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Correspondence between Mathematics and Mathematical Literacy Scores: An Analysis for 2010 to 2018

Grace Bridgman[1]

This paper estimates correspondence curves between mathematics and mathematical literacy scores for South African Matric Students from 2010 to 2018. The analysis is an extension of previously estimated correspondence scores as in Simkins (2010) and goes on to discuss potential pass rates in mathematics, were students to enroll in the type of mathematics class for which they have a greater aptitude. The paper argues that greater care should be taken in advising students as to which classes they should enroll in, and argues that mathematics Matric pass rates could be improved at no additional cost by better matching students to the correct class.

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1. Introduction

The presence of a skills shortage in the South African labour force has become a persistent and unwelcome reality, and is regarded as a lasting and damaging legacy of the apartheid regime (Van der Berg, 2007). Although the direction of causality from higher education levels to higher economic growth is not certain, the shortage of skilled workers is regarded as a structural impediment to economic growth in South Africa, and has become a serious policy concern. Furthermore, the parallel oversupply of unskilled workers in South African labour markets manifests in a skills premium, which results in the skills shortage perpetuating inequality. That is to say, multiple studies of South African inequality have found that more highly skilled and educated individuals are more likely to be employed, which in turn diminishes the likelihood that educated individuals and their families are poor (Van der Berg, 2007, 2008; Van der Berg, *et al.*, 2011). Inequality in employable skills therefore plays an important part in the interrelationship between poverty, education, income inequality and unemployment. Addressing the inequality in educational opportunities that children receive in school is therefore crucial to addressing overall inequality in South Africa.

One of the starkest inequalities that is observed in educational outcomes is the rate of mathