy directives. In 2021 there were 24,456 annual 'joiners' into the public system, by 2030 this will have to increase to 31,741 (Scenario 1), 35,847 (Scenario 2), or 42,109 (Scenario 3) depending on policy directives related to teacher headcount, LE ratios and class sizes. It is clear that choices regarding these factors will have a very large impact on the number of teachers that need to be produced since typically only 60-75% of teachers that graduate join the public education system. Note that Figure 4 reports 'all joiners' (i.e. young joiners graduating from universities and older joiners coming from the reserve pool or elsewhere). Figure 5 below reports only the number of young joiners.

Young joiners will need to increase from around 15,000 to around 23,000 in 2030 (or 26,000 to return to 2012's LE ratio): Figure 5 below reports projections of the needed 'young joiners', i.e. new teacher graduates. It is important to emphasize that not all teachers produced by universities go on to be employed in schools, or in public schools. Figure 5 reports joiners in public schools. Although approximately 28,000 teachers were produced in 2019 (see Note 6), only about 15,000 joined in 2021. This ratio of produced:joiners fluctuates and has been as high as 75% and as low as 50% historically.

Figure 5: *Number of teachers ('young joiners') required to join the public schooling sector under different scenarios 2021-2040*



Source: Gustafsson, 2022 Projections

Current modeling is ongoing and projections can be sensitive to assumptions: The Teacher Demographic Dividend research project is a three-year programme and 2022 is the first year of research. Modeling demographic changes with respect to teacher supply (university production), theoretical demand (to replace retirees or maintain LE ratios) and realized teacher demand (whether provinces hire) is a difficult exercise. There are many assumptions that influence these projections. Wherever possible we have used historical numbers to calibrate projections. Yet even here the historical numbers differ depending on the period under analysis (for example whether 50% or 75% of teacher graduates enter public schools). Whether younger teachers leave teaching in higher numbers (as they did in 2010-2011) also influences how many teachers will be required, and would increase graduates required over and above those listed in the figures above. See Figure 12, 15 and 16 in Gustafsson (2022) for estimates under 'high attrition.' Nevertheless, modeling presented here and elsewhere in the TDD project is imperative for policy makers to understand how the incoming retirement wave will affect graduate production, hiring, class sizes etc. The financial implications of the retirement wave will be dealt with in Q1-2 of 2023.

Endnotes

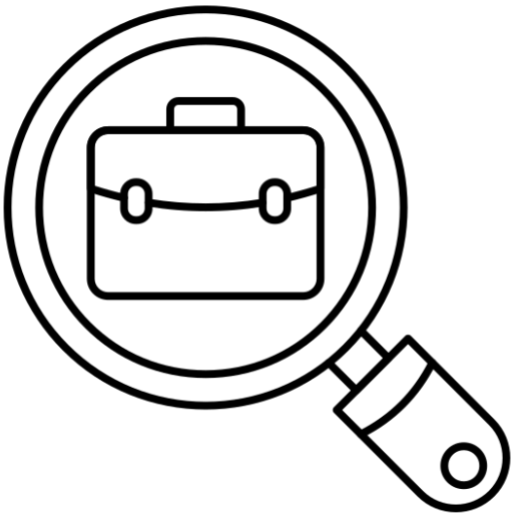
[1] Department of Basic Education (2022). What are our learner-educator (LE) ratio trends? (18 June 2022). Unpublished report. Pretoria. Figure 4

[2] Department of Higher Education and Training (2020). School teacher supply and demand in South Africa in 2019 and beyond. Pretoria. (page 44)

3

To what extent are provinces freezing HOD and Deputy Principal posts to cope with budgetary pressures?

Nic Spaull & Poppie Ntaka (10 November 2022)



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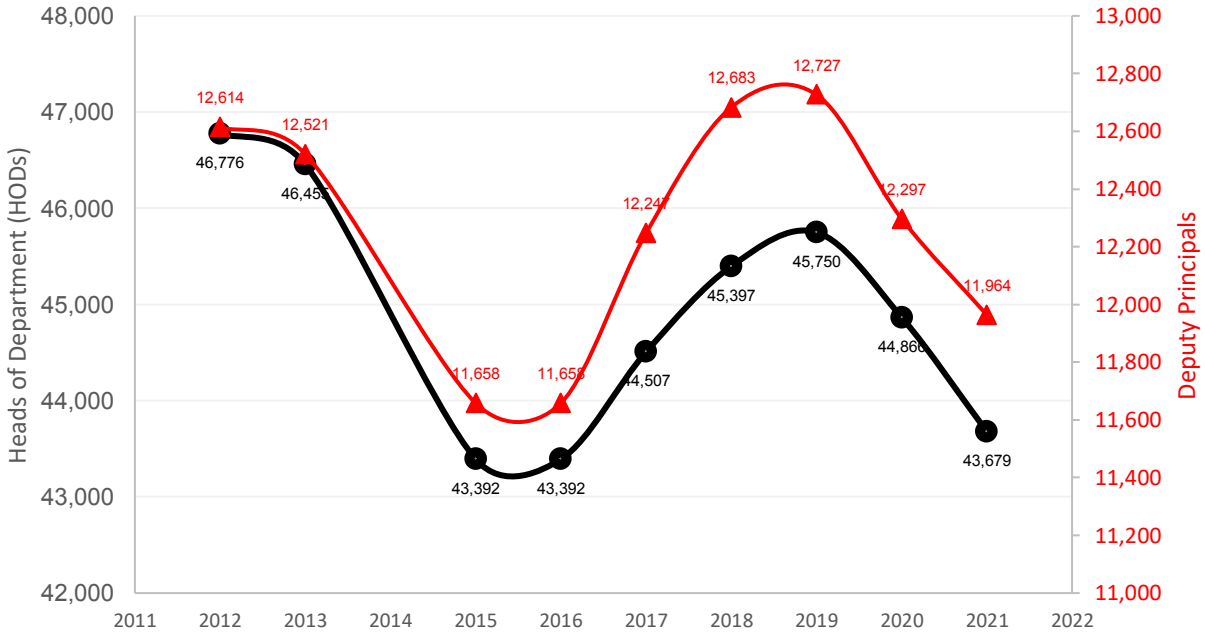
Using PERSAL to measure hiring freezes over time: Using the DBE's salary database (PERSAL) allows for the analysis of changes in the number of people employed at different levels (i.e. teacher, Head of Department (HOD), Deputy Principal etc.). Figure 1 shows that there was a decline in the number of heads of department (HODs) and deputy principals employed between 2012 to 2015 and that these numbers then rose to their previous level by 2019 only to fall again from 2019 to 2021. In the 2020 Medium Term Budget Statement, Finance Minister Tito Mboweni announced a public sector wage freeze for three years as the Treasury sought to tackle public debt and increase spending elsewhere. It is remarkable to see how the number of middle management posts corresponds to overall austerity measures in provincial education budgets. The data suggests that provinces have been instituting hiring freezes for middle-management posts. Between 2019 and 2021 there was a decline of 2,071 HOD's and 763 Deputy Principals (Figure 1). Note that some smaller schools are not big enough to qualify for a Deputy Principal position hence the large differences between Deputy Principals and HODs.

Hiring freezes of management posts 'save' provinces money because senior educator posts are more expensive than regular teaching posts. The average 2019 total average annual salary packages for teachers was R449,868 compared to HODs (R577,224) and Deputy Principals (R687,156). The difference between these last two figures (and depending on the experience of the incumbent HOD) would be the saving from not appointing an HOD or Deputy Principal. See Note 4 for the breakdown of salary and benefits by seniority.

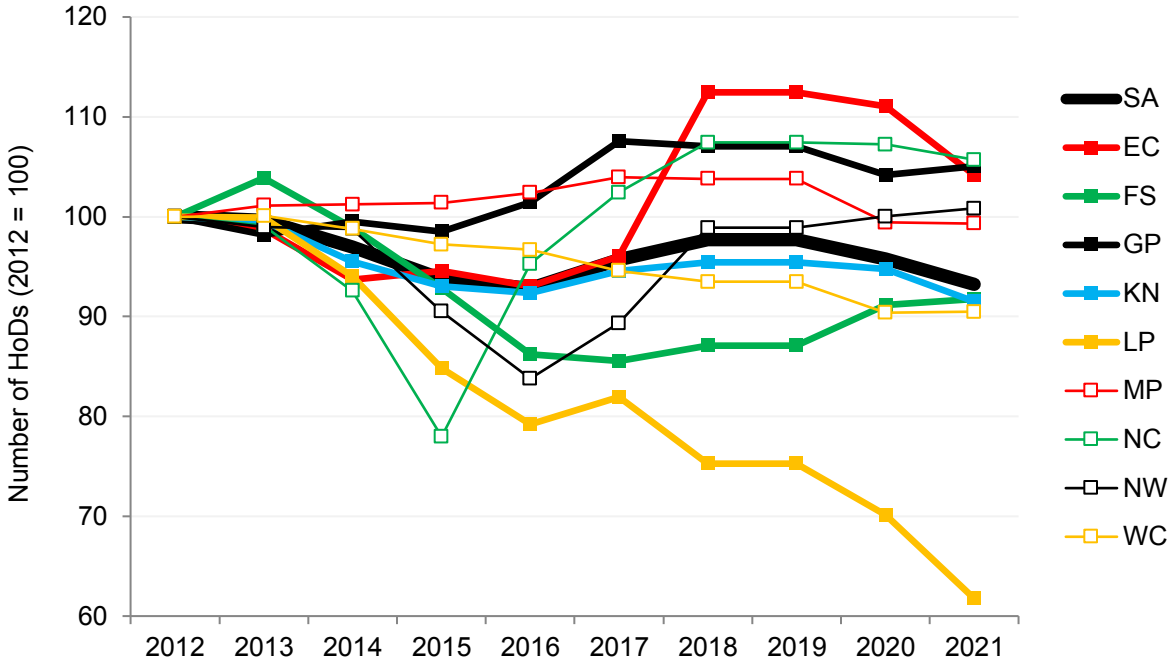
Figure 1: *Number of heads of department (black) and Deputy Principals (red) in PERSAL*



Source: Department of Basic Education (2022).

Large inter-provincial variation in middle-management freezes, with extreme declines in Limpopo Figure 2 shows how this national trend looks in selected provinces, and reveals that most provinces employ fewer HODs in 2021 compared to 2012, but this is especially pronounced in Limpopo which has seen a continuous decline since 2012. Limpopo had only 60% as many HODs in 2021 compared to 2012. The figure also presents evidence that KwaZulu-Natal, Eastern Cape and North West took steps towards rectifying these losses post-2016, with the number of HoDs almost recovering to 2012 levels by 2018. One limitation of Figure 2 is that it does not take into account overall enrolment and number of schools per province and whether this is growing (or shrinking) over time. This likely under-estimates the problem in a province such as Gauteng.

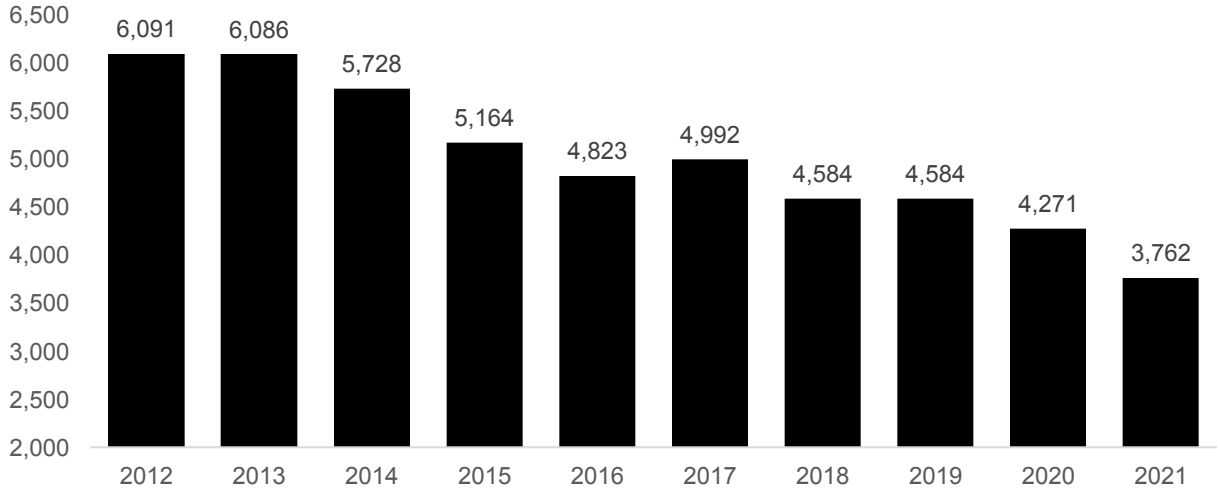
Figure 2: *Number of Heads of Department (HODs) by province relative to 2012 (baseline = 100 in 2012)*



Source: Department of Basic Education (2022).

Limpopo employed 2,300 fewer HODs in 2021 than it did in 2012: Figure 3 below shows that in 2012 Limpopo employed 6,091 HODs but this had declined to 3,762 by 2021, a decline of 2,329 HODs. Although there were 298 fewer schools in Limpopo in 2021 compared to 2012 according to DBE's School Realities (3935 schools in 2012 compared to 3675 schools in 2021) this would account for at most about 460 fewer HOD posts in 2021 relative to 2012, not 2,329. Clearly Limpopo is freezing HOD posts to cope with budgetary pressures.

Figure 3: *Number of Heads of Department (HODs) in Limpopo (PERSAL)*



Source: Department of Basic Education (2022).

Why do provinces institute hiring freezes for middle-management posts? To cope with budgetary pressures, provincial education departments (PEDs) cut down on expenditure by freezing middle-management posts or by appointing individuals in acting roles [1], [2], [4], [5]. This is because middle-management posts are more expensive than teacher posts, as discussed above. Additionally, PEDs are aware that the system will most likely continue functioning if the delays in appointments are occurring in middle-management posts, whereas the system would break down if there were no principals or teachers.

Undermining teacher career incentives and school curriculum support: When HOD and Deputy Principal posts are frozen, this blocks one of the only paths of significant career and pay progression for most teachers, undermining the incentive system within a school [5]. For example, the average pay of a teacher increases by 20% when they are promoted to a HOD position [2]. Although freezing HOD and Deputy Principal posts may seem to be an expedient measure to reduce spending, these posts are meant to play important roles for monitoring curriculum coverage, offering support to teachers, managing assessment and teacher professional development etc. Given that men tend to dominate leadership positions in South African schools, it also means that hiring freezes impact negatively on the possible progress that can be made towards the gender transformation of school leadership positions.

Endnotes

[1] Department of Basic Education (2022). *Trends from the Persal data to inform basic education planning.* Unpublished report. Pretoria.

[2] Department of Basic Education. (2017). *Who becomes an HoD?* Published report. Pretoria.

[3] Department of Basic Education (2017). *Personnel spending pressures: Hiring and promotion cuts with enrolment growth*. Pretoria.

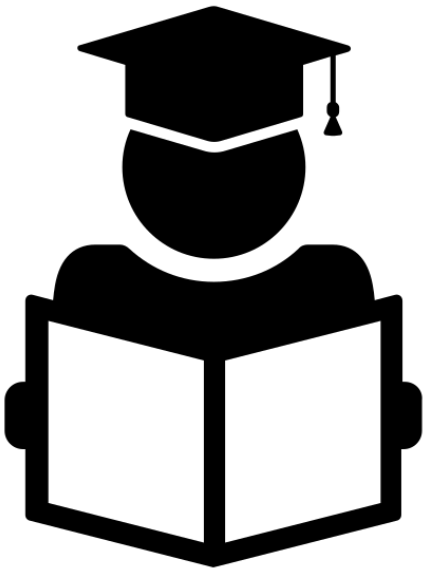
[4] Spaull, N., Lilenstein, A., & Carel, D. (2020). The race between teacher wages and the budget: The case of South Africa 2008-2018. Research on Socioeconomic Policy (RESEP). Stellenbosch: Stellenbosch University.

[5] Wills, G. (2019). *School Leadership and Management: Identifying Linkages with Learning and Structural Inequalities*. In Spaull, N. & Jansen, J. (eds): South African Schooling: The Enigma of Inequality. Springer.

4

Are provinces hiring the additional teachers that universities produce?

Poppie Ntaka (10 Nov 2022)



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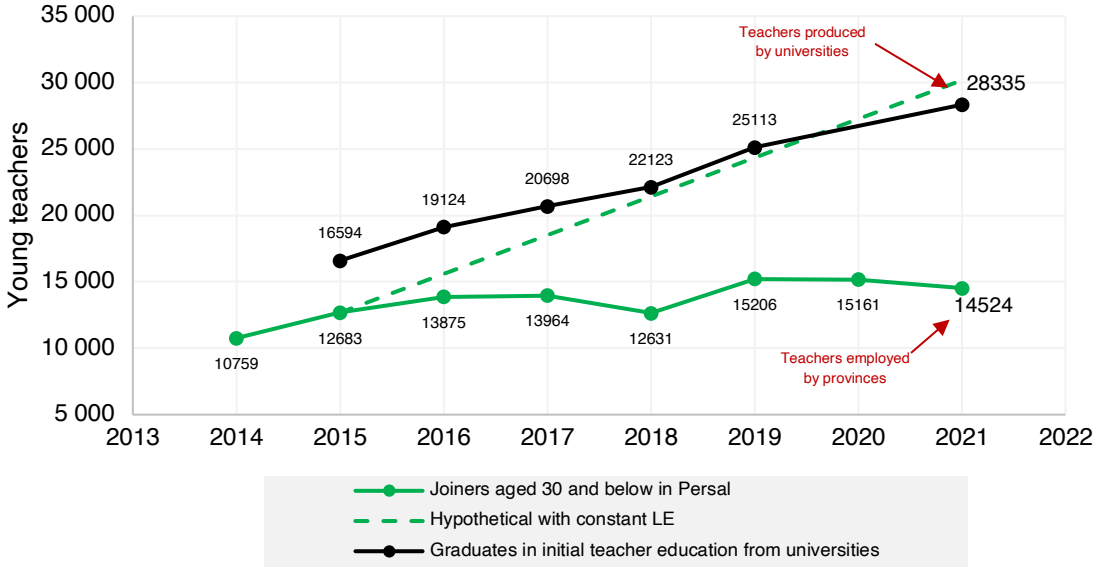
Overview. To adequately respond to the teacher shortages that will face South Africa's schooling system in the next 10 years, there is a need to understand the capacity of universities to produce teachers (teacher supply) but also the extent to which provincial education departments (PEDs) actually employ new teacher graduates (teacher demand). This note briefly highlights the gap between teacher supply and teacher demand over the last nine years.

Since 2016 universities have increased teacher supply, but provinces have not increased hiring, leading to larger LE ratios over time. Universities have met the initial teacher education (ITE) graduate targets set by the Department of Higher Education and Training (DHET), which suggests that they have managed to respond to the pressures of training additional teachers. Figure 1 below shows both the number of ITE graduates produced by universities (from DHET reports), and the number of young joiners into public education (from Persal). It is clear that while teacher production has increased significantly, provinces have not increased the number of teachers they are hiring, with this gap growing over time. In 2021, only 14,524 teachers were hired by provinces, while 28,335 teachers graduated from universities, i.e. only half of graduating teachers were hired. Between 2015 and 2016 this was 75% (Gustafsson 2022, p.31,33).

LE ratios are rising because provinces are not hiring: In Figure 1 the dotted green line shows the number of joiners that would be required to maintain a constant LE ratio from 2015. The fact that actual hiring has fallen below this means that LE ratios are rising across the country. It is telling to note that universities have been producing the 'correct' number of graduates, while provinces have not been hiring (likely due to cost constraints).

Universities will need to produce even more teachers to keep up with the incoming retirement wave, although provinces need to hire teachers that are produced. The current graduate production levels (28,000 per year) will need to increase even further to avoid very large increases in class sizes due to large numbers of retiring teachers not being replaced. Yet provinces need to hire the teachers that universities are producing.

Figure 1: *Graduates from initial teacher education compared to young Persal joiners*



Sources: Figure 19 from Gustafsson (2022). For graduates, source is the DHET annual reports of 2019/20 and 2020/21. To illustrate, the DHET value for 2020/21 would be plotted as the 2021 value in the graph. For Persal joiners, the source is values behind the 'simple approach' in Figure 5 of Department of Basic Education (2022b).

Why are provinces not hiring more teachers?The Public Service Co-ordinating Bargaining Council (PSCBC) Resolution 1 of 2018, which resulted in the notches of salaries of educators shifting from a 1% notch increase to a 1.5% notch increase [4], has made it difficult for provinces to hire more teachers, especially in a climate of fiscal austerity and freezes on the Cost of Living increases for public employees. This is because teacher salaries are growing at a faster rate than what is being allocated to the education budget [1], [3]. Furthermore, provinces are facing budget constraints and are likely to respond by freezing middle-management posts or leaving vacant posts unfilled as a cost-saving measure [1], [3], [5].

No-fee and rural schools will be affected the most by the growing gap between increasing teacher retirements and stagnant hiring. If provinces fail to hire more teachers as older teachers exit the system, learner-educator ratios are likely to rise above 2021's projected ratio of about 30 learners per teacher (Gustafsson 2022, p. 31), which means that teachers will be faced with large and growing class sizes, especially for those teaching at poor and remote or rural schools. Additionally, primary schools are more likely to be impacted than secondary schools since there are more older teachers in primary schools than high schools.

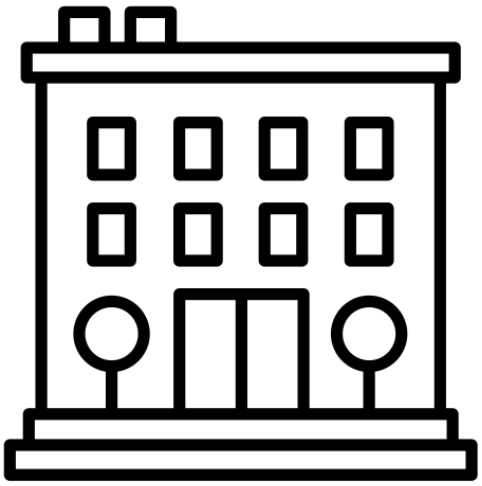
Endnotes

[1] Gustafsson, M. (2022). *Projections of educators by age and average cost to 2070*. TDD report. Stellenbosch.
[2] Department of Basic Education. (2022). *Interpreting the contents of the DBE's National Recruitment Database*. Unpublished report. Pretoria.
[3] Spaull, N., Lilenstein, A., & Carel, D. (2020). *The race between teacher wages and the budget: The case of South Africa.* Resep education working papers.
[4] Department of Public Service and Administration. (2018). PSCBC Resolution of 2018. Pretoria. Available online at https://www.dpsa.gov.za/dpsa2g/documents/pscbc/2018/Res1%20of%202018%20PSCBC.pdf
[5] Wills, G. (2019). School Leadership and Management: Identifying Linkages with Learning and Structural Inequalities. In Spaull, N. & Jansen, J. (eds): South African Schooling: The Enigma of Inequality. Springer.
[6] Department of Basic Education (2022b). *Inflow of new teachers into the public system*. Pretoria. [Unpublished report]

5

Which universities produce the most teachers who enter public schools?

Nic Spaull & Poppie Ntaka (10 Nov 2022)

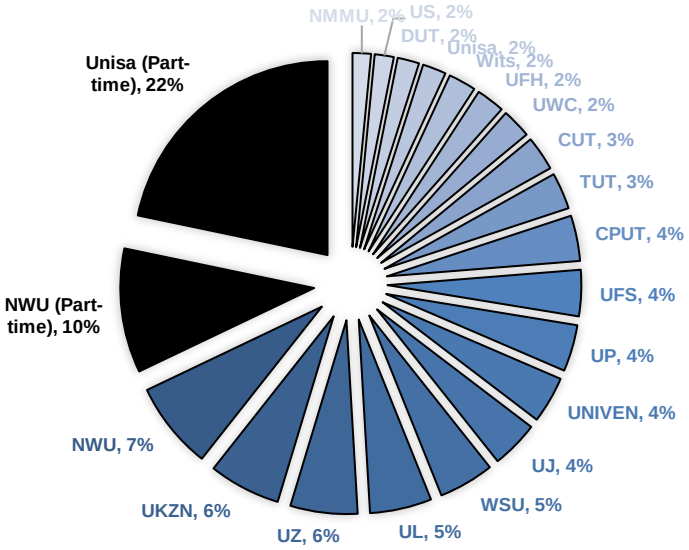


RESEP
Research on Socio-Economic Policy

Teacher **D**emographic **D**ividend.

Overview: The impending teacher shortage will require universities to train thousands of teachers. There is therefore a need to understand whether or not universities have the capacity to meet the future demand. To do so, it is helpful to consider which universities are best placed to meet the projected future demand for teachers. This note provides information on which universities produce the most teachers and details the flow through rates of full-time and part-time Bachelor of Education (B.Ed) and Postgraduate Certificate in Education (PGCE) students.

***Figure 1**: The relative contribution of universities to training teachers who go on to be employed in public schools in SA*



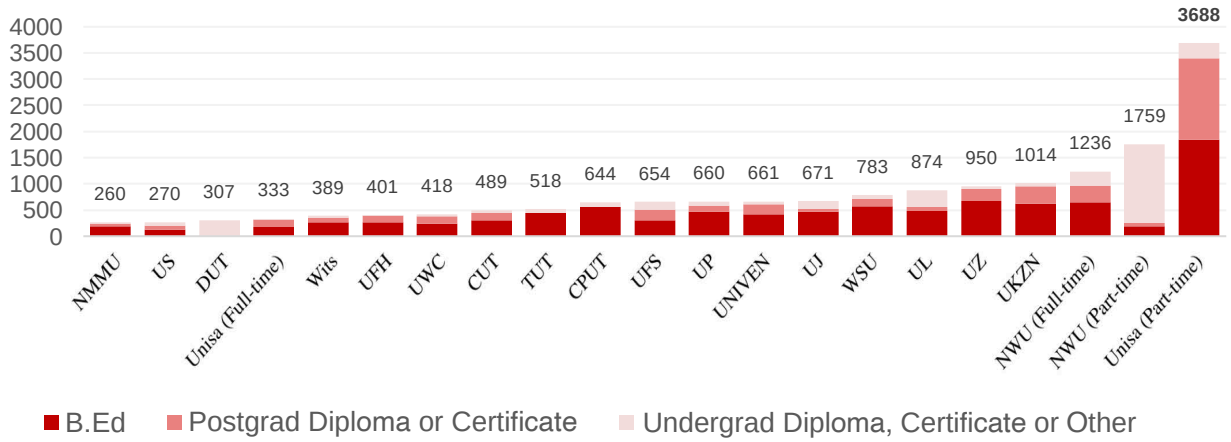
Source: DHET, 2020: pp. 95-96.

Just four universities train half of all teachers who enter public schools in SA: By merging higher education information (HEMIS) with teacher salary information (PERSAL) it is possible to identify where teachers who enter public schools were trained. Just four universities (UNISA, NWU, UKZN and UZ) trained half (51%) of all teachers entering public schools in 2017. Although there are 19 universities supplying teachers to public schools, two thirds (65%) come from the largest seven universities.

One third (32%) of teachers who entered public schools in 2017 studied part-time, either at UNISA (22%) or at North West University (10%)

Improving the quality of graduate training should focus on part-time (i.e. distance) students and those which supply public schools with teachers. Figure 1 and 2 illustrate quite clearly the outsize role that part-time (distance education) students play, and UNISA in particular. Improving the quality of ITE at Wits (2%), Stellenbosch (2%) or NMMU (2%) is unlikely to improve overall quality of teachers entering public education. Focus should be on the largest providers.

***Figure 2:** Of those 16,979 teachers who joined PERSAL in 2017, which universities did they come from and what programs did they study?*

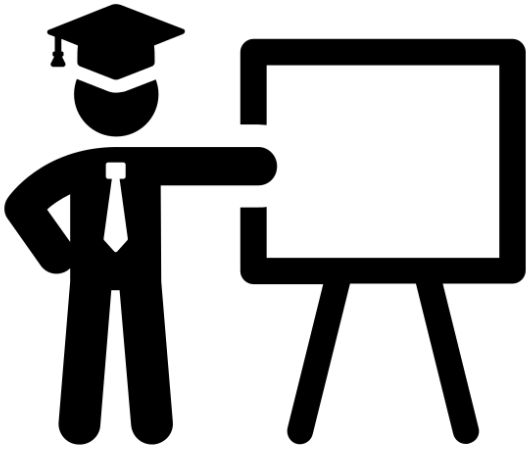


Source: DHET (2020).Table 35, pp. 95-96. School teacher supply and demand in South Africa in 2019 and beyond. Pretoria.

6

How many teachers are universities producing?

Bianca Böhmer and Irene Pampallis (10 Nov 2022)

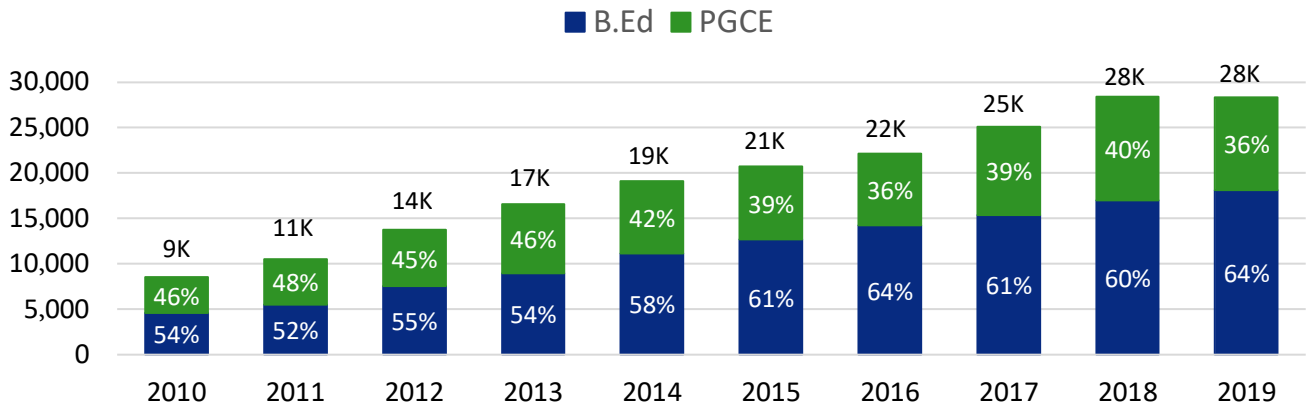


RESEP
Research on Socio-Economic Policy

Teacher **D**emographic **D**ividend.

The number of graduates from initial teacher education (ITE) has increased substantially, tripling from about 9,000 in 2010 to over 28,000 in 2019. This is according to the Department of Higher Education and Training (DHET's) Annual Reports from 2011/12 to 2020/21. This is a remarkable increase of over 200% in ten years. The proportion of teaching graduates with a B.Ed has increased slightly since 2010, but has been relatively constant and in the range of 60-65% since 2015 (see Figure 1). This shows that both B.Ed and PGCE graduates have been increasing at about the same rate over this period.

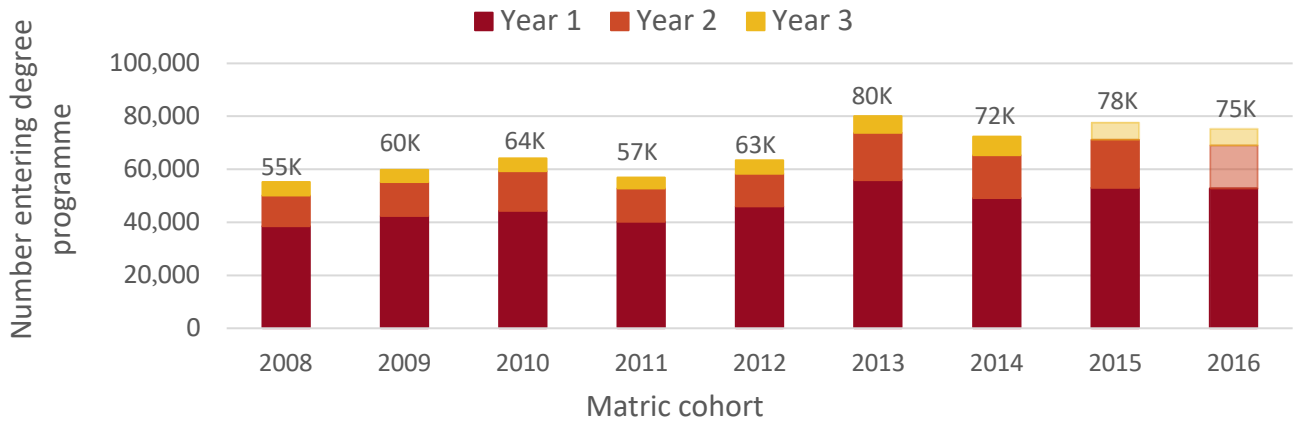
***Figure 1**: Number of Initial Teacher Education graduates from South African universities, 2010-2019*



Source: The numbers for ITE graduates are taken from the DHET annual reports from 2011/12 to 2020/21. The latest report contains numbers on 2019 graduates. Split between B.Ed and PGCE calculated using graduates information on PowerHEDA.

The number of matriculants enrolling in <u>any degree programme</u> increased by about 40% between 2008 and 2016. More than 75,000 students from the 2016 matric cohort enrolled in a degree within three years, while only 55,000 of the 2008 cohort did so (see Figure 2). Two trends have caused this increase: growth in the number of learners writing the National Senior Certificate (NSC/matric) exams, and an increase in the proportion of matriculants who are enrolling in degree programmes. The percentage of a matric cohort starting a degree within three years of matriculating has increased from 10% of the 2008 matric cohort, to 14% of the 2013 matric cohort.

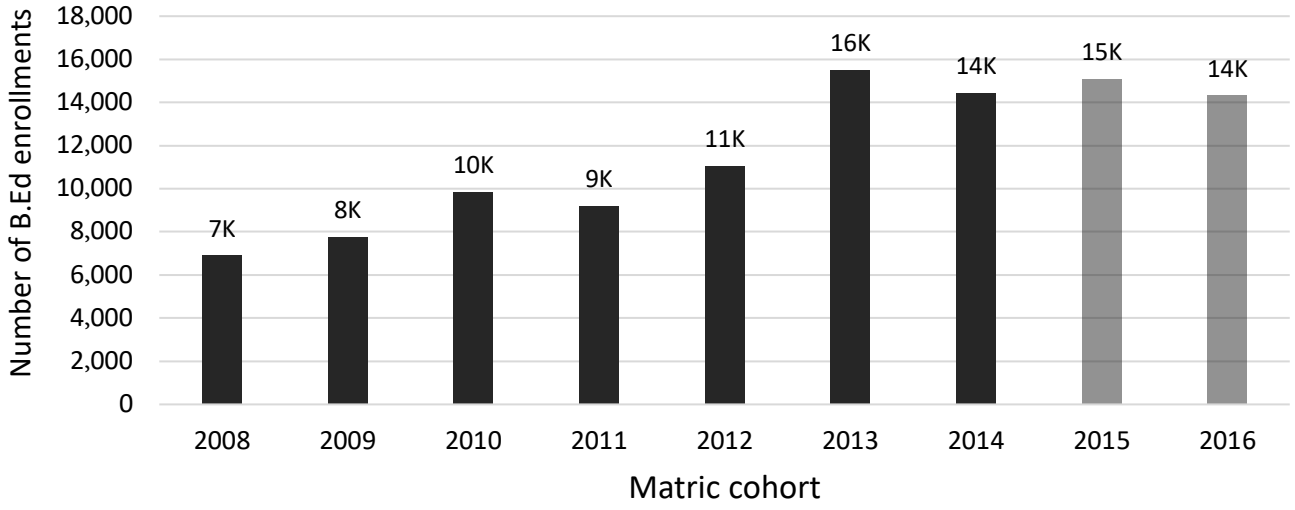
***Figure 2:** Number of NSC candidates that start a degree within 3 years of matriculating*



Source: NSC-HEMIS-PERSAL dataset from 2008-2017. The first three years capture 80-85% of those who enrol in a degree within 10 years after matriculation. In 2015 and 2016 the access rate shown by the lighter bars is estimated using 2010-2020 DHET enrolment data available on PowerHEDA.

The number of students enrolling in B.Ed programmes doubled from the 2008 matric cohort to the 2014 matric cohort. As illustrated in Figure 3, only 7,000 students enrolled for a B.Ed from the 2008 matric cohort, while from the 2014 matriculants 14,000 enrolled in a B.Ed within three years of matriculating. This number is estimated to have remained relatively constant for the 2013-2016 matric cohorts. The current analysis is only possible by merging NSC and HEMIS data. The research team currently only has access to the 2008-2017 data and thus additional data would need to be made available to extend the analysis beyond 2017.[1]

Figure 3: *Number of B.Ed enrolments for first-time degree students within 3 years of matriculating*



Source: NSC-HEMIS-PERSAL dataset from 2008-2017. The numbers for 2015 and 2016 are estimated using DHET administrative data on headcounts within selected qualifications types in the CESM Education for 2010-2020 available through the PowerHEDA online tool.

The growth in B.Ed enrolments has been much higher than for other undergraduate degrees. Among 2008 matriculants who started undergraduate degrees between 2009 and 2011, 13% (one in eight) enrolled in B.Ed degrees. By the time the 2014 matriculants entered higher education, this number had jumped to 20% (one in five). This suggests that universities opened more spaces or otherwise encouraged students to study teaching, or alternatively the teaching profession gained popularity among students for other reasons. More recently, there has been a clear strategy to increase the production of ITE graduates by the Department of Higher Education and Training (DHET) as a part of their Teaching and Learning Development Capacity Improvement Programme.[2]

If growth in the number of ITE graduates is to be sustained, it will be necessary to improve matric outcomes and hire all graduating teachers. If we do not increase the number of high-achieving candidates writing the NSC exams, it is likely that with further growth in student numbers, the average quality of the students entering ITE will drop. It is also critical that new teaching graduates are subsequently hired by provinces. If they are not, high rates of unemployment among new teacher graduates may create a perception of low demand for teachers, which may decrease the incentives to study teaching which, in the long run, may negatively affect ITE graduate targets. This is in addition to the problem of rising class sizes as a result of provinces not hiring teachers that are already being produced.

[1] The data employed for this analysis was merged by DHET with the support of the DBE and made available to Resep in anonymised form for the earlier study. Currently, concern about the POPI Act has prevented further data merging of NSC examination data with HEMIS data to take place, which has limited analysis of more recent trends.

[2] Department of Higher Education and Training. (2021). *Annual Report 2020/21*. Pretoria. Pp.35 and 81.

7

What do teachers earn?

Irene Pampallis (10 Nov 2022)

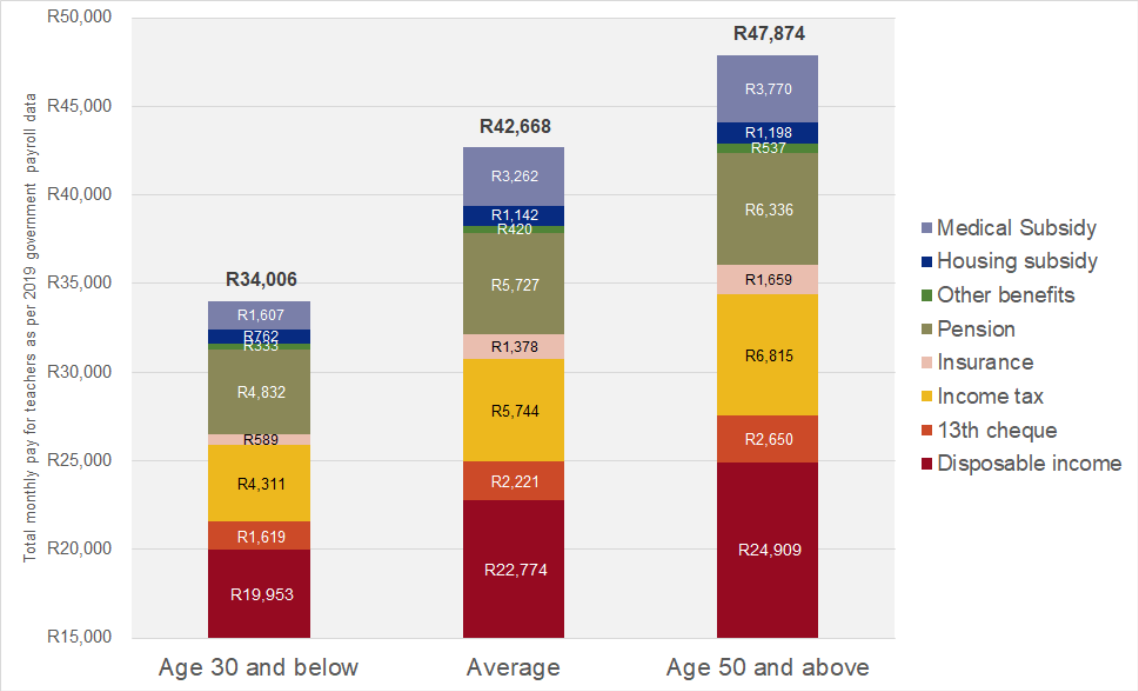
RESEP
Research on Socio-Economic Policy

Teacher **D**emographic **D**ividend.

Teacher salaries are the largest single line item in the South African budget. In the 2022 budget, teacher salaries accounted for one third of all public sector wages at R222 billion, approximately 3.5% of GDP and 10% of total government expenditure.[1] It is important to understand how much teachers earn, how their pay packages and benefits are structured, and how this differs by age and experience. These factors will influence how many younger teachers can be employed as older teachers retire. There is a common perception in South Africa that teacher salaries are low even relative to comparable professions, yet this is often based on incorrect information on what constitutes a teacher's 'full package' inclusive of benefits.

The average government teacher earned R42,668 per month in salary and benefits in 2019.[2] Using extracts from the government payroll database (PERSAL), this note shows that the average teacher in November 2019 received salary and benefits totalling R42,668 per month. This places teachers in the top 5% of the income distribution in South Africa (see Note 8 for a further discussion). It includes the teacher's pre-tax salary, as well as a number of benefits which are paid for by the employer (see Figure 1). Many teachers themselves believe they earn less than this, but this is because they do not factor in the benefits they receive over and above their basic salary. The annotated payslip in the Appendix is an anonymised payslip for a young teacher in their fifth year of teaching.

Figure 1: *Average monthly teacher pay in South Africa according to 2019 government payroll data*



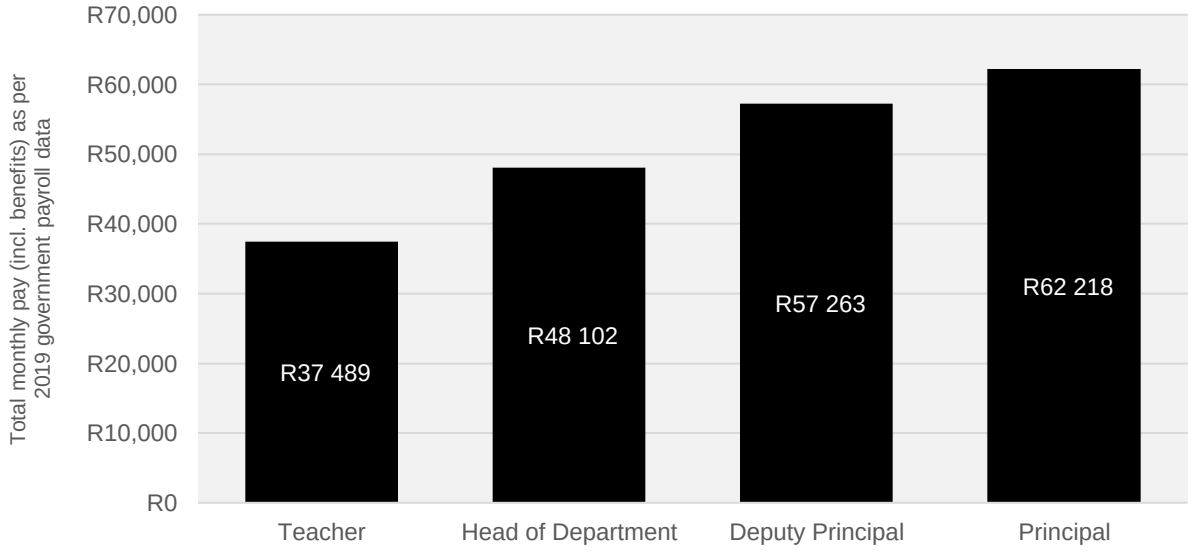
Source: Gustafsson & Maponya, 2020, p.5. In this figure, "teachers" includes ordinary teachers, HODs, deputy principals and principals.

The basic salary is determined by the teacher's notch on the salary scales published in the Government Gazette. The notch on which a teacher enters public service depends on their qualifications. For example, a teacher with REQV 14[3] (matric plus 4 years of university education) would enter on Notch 164. This translates to a basic salary of R284,238 in their first year of employment, or R23,686 monthly (based on the salary scales that came into effect in July 2021). Teachers who meet minimum performance requirements move up to a higher salary notch each year that they remain in government service. The annual notch increase is now 1.5% (previously this was 1% before 2019), and in practice almost all teachers experience pay progression every year.[4,5] This means that older

teachers tend to earn a higher basic salary than younger teachers. In addition, cost-of-living adjustments may be negotiated between teacher unions and the government.

Teachers' total remuneration package includes large amounts of other benefits each month. All permanent teachers receive an employer pension contribution (equal to 13% of the basic salary) and an annual service bonus (i.e. a 13th cheque; equal to the basic salary). All teachers who choose to join the Government Employees Medical Scheme (GEMS) receive a medical aid subsidy; some teachers who were appointed before 1 July 2006 may receive a smaller subsidy towards non-GEMS medical aid membership. In addition, teachers who own or rent property may apply for a housing allowance, which is R1,500 per month as of July 2021.[6] These are the major benefits paid to teachers.

Figure 2: *Total monthly teacher pay (including benefits) in South Africa in 2019 by type of teacher*



Source: Based on PERSAL data from Table 7 in Department of Basic Education, 2022a

Promotions lead to considerable increases in teacher pay. Because their positions place them on higher salary notches, senior educators (heads of department, deputy principals and principals) earn considerably more than ordinary teachers, as illustrated in Figure 2.[7] They therefore also receive higher employer pension contributions and annual service bonuses, since these are calculated as a percentage of the basic salary. The 2019 PERSAL teacher salary data used in Figure 1 includes both ordinary teachers and senior educators.[8]

Between 2013 and 2019 teacher salaries rose by 15% in real terms. [5,9] Even allowing for the fact that this
pushed many teachers into higher tax brackets, the average teacher saw their after tax income increase by 15% in real terms between 2013 and 2019.[7] This long period of above-inflation increases in teacher pay has resulted in serious pressure on provincial education budgets: real per-learner spending has declined significantly,[5] and many provinces have implemented hiring freezes for HODs, deputy principals and principals.[5,10] (See Note 3 for more information about management post freezes.) From 2020 to 2022, there were no cost-of-living adjustments, which saw teacher salaries decline in real terms, although the impact was softened by a cash gratuity.[11,12] In October 2022, teacher unions agreed to a 3% cost-of-living increase in basic salary, which will be combined with a cash
gratuity and the usual 1.5% annual pay progression to give a total increase of over 6%.[13]

Endnotes

[1] National Treasury. (2022). *Budget Review 2022*. Pretoria: Communications Directorate, p. iv. Available online at http://www.treasury.gov.za/documents/national%20budget/2022/review/FullBR.pdf.

[2] Gustafsson, M. & Maponya, G. (2020). *Are South Africa's teachers among the best paid in the world? Using household assets as a proxy for monetary pay*. Stellenbosch Economic Working Paper 08/2020. Stellenbosch: Stellenbosch University, p. 5

[3] REQV stands for Relative Equivalent Qualification Value.

[4] Gustafsson, M. (2022a). Projections of educators by age and average cost to 2070 (21 September 2022). [Unpublished pre-final report.], pp. 15, 33.

[5] Spaull, N., Lilenstein, A., & Carel, D. (2020). *The race between teacher wages and the budget: The case of South Africa 2008-2018*. Research on Socioeconomic Policy (RESEP). Stellenbosch: Stellenbosch University, pp. 11, 12.

[6] Department of Public Service and Administration. (2022). Circular 33 of 2022. Pretoria. Available online at https://www.dpsa.gov.za/dpsa2g/documents/cos/2022/GEHS%20Circular%2033%20of%202022.pdf, p.2.

[7] Department of Basic Education. (2022a). Recent purchasing power trends among public employees in basic education. (31 August 2020). Pretoria: Department of Basic Education. [Unpublished discussion document.], pp. 1, 16.

[8] The PERSAL data also includes a small number of people who are not employed in schools, for instance instructors in adult education centres.

[9] Intellidex. (2020). *The Public Sector Wage Bill - An evidence-based assessment and how to address the challenge*. Available online at:
https://www.intellidex.co.za/wp-content/uploads/2020/11/Intellidex-Public-Sector-Wage-Bill-Nov-2020.pdf

[10] Department of Basic Education. (2022b). Trends from the Persal data to inform basic education planning. (7 June 2022). Pretoria: Department of Basic Education. [Unpublished report.]

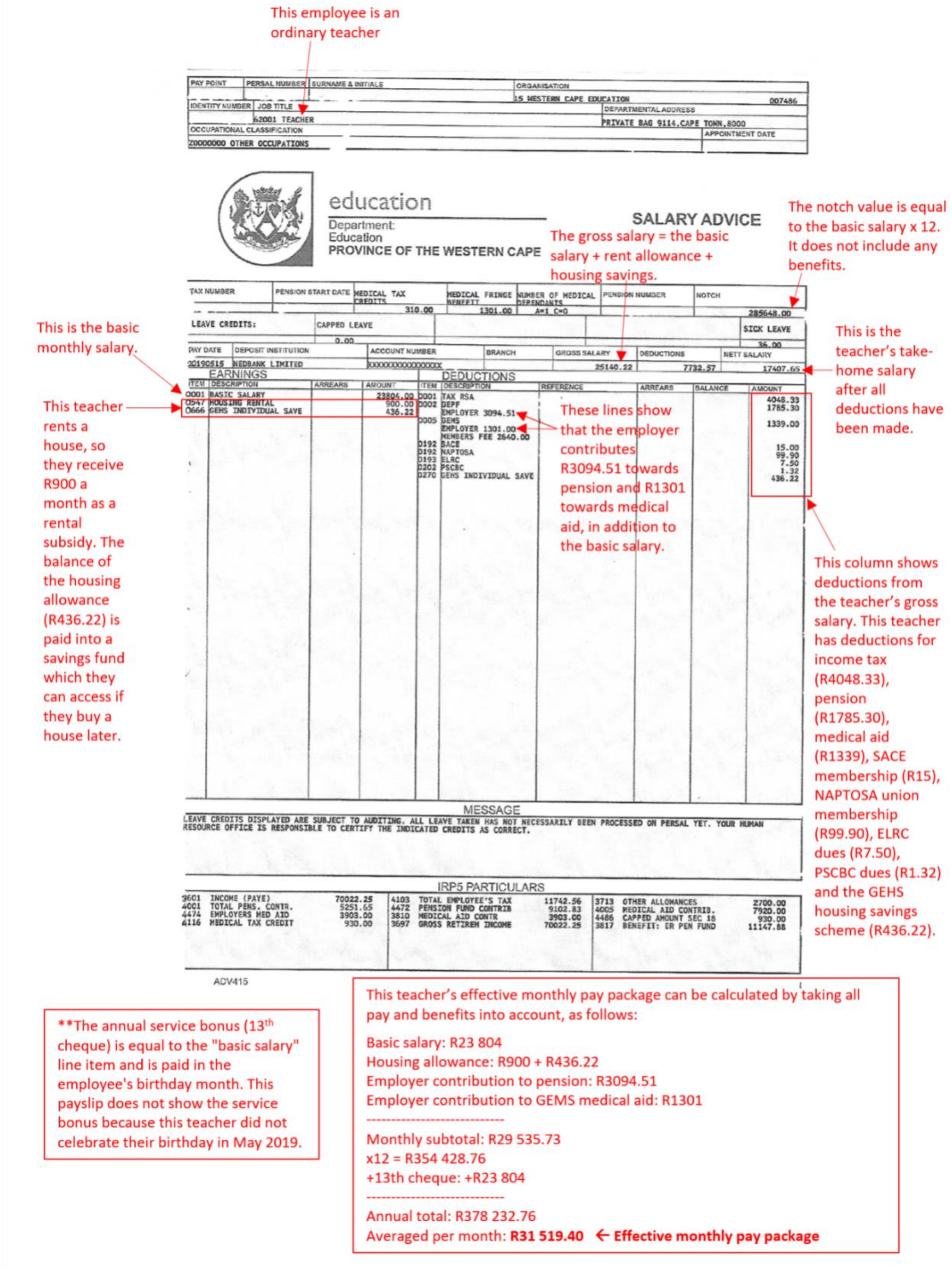
[11] Spaull, N. & Lilenstein, A. (2021). Teacher pay freeze right move. *Financial Mail*, 25 February 2021. Available online at: https://nicspaull.com/2021/02/25/financial-mail-education-op-ed-on-budget-2021/

[12] National Treasury. (2022). *Medium-Term Budget Policy Statement Annexure B*. Available online at http://www.treasury.gov.za/documents/mtbps/2022/mtbps/Annexure%20B.pdf, pp.60-61.

[13] Mkentane, L. (2022). Wage offer exposes cracks in Cosatu as teachers' union breaks ranks. *Business Day*, 4 October 2022. Available online at:
https://www.businesslive.co.za/bd/national/2022-10-04-wage-offer-exposes-cracks-in-cosatu-as-teachers-union-breaks-ranks/

Appendix: Teacher Payslip from May 2019

This payslip belongs to a 26-year-old teacher in their fifth year of teaching with the Western Cape Education Department. Personally identifiable information has been removed



**The annual service bonus (13th cheque) is equal to the "basic salary" line item and is paid in the employee's birthday month. This payslip does not show the service bonus because this teacher did not celebrate their birthday in May 2019.

This teacher's effective monthly pay package can be calculated by taking all pay and benefits into account, as follows:

Basic salary: R23 804
Housing allowance: R900 + R436.22
Employer contribution to pension: R3094.51
Employer contribution to GEMS medical aid: R1301

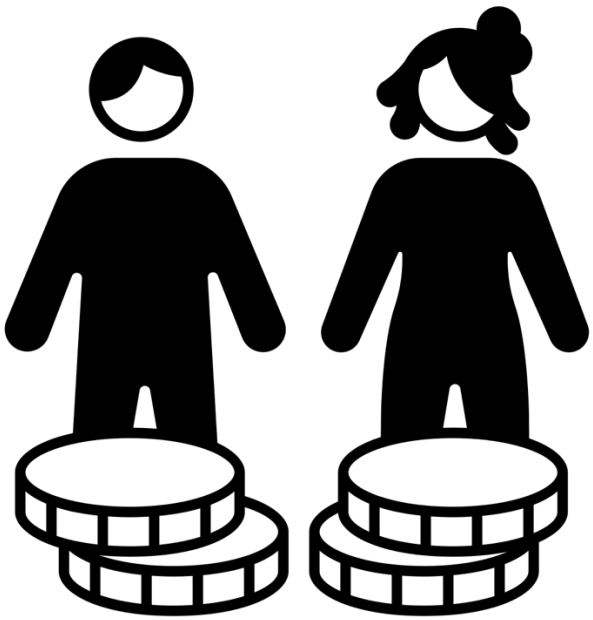
Monthly subtotal: R29 535.73
x12 = R354 428.76
+13th cheque: +R23 804

Annual total: R378 232.76
Averaged per month: **R31 519.40** ← **Effective monthly pay package**

8

Where do teachers fall relative to others in the labour market?

Debra Shepherd & Nic Spaull (10 Nov 2022)



RESEP
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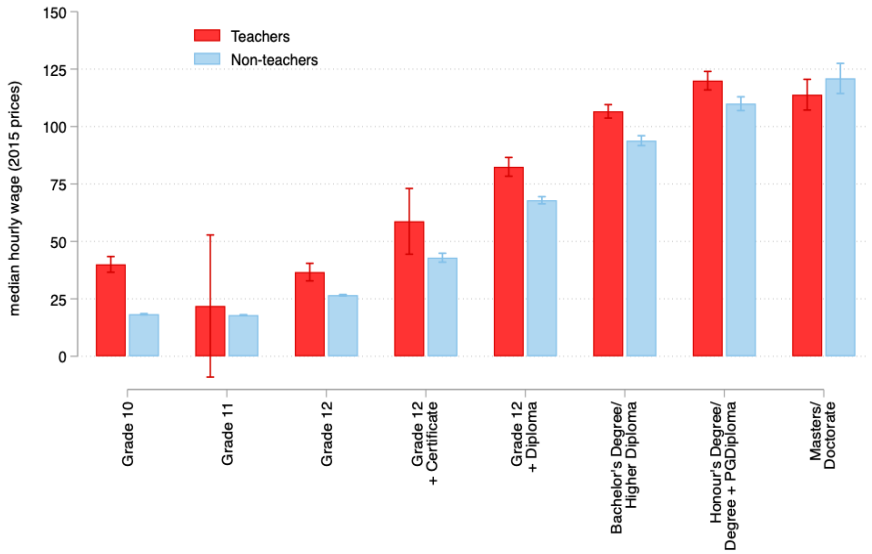
Teacher **D**emographic **D**ividend.

Teacher retirements and the relative position of teachers in the labour market. If there are a large number of teacher retirements in the coming decade, many more teachers will need to be recruited and trained to take their place. Understanding the relative position of teachers in the labour market and how this has changed over time is therefore important if one is to develop strategies to recruit more students (and higher achieving students) into teaching. The cost of teacher salaries and benefits is also important to understand relative to overall budgets allocated to education since increases in salaries and benefits without similar increases in education budgets can erode provinces' abilities to hire more teachers.

The average teacher in South Africa is in the top 5% of the income distribution. Analysis using the teacher salary database (PERSAL) shows that the income of the average publicly employed teacher is R42,668 per month or R512,016 per year in 2019 (inclusive of benefits and before tax, see Note 7). Recent research combining both survey data and SARS tax data shows that in 2016 rands, the income of the top 5% of South Africans was R25,826 per month, and R36,129 for the top 3%.[1] Adjusting for StatsSA headline CPI figures for 2016 and 2019 inflation,[2] the income of the top 5% of earners is R29,596 in 2019 Rands and R41,402 for the top 3% (all pre-tax). This shows that the average teacher's total income and benefits in 2019 was well within the top 5% nationally. It should be noted, however, that South Africa is very unequal with the poorest 60% of the population earning no income from the labour market and only about 30% of South African adults earn income in the formal sector.

According to the Quarterly Labour Force Survey (QLFS), teachers earn higher hourly[3] median wages than non-teachers for almost all levels of education. The QLFS data from 2012-2017 show that teachers' median hourly wages are higher than non-teachers for all levels of education except for those with a masters or PhD degree (Figure 1). The vast majority of teachers in the sample (78%) have 14, 15 or 16 years of education. The differences in median hourly wages here are statistically significantly higher for teachers compared to non-teachers.

Figure 1: *Median hourly wages of teachers compared to non-teachers by level of education (QLFS 2012-2017)*



Source: own calculations using PALMS data, 2012 Q3 - 2017 Q4.

Notes: Sample includes individuals aged 21-64 years old with at least 10 years of education. The sample excludes informal sector workers, those earning more than R200,000 per month (2015 prices), the self-employed, and outliers as flagged in the PALMS. Data are weighted.

[1] Bassier, I., & Woolard, I. 2021. Exclusive Growth? Rapidly increasing top incomes amid low national growth in South Africa. UNU-WIDER Working Paper. Available: https://www.wider.unu.edu/publication/exclusive-growth, Table 3 (p 8). *Note that all annualized figures have been presented as monthly totals to make them comparable.*

[2] Available: https://www.statssa.gov.za/publications/P0141/CPIHistory.pdf

[3] Hourly wages are chosen to be consistent with prior work on this topic: Armstrong, P. (2015). Teacher pay in South Africa: How attractive is the teaching profession? Department of Economics Working Paper, (04/09). Stellenbosch: Stellenbosch University; Van der Berg, S., & Burger, R. (2010). Teacher pay in South Africa. Department of Economics Working Paper, (26/10). Stellenbosch: Stellenbosch University.

Using survey data (QLFS) to compare earnings across professions is possible but certain measurement issues must be taken into account. Most notable of these are under-reporting and imputation.[4] Earnings reported in household surveys tend to be lower, more so in the private sector and at the top end of the earnings distribution where benefits and tax are largest.[5] Changes to the imputation method adopted by StatsSA across the Labour Force Survey (LFS) and QLFSs has complicated cross-time comparisons of earnings.[6] For both these reasons, we can expect teachers' reported earnings in the labour force data to differ from that reflected in PERSAL. We could assume that these issues are no less or more likely to affect teachers' reported earnings than that of others in paid employment. We would still proceed with caution, particularly if the imputation method has introduced systemic bias in earnings estimates.[7]

Where do teachers fall relative to other employees in the formal sector and other professionals? Trends in average and median earnings disguises an important factor in teachers' pay: what induces an individual graduate to enter the teaching profession is not only pay in teaching but *relative* pay when comparing earnings in teaching with potential 'foregone' earnings associated with an alternative career. The Post-Apartheid Labour Market Series (PALMS)[8] that harmonizes the LFSs and QLFSs is used to compare the relative position of teachers and other public-sector and private-sector employees. Figure 2 below shows that, on average, teachers had higher hourly wages than at least 70% of all formal sector paid-employed people in South Africa in 2017.[9] According to the South African Standard Classification of Occupations (SASCO), teachers fall into either Professional or Associate Professional (PAP) occupation levels. If one compares teachers to other PAPs — for example, engineers, lawyers, architects, nurses, doctors, scientists, accountants, journalists, bookkeepers, clerks, and technicians — we can see that the average teacher lies higher in the wage distribution than the average worker from this broadly classified group of occupations. Compared with *degreed* PAPs — that is, those with a degree or a post-bachelor's qualification — teachers' average position has improved over time and by 2017 had converged on this group's average position.

[4] Kerr, A., & Wittenberg, M. (2021). Union wage premia and wage inequality in South Africa. *Economic Modelling*, *97*, 255-271.

[5] Wittenberg, M. (2017). Wages and wage inequality in South Africa 1994–2011. Part 1: Wage measurement and trends. *South African Journal of Economics*, *85*(2), 279–97.

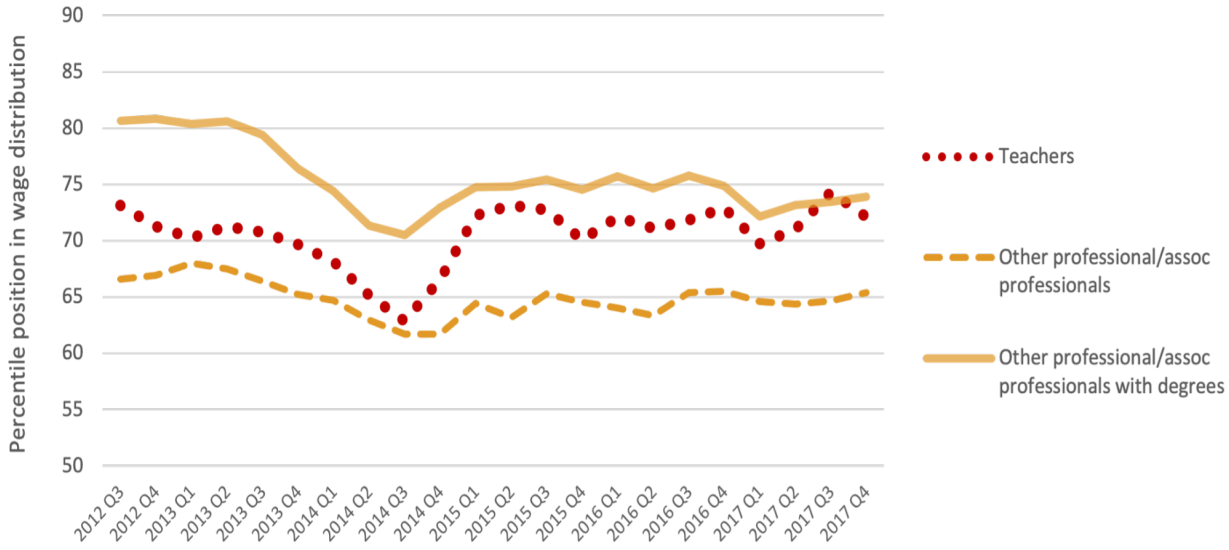
[6] Earnings data in the LFSs are unimputed, whilst data for the QLFSs collected since 2021 Q3 is partially imputed. There is no indication in the data which of the latter is imputed or unimputed.

[7] Requests will be made to access the unimputed QLFS data so that the analysis shown here can be performed excluding imputed data and running consistent imputations for all data.

[8] Kerr, A., Lam, D., and Wittenberg, M. (2019). Post-Apartheid Labour Market Series [dataset]. Version 3.3. Cape Town: DataFirst, University of Cape Town.

[9] We also restrict the analysis to those individuals with at least 10 years of education, which excludes about 15% of the formal sector employed, in predominantly elementary occupations.

Figure 2: *Teachers' and professionals' unconditional pay positions relative to all formal sector wage workers*



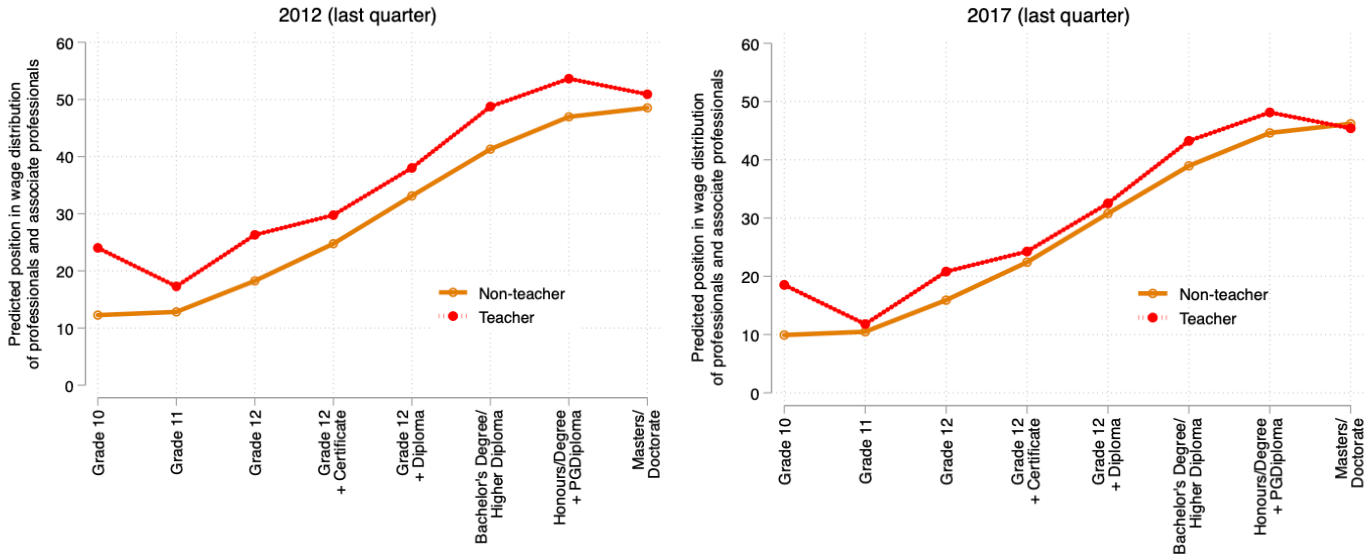
Source: own calculations using PALMS data, 2012 Q3 – 2017 Q4.

Notes: Sample includes individuals aged 21-64 years old with at least 10 years of education. The sample excludes informal sector workers, those earning more than R200,000 per month (2015 prices), the self-employed, and outliers as flagged in the PALMS. Data are weighted.

The trends shown in Figure 2 are unconditional. This means they do not take into account differences in productive and other characteristics. Teachers, especially those teaching in secondary schools, are generally more educated than other workers, even PAPs. Teachers are also older and more likely to be unionised. These characteristics should, on average, put teachers in a favourable earnings position when compared to non-teachers. The demographic profile of teachers also differs in terms of race (greater share of black African and coloured people) and gender (greater share of women), and teachers are less likely to reside in metro areas and more likely to reside in rural areas, especially when compared to those employed in the private sector.

Adjusting for these differences, teachers' expected position in the wage distribution of professionals and associate professionals (PAP) is not significantly different from what is expected for non-teachers (Figure 3). This is true for teachers at all levels of education. Teachers with some post-secondary — but not degree equivalent — qualification lie at the 24th-32nd percentile of the PAP wage distribution; 30% of primary school teachers fall into this education category. Teachers with a degree or postgraduate qualification lie 20 percentage points higher; more than half of primary school teachers and almost all secondary school teachers are at this level of education. The convergence seen in Figure 2 is likely due to an increase in the share of teachers' with higher levels of education. The position of teachers relative to non-teacher PAPs worsened slightly (± 3-4 percentage points) between 2012 and 2017 although this change is not statistically significant.

Figure 3: *Teachers' conditional pay positions relative to professionals and associate professionals, 2012 Q4 vs 2017 Q4*



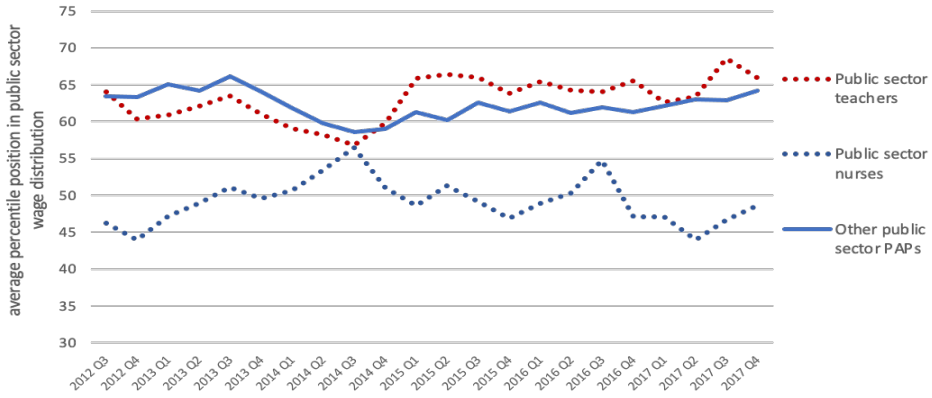
Source: own calculations using PALMS data, 2012 – 2017.

Notes: Sample includes individuals aged 21-64 years old with at least 10 years of education, and employed as a professional or associate professional (PAP). The sample excludes informal sector workers, those earning more than R200,000 per month (2015 prices), the self-employed, and outliers as flagged in the PALMS. Data are weighted. Predictive margins are computed from a tobit regression (lower limit = 0, upper limit = 100), where the dependent variables is the individual's position in the wage distribution of professional and associate professionals as dependent variable, and controls include survey wave, teacher, gender, race, marital status, union status, sector of employment, geographic location type, province, and level of education dummies, as well as potential experience (age - 6 - years of education) mean centered around 10 years.

Where do teachers fall relative to other public-sector <u>employees</u> and other public-sector <u>professionals</u>?

If one ranks all public sector employees, the average teacher is at the 65th percentile of government employees. The ranking of nurses has tended to oscillate around the 50th percentile, whereas other public sector PAPs rank very similarly to teachers. The relative position of teachers increased between 2013/14 and 2015-2017.

Figure 4: *Teachers', nurses' and other professionals' unconditional pay positions relative to all public sector wage workers*

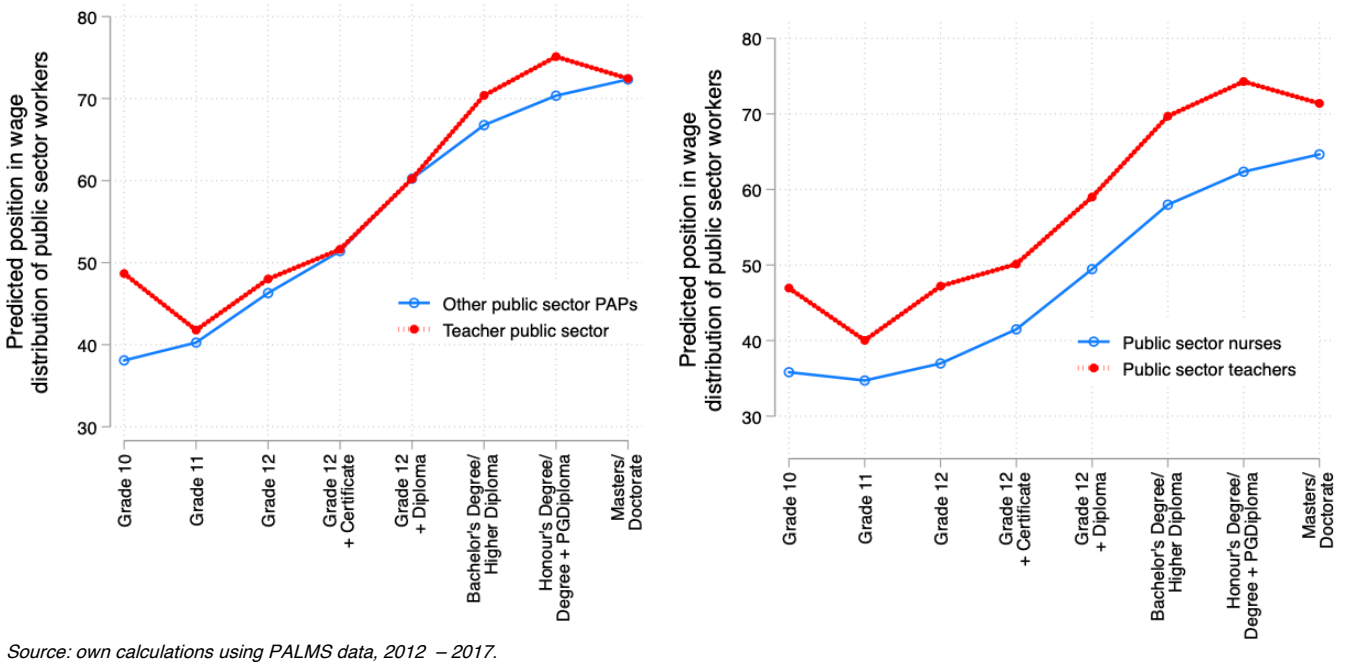


Source: own calculations using PALMS data, 2012 Q3 – 2017 Q4.

Notes: Sample includes individuals aged 21-64 years old with at least 10 years of education and employed in the public sector. The sample excludes informal sector workers, those earning more than R200,000 per month (2015 prices), the self-employed, and outliers as flagged in the PALMS. Data are weighted.

Similar to Figure 3, Figure 5 shows the expected pay position of teachers in the public sector wage distribution after adjusting for differences in productive and sociodemographic characteristics. The average teacher ranks
quite a bit higher in this distribution than they did in the wage distribution of PAPs. **A teacher is not expected to earn any differently from other public sector PAPs with the same level of education**, but the
differences between teachers and nurses from "Grade 12 + Diploma" to "Honour's Degree/Degree + PGDiploma" are statistically significant. Put differently, for a given level of education, and similar experience, demographics and geographic location, the average teacher is higher up in the wage distribution than the average nurse.

Figure 5: *Teachers' conditional pay positions relative to other public sector professionals and associate* professionals, 2017 Q4



Source: own calculations using PALMS data, 2012 – 2017.

Notes: Sample includes individuals aged 21-64 years old with at least 10 years of education, and employed in a professional or associate professional (PAP) occupation in the public sector. The sample excludes informal sector workers, those earning more than R200,000 per month (2015 prices), the self-employed, and outliers as flagged in the PALMS. Data are weighted. Predictive margins are computed from a tobit regression (lower limit = 0, upper limit = 100), where the dependent variables is the individual's position in the wage distribution of professional and associate professionals as dependent variable, and controls include survey wave, teacher, gender, race, marital status, union status, sector of employment, geographic location type, province, and level of education dummies, as well as potential experience (age - 6 - years of education) mean centered around 10 years.

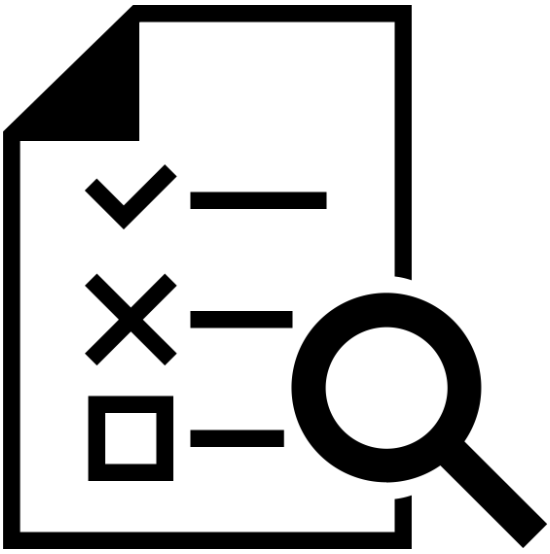
Overall, teachers fall in the 70th-75th percentile of formal sector pay, and they are expected to rank similarly to other professionals and associate professionals — both in the private and public sectors — with similar levels of education, experience and demographic characteristics. Earlier analyses[10] of labour force survey data for the 2000-2007 period found the advantage of entering the teaching profession to diminish with educational attainment. This could have served as a disincentive to acquire higher qualifications or remain in teaching. Using more recent labour survey data, this no longer appears to be the case.

[10] Van der Berg, S., & Burger, R. (2010). Teacher pay in South Africa. Department of Economics Working Paper, (26/10). Stellenbosch: Stellenbosch University.

9

What are the matric marks of those entering ITE programmes?

Irene Pampallis (10 Nov 2022)



RESEP
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Teacher **D**emographic **D**ividend.

1. Overview

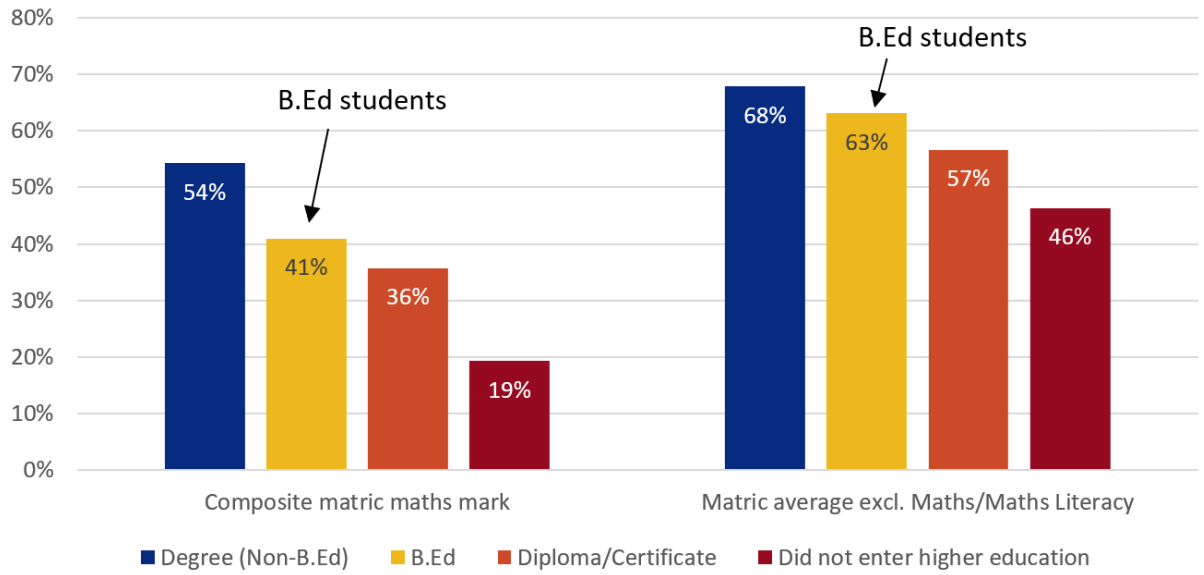
In devising recruitment plans to meet the projected teacher demand in the coming decade, it is helpful to consider who chooses to enter initial teacher education (ITE) programmes. An important metric to consider is how the high school results of education students compare to those of students in other degree programmes. This note compares the National Senior Certificate (NSC) results of Bachelor of Education (B.Ed) students to students in other degree programmes. Implications for the quality of teaching graduates are considered.

What are the NSC (matric) scores of those who choose to become teachers?

B.Ed students perform poorly in matric mathematics, particularly compared to those who enrol in other degree programmes. This can be seen in Figure 1, which shows the matric marks of B.Ed candidates compared to those in other programmes. Using data linking matric performance and university enrolment (HEMIS) for students from the 2008-2015 matric cohorts, one can see that those who enrolled in B.Ed degrees achieved an adjusted average of 41% for mathematics in matric, compared with 54% for students in other degree programmes and 36% for students in diploma or certificate programmes. These figures are based on a composite mathematics mark for all matriculants, which converts Mathematical Literacy marks into Mathematics-equivalent marks, so that all matriculants can be compared on the same scale.[1]

There is a similar trend for other non-mathematics subjects although the difference is smaller: A similar pattern was apparent in the marks from candidates' other subjects, although as illustrated in Figure 1, the marks for other subjects were significantly higher than the mathematics marks. The difference between B.Ed candidates and other degree students is also smaller for these other subjects than for Mathematics, which suggests that students entering ITE are stronger in subjects other than Mathematics.

Figure 1: *The matric marks of B.Ed candidates compared to those who enrol in other degrees, in non-degree programmes, or who do not enter higher education at all (2008-2015 matric cohorts)*

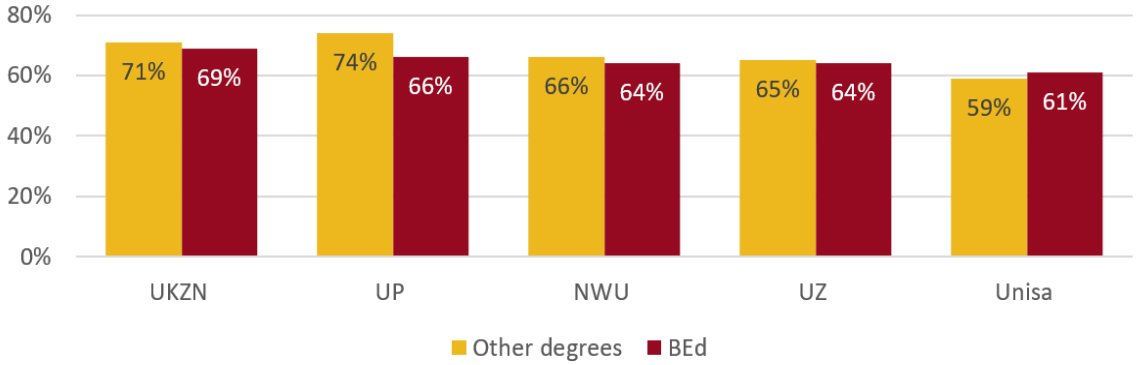


Source: NSC and DHET matched data from 2008-2017. The figures above are based on students who wrote matric in 2008-2015 and who started tertiary studies in or before 2017.

The trends above are confirmed if we consider the matric marks of incoming B.Ed students at the universities which produce the most B.Ed graduates. Figure 2 shows the average matric mark obtained by students enrolling in B.Eds and in other degrees at the five universities which produce the most B.Ed graduates: Unisa, the University of Zululand, North-West University, UKZN, and the University of Pretoria. Together, these five universities produce almost half of all B.Ed graduates in South Africa.[2] Figure 3 shows the percentage of incoming students at the same five universities who took Mathematics (not Mathematical Literacy) in matric and scored at least 50%. It is clear that while prospective teachers generally have similar academic results to other degree candidates, they are less likely to take mathematics (as opposed to mathematical literacy) and their mathematics results are far weaker. It is particularly alarming to note that at Unisa, which trains far more

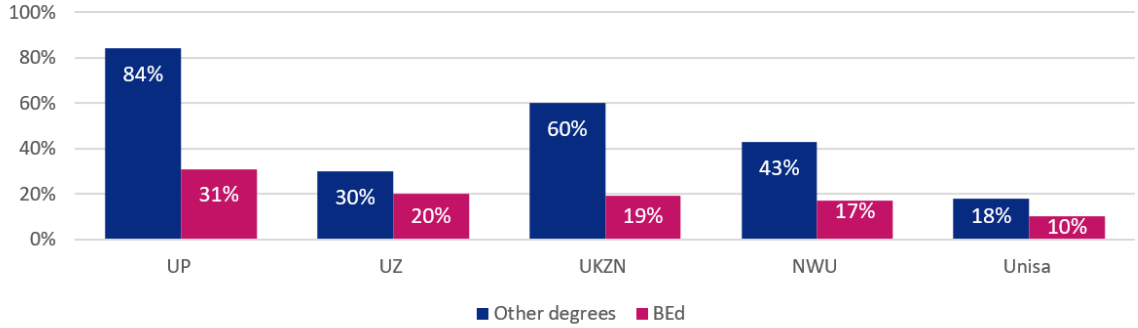
teachers than any other university, only 10% of incoming B.Ed students in the years 2014-2016 took Mathematics in matric and passed with at least 50%.

Figure 2: *What was the average matric mark for incoming B.Ed students compared to teachers in other degrees?*



Source: Van der Berg et al., 2020, pp. 102-103.[3] *Based on the 2013 matric cohort, enrolling for degrees in 2014-2016.*

Figure 3: *What percentage of incoming B.Ed students and other degree students scored 50% or more for Mathematics in matric? (NB: Mathematics, not Mathematical Literacy)*

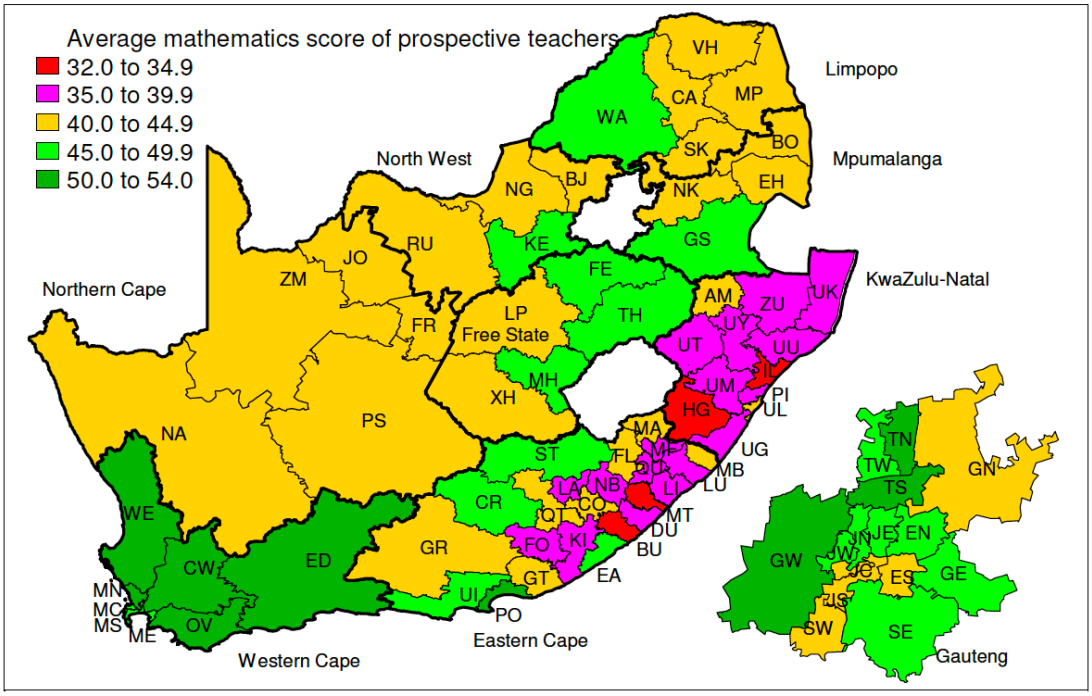


Source: Van der Berg et al., 2020, pp. 102-103. Based on the 2013 matric cohort, enrolling for degrees in 2014-2016.

Strong mathematics skills are vital for teachers, but we are unlikely to attract stronger mathematicians into teaching without improving the standard of matric results overall. Mathematics is essential for all Foundation Phase teachers, as well as teachers who teach mathematical, commercial or scientific subjects in other grades. Furthermore, all teachers require at least basic mathematical skills for assessing their learners. Although B.Ed students are drawn from the lower part of the degree-enrolled distribution at university, they are part of the top-performing matric candidates by virtue of being accepted at university: almost two-thirds of student teachers who took matric mathematics were in the top 25% of achievers in matric nationally.[4] And as was seen in Figure 1, B.Ed students have higher matric marks than students completing diplomas and certificates, and much higher matric marks than students who wrote the matric exams but did not enter higher education at all. Taken together, these things suggest that there is a shallow pool of alternative high-quality candidates to attract into teaching, unless students that would previously have taken other courses of study choose instead to study teaching. It will be difficult to improve the academic calibre of our prospective teachers without improving matric outcomes more generally or drawing candidates into teaching who would otherwise not have chosen teaching. In the meantime, it is critical that universities address gaps in mathematical skills and mathematical confidence as a part of teacher training.

There is considerable geographic variation in the mathematics scores of matrics who go on to pursue teaching. Existing data linking matric and university data (HEMIS) can also be used to see the distribution of mathematics scores by matric location (i.e. where the student wrote their matric exam). Figure 4 shows that students enrolled in ITE programs who were originally from the Western Cape, Gauteng, and certain districts in other provinces score relatively highly on matric mathematics (again using the composite score which is based on Mathematical Literacy marks as well as Mathematics marks), while students from other parts of the country (notably KwaZulu-Natal and the eastern half of the Eastern Cape) achieve much lower mathematics grades.

Figure 4: *Average mathematics scores of matrics who become teachers*



Source: Department of Basic Education, 2018, p. 15. This includes people who matriculated in 2008-2011, and who entered Persal as teachers in 2013-2017.

Comparing university entry requirements

The entry requirements to B.Ed degrees are on the lower end of the spectrum when compared to other popular university degrees, especially in mathematics. This can be seen in Table 5, which shows the entry requirements of different degree programmes at three universities. The B.Ed is also one of very few degrees that does not require a minimum mark for mathematics or mathematical literacy at many universities (although as can be seen from the Unisa requirements, this is beginning to change). This may funnel students who are weaker academically into teaching programmes, because they do not meet the entry requirements for more selective programmes. These results highlight one possible explanation for the difference between the marks of incoming B.Ed candidates when compared to the marks of other degree candidates.

Table 5: *Entry requirements to various degree programmes at three universities*

	North-West University (2023 admissions)			University of Pretoria (2023 admissions)			Unisa (2023 admissions)		
	APS*	**Maths/ M. Lit.**	**English**	**APS***	**Maths/ M. Lit.**	**English**	**APS***	**Maths/ M. Lit.**	**English**
B.Ed FP	26	-	50%	28	-	50%	23	40% M 50% ML	50%
BCom Acc	24	40% M No MLit option	50%	34	70% M No MLit option	60%	21	50% M No MLit option	50%
BA	24**	-	50%	30	-	60%	20	-	50%
BEng#	34***	70% M No MLit option	60%	35***	70% No MLit option	60%	-	-	-
LLB	30	40% M (recommended but not required)	60%	32	-	60%	20	-	50%

*Admissions Points Score **BA Humanities ***Physical Sciences 70% also required #Unisa does not offer BEng degrees
B.Ed FP: Bachelor of Education (Foundation Phase), BCom Acc: Bachelor of Commerce (Accounting Sciences), BA: Bachelor of Arts, BEng: Bachelor of Engineering, LLB: Bachelor of Laws
Note: For NWU and Unisa other languages than English may also be accepted, depending on the campus and programme.
Source: University websites and undergraduate prospectuses

Endnotes

[1] The process is outlined in Department of Basic Education (2018). *Grade 12 learners who become teachers: A linking of Matric and Persal data 2008-2017.* Unpublished report. Pretoria.

[2] Van der Berg, S., Gustafsson, M., & Burger, C. (2020). *School Teacher Supply and Demand in South Africa in 2019 and Beyond.* Pretoria: Department of Higher Education and Training, pp. 102-103.

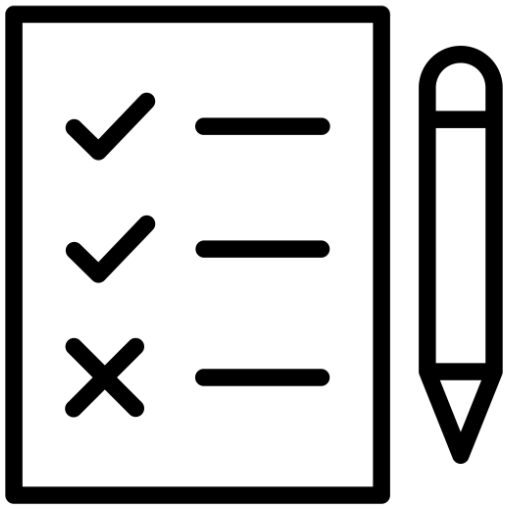
[3] Van der Berg, S., Gustafsson, M., & Burger, C. (2020). *School Teacher Supply and Demand in South Africa in 2019 and Beyond*. Pretoria: Department of Higher Education and Training.

[4] Department of Basic Eduation (2018). *Grade 12 learners who become teachers: A linking of Matric and Persal data 2008-2017.* Unpublished report. Pretoria, p. 5.

10

Teacher knowledge and teacher age: What are the levels of in-service teacher knowledge?

Nic Spaull & Peter Courtney (10 Nov 2022)



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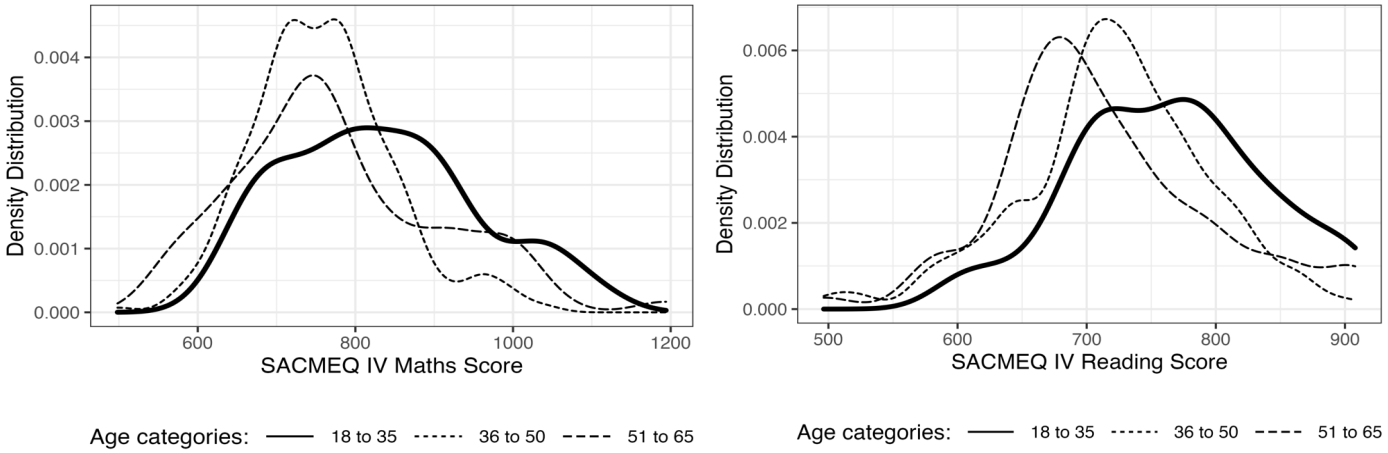
Do younger teachers have higher levels of content knowledge than older teachers?

There is only one dataset that can be used to assess the levels of content knowledge of younger teachers compared to older teachers in South Africa, and that is the Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ)[1]. This is the only dataset that tests a nationally representative sample of Grade 6 teachers on reading and mathematics and has been conducted in 2007 and 2013. Previous analysis on the 2007 data showed that younger teachers have significantly higher levels of content knowledge than older teachers, particularly in mathematics[2], and that the average Grade 6 mathematics teacher could not score 60% correct on Grade 6 or 7 level items[3]. In this note we repeat the age analysis but for the more recent 2013 data from 298 primary schools. The figure below reports the distributions of mathematics (left) and reading (right) content knowledge of teachers by age group. The population of teachers is split into three categories by age (18-35yrs, 36-50yrs, 51-65yrs). The youngest teachers (shown by the solid bold line) score significantly higher in maths than older teachers (shown by dotted lines).

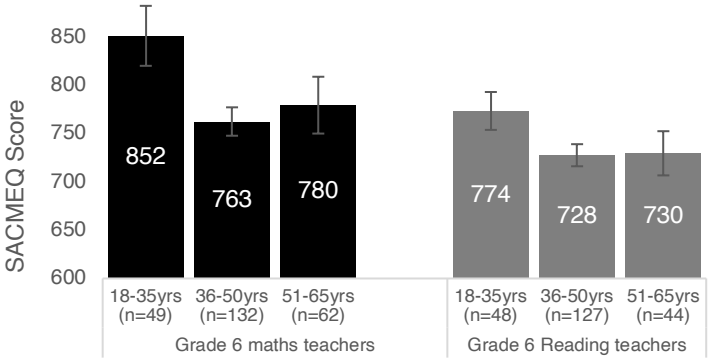
***Figure 1**: Content knowledge levels of South African Grade 6 mathematics teachers (left panel) and Grade 6 reading teachers (right panel) by age category (SACMEQ, 2013)*



Source: Own calculations using SACMEQ IV data

Differences between younger and older teachers in mathematics are larger than provincial differences between WC and EC. To provide a sense of the size of the difference between younger and older teachers in mathematics (70-90 points), it is helpful to compare provinces. The SACMEQ IV South Africa report[4] shows that the average mathematics teacher's score in the Western Cape was 843 points, and in the Eastern Cape was 781 points (i.e. 62 points). Therefore the gap between younger and older teachers is larger than the average gap between teachers in the Western Cape and the Eastern Cape.

***Figure 2:** Average teacher content knowledge score for Grade 6 mathematics and reading teachers*

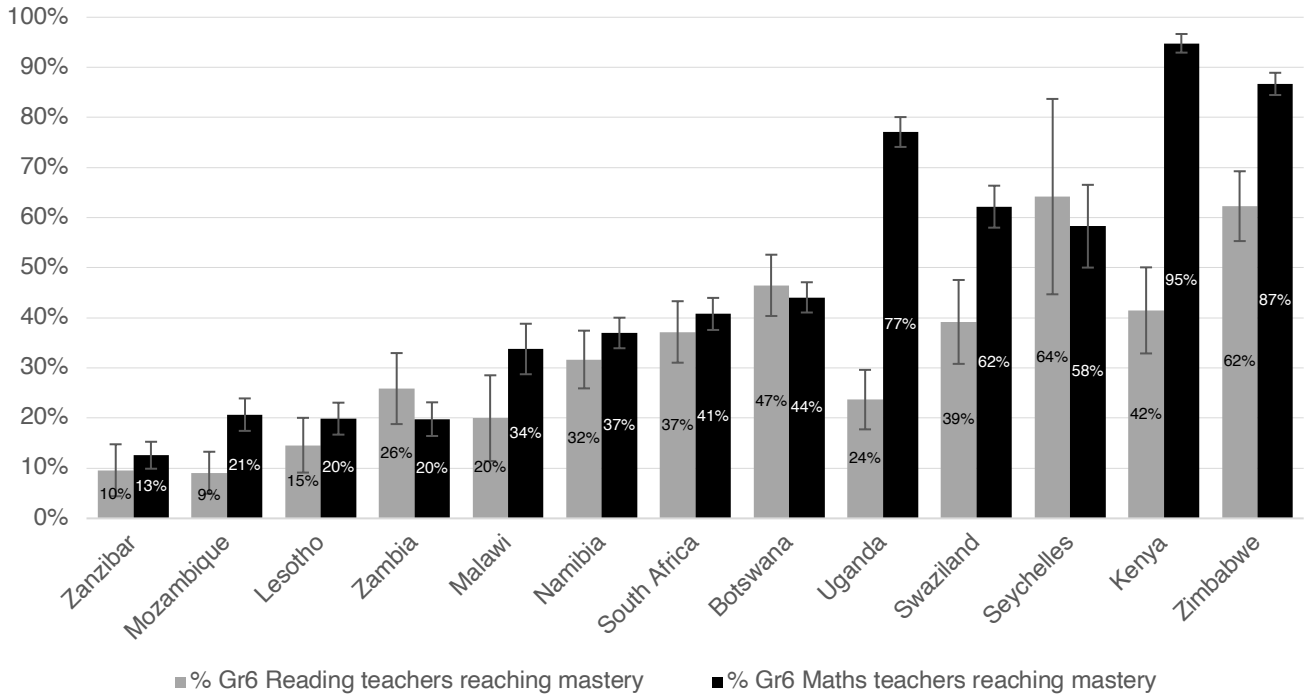


Source: Own calculations using SACMEQ IV unweighted data (90% confidence interval shown)

Younger teachers replacing older teachers could lead to improvements in learning outcomes. Although there are many dimensions to effective teaching that include training, materials, accountability and support, at a base level a teacher cannot teach that which they do not know. It is clear that older teachers that were educated and trained under apartheid have lower levels of content knowledge than their younger colleagues who were trained at universities post-apartheid. This trend is especially evident in mathematics. While this is for no fault of their own, there is some South African research evidence showing that learners learn more when their teachers have higher levels of content knowledge[5], suggesting that the retirement of older teachers may lead to improvements in learning outcomes in the coming years, other things being equal.

South African teachers have lower levels of content knowledge than those in Zimbabwe or Kenya. The SACMEQ IV (2013) teacher tests in reading and mathematics were the same for all SACMEQ countries allowing comparisons across the nationally representative samples. Figure 3 below reports the percentages of teachers reaching 'mastery' on the SACMEQ teacher tests, as reported in the SACMEQ IV International Report. This shows that in South Africa, only 37% of Grade 6 reading teachers and 41% of Grade 6 maths teachers reached mastery in the subjects. The levels of mathematics mastery among teachers in South Africa (37%) is considerably lower than in Kenya (95%), Zimbabwe (87%), or Uganda (77%).

Figure 3: *Percentages of Grade 6 reading and mathematics teachers reaching SACMEQ levels of mastery by country*



Source: Awich, M. (2021). SACMEQ IV International Report. Southern and Eastern African Consortium for Monitoring Educational Quality (SACMEQ), p.62.

Even within existing constraints, current teachers could improve learning outcomes more than at present. Existing research in South Africa shows that Grade 6 learners achieve lower reading and mathematics outcomes *for a given level of teacher content knowledge* than most other African countries, especially at lower levels of content knowledge[6] suggesting that there may be other challenges, such as low levels of accountability.

Endnotes

[1] SACMEQ IV international report available: http://www.sacmeq.org/sites/default/files/sacmeq/reports/sacmeq-iv/international-reports/sacmeq_iv_international_report.pdf

[2] Armstrong, P., 2007. Teacher characteristics and student performance: An analysis using hierarchical linear modelling. South African Journal of Childhood Education. Vol 5, 2.

[3] Venkat, H. and Spaull, N. 2015. What do we know about primary teachers' mathematical content knowledge in South Africa? An analysis of SACMEQ 2007. International Journal of Educational Development. Vol. 41 Mar. p.121-130.

[4] Awich, M. 2021. The SACMEQ IV project in international: A study of the conditions of schooling and the quality of education. Gaborone SACMEQ. p.27.

[5] Armstrong, P. 2015. *Teachers in the South African education system: An economic perspective*. PhD: https://resep.sun.ac.za/wp-content/uploads/2017/10/Paula-Armstrong-Thesis.pdf. p.102.

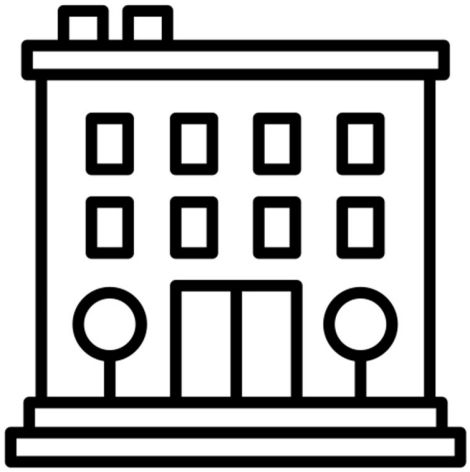
[6] DBE., 2013. Report on Progress in the Schooling Sector against Key Indicators. Available: https://www.education.gov.za/Portals/0/Documents/Reports/Report%20on%20Progress%20in%20the%20Schooling%20Sector%20Against%20Key%20Indicators%202013.pdf?ver=2015-02-01-131925-513 p.31

11

The Quality of Primary Mathematics Teacher Preparation in SA

Findings from PrimTEd

Nicky Roberts & Qetelo Moloi (21 Nov 2022)



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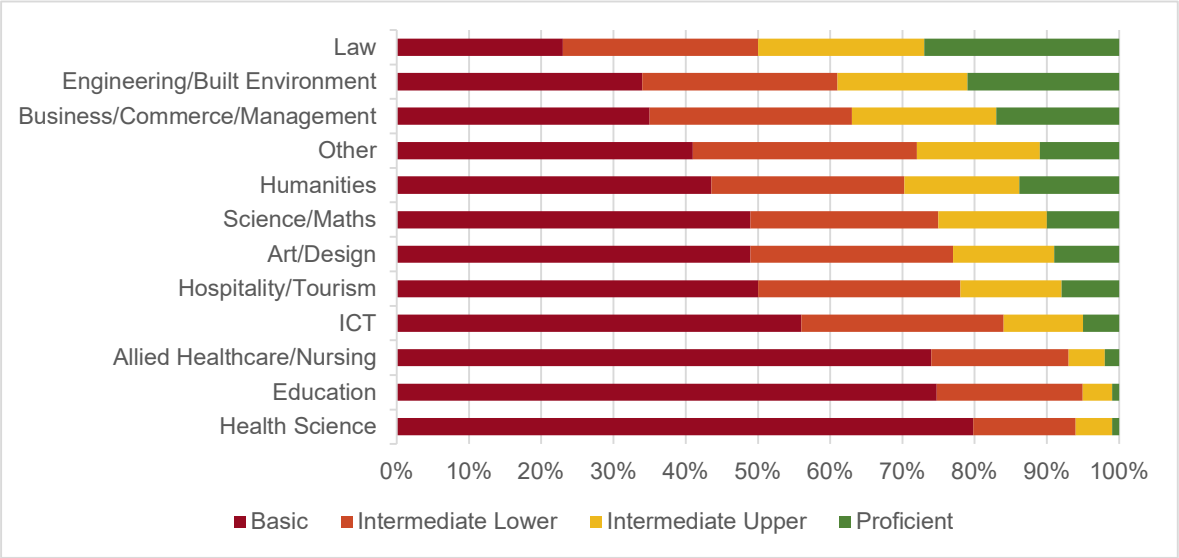
Teacher **D**emographic **D**ividend.

This report provides an overview of key findings from the Primary Teacher Education Development (PrimTEd) project for the period 2018-2021. PrimTEd is a voluntary collective of 25 universities with the aim of monitoring the performance of students in Initial Teacher Education (ITE) programmes for primary school teachers. Assessments in Mathematics and English (First Additional Language) have been collaboratively developed and administered regularly. This enables the use of assessment data as a rich source to improve teaching and learning. The findings in this report are drawn from mathematics assessments that were administered to Foundation Phase and Intermediate Phase ITE students at first and final (fourth) year in the Bachelor of Education (B.Ed) programmes in PrimTEd universities.

First year students entering primary education B.Ed programmes have very weak mathematical skills. Universities start where secondary schools finish, so many first-year students have weak mathematics literacy results, and very poor mathematics knowledge. Candidates applying to education faculties at universities have weaker quantitative literacy skills (as measured by the NBTs) than candidates applying to any other faculty except Health Science (Figure 1). About 75% of applicants to Education perform only at the Basic level for quantitative literacy. The Intermediate Upper level is regarded as a requirement for success at university.

***Figure 1**: 2018 NBT Quantitative Literacy performance levels (n=18,000) by intended faculty of study*



Source: NBTP Team at CETAP. (2019). The National Benchmark Tests National Report.

The PrimTEd mathematics assessment was developed as a reasonable measure of what might be expected of teachers completing a primary B.Ed programme. It was administered at two points in time – at the beginning and end of the B.Ed programme. The initial PrimTEd test comprised a set of 50 mathematics items in a multiple-choice format that assess students' "mathematical knowledge for teaching". The 90-minute test is administered online under invigilation of at least one lecturer. The test items are categorized in relation to the mathematics content domains: whole number and operations (24%), rational number and operations (38%), patterns, functions and algebra (16%), geometry (8%) and measurement (14%). The items are also classified as either lower or higher cognitive demand as stipulated by Stein, Grover and Henningsen's (1996) framework on tasks.[1] Exemplar items are given in Figure 2.

Attainment in the PrimTEd mathematics assessment is weak at both first- and fourth-year levels. Across all institutions which participated throughout the three-year project period (2017-2019), the mean result of first year students was 47.6%. The mean result for fourth year students was 52.5% (see Figure 3).

As such, the improvement in mathematical knowledge between first- and fourth-year students was only 5 percentage points. However, standards-based reporting shows that there are positive shifts in the attainment level when comparing first years to fourth years (see Figure 4).

***Figure 2**: Exemplar items from the PrimTEd mathematics assessment*

Exemplar item 1: Rational number, low cognitive demand
0,7 is a decimal fraction.
Write 0,7 as a common fraction.

Exemplar item 2: Rational number, high cognitive demand
A farmer's cost for milk production is R3,12 for each litre. What are his production costs for 2,5 litres of milk? The calculation you need, to get the correct answer is:

A. 3,12 × 2,5
B. 3,12 - 2,5
C. 2,5 ÷ 3,12
D. 3,12 ÷ 2,5

***Figure 3**: PrimTEd Mathematics test – mean results (2017-2019)*

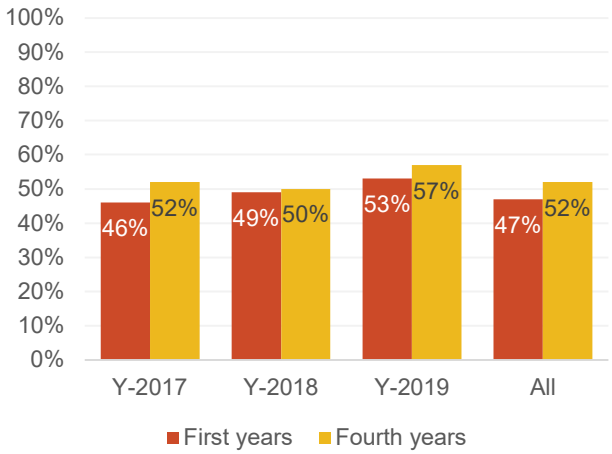
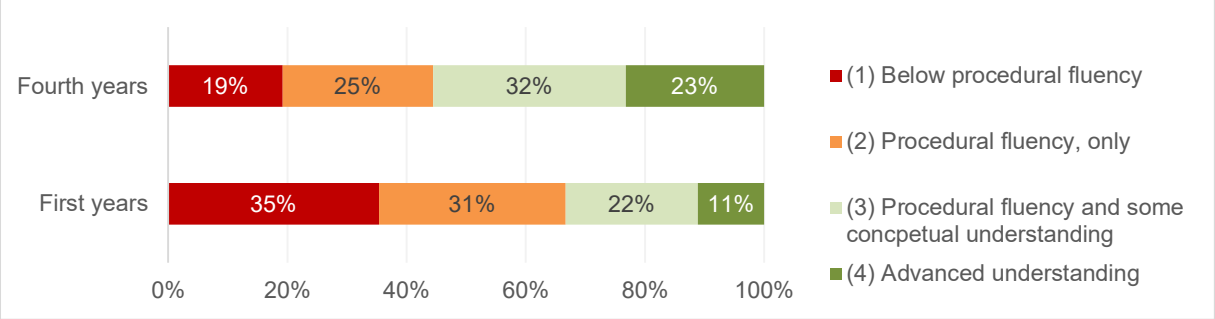


***Figure 4**: PrimTEd Mathematics attainment levels 2017-2021 (first years n = 3799, fourth years n = 1062)*



It is evident that some of the mathematics (and mathematics literacy) deficiencies that student teachers bring from school persist to the end of the four-year B.Ed programmes. This presents a challenge to universities and also suggests that the vicious cycle of schooling and ITE reported in Taylor (2019)[2] is yet to be broken.

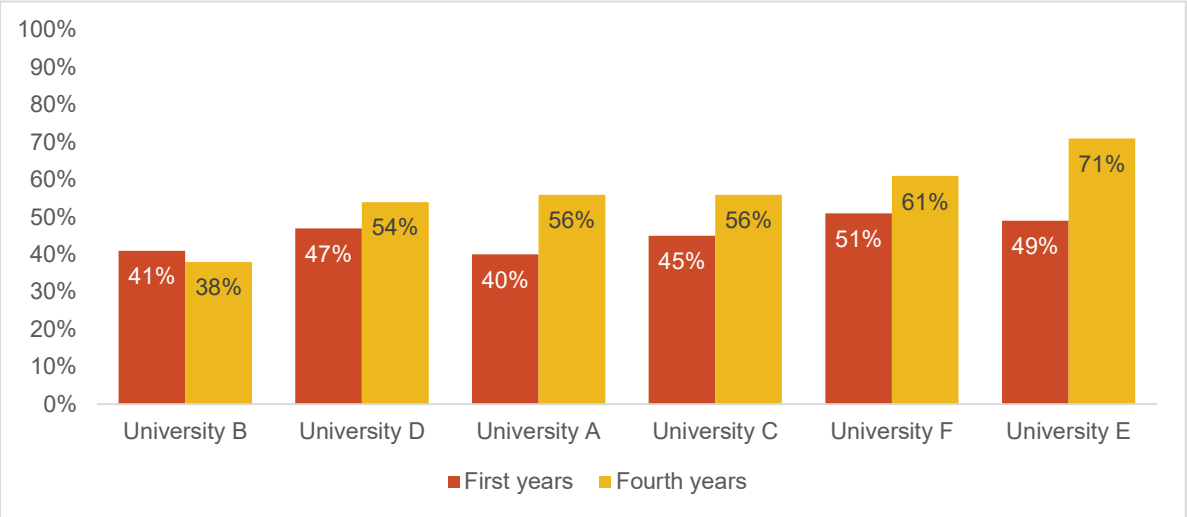
The PrimTEd process is driven by ITE lecturing staff themselves, who are very concerned about this lack of progress from first to fourth year. Accordingly, they have sought ways to collaborate and improve mathematics course offerings. These academics have agreed on PrimTEd knowledge and practice standards for mathematics. There is clear evidence of ITE lecturer appetite for change and for gaining specialized skills in the mathematical knowledge that is required for teaching well at primary school level.

Reasons for the lack of progress are varied: insufficient course alignment to PrimTEd standards, poor entry level mathematics, insufficient training and knowledge amongst ITE lecturers for primary school (many of whom have a secondary school mathematics specialisation), and insufficient time in the B.Ed programmes to work with students on their mathematics knowledge for teaching.

The lack of time allocated to mathematics in B.Ed programmes is a serious constraint. In 2020, mathematics lecturers in 6 universities applied for funding to improve their course offerings (through the Maths 4 Primary teachers project). Across these six universities, credit weightings for mathematics range from 5% to 17% of the 480 credits in the B.Ed degrees. This is a very small proportion of the total credits.

Some variation is evident in PrimTEd mathematics results across universities, as shown in Figure 5. Universities A and E show fairly large differences in their cross-sectional data comparing first years to fourth years. Investigating the practices at these universities may provide valuable information about effective teacher education strategies.

***Figure 5**: PrimTEd Mathematics test – mean results by university (2017-2019)*



Given the above evidence, it is clear that there are several possible next steps, which require urgent attention:

1. The DHET should include a firm recommendation for the credit weighting in B.Ed programmes (Foundation and Intermediate Phase) for at least 100 credits in mathematics, and at least 120 credits for language and literacies;
2. Raise the entry requirements for incoming B.Ed entrants (prioritizing mathematics, and/or higher scores in mathematics literacy);
3. Consider extending the B.Ed to a five year programme, with a first year focused on mathematics, language and literacy;
4. Support the work of PrimTEd assessment beyond 2023;
5. Fund and support the ITE lecturers who acknowledge the seriousness of this problem, are seeking capacity building and are willingly collaborating to improve their mathematics course offerings; and
6. Ensure that the UNISA online courses are the best that can be offered, and draw on the innovations being designed and trialled at smaller scale in numerous other ITE sites.

[1] Stein, M. K., Grover, B. W., & Henningsen, M. A. (1996). Building student capacity for mathematical thinking in reasoning: An analysis of mathematical tasks used in reform classrooms. *American Educational Research Journal*, 33 (20), 455-488.
[2] Taylor, N. (2019). Inequalities in teacher knowledge in South Africa. In N. Spaull and J. D. Jansen (Eds.), South African Schooling: The Enigma of Inequality: A Study of the Present Situation and Future Possibilities. Springer, pp. 263-282.

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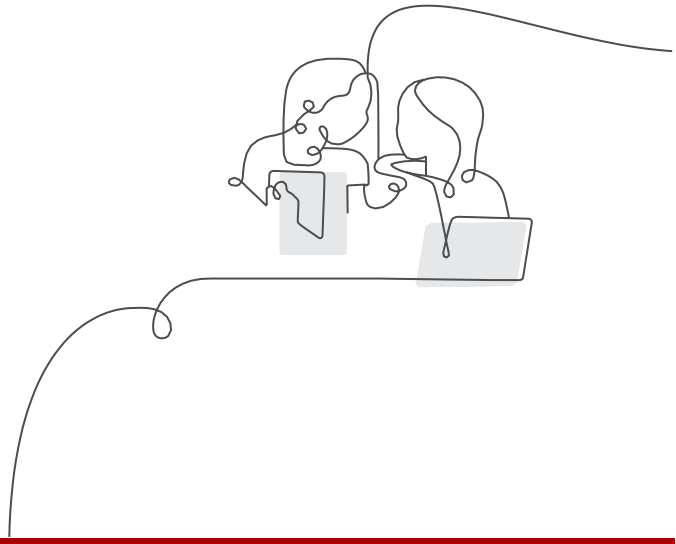

Teacher Demographic Dividend.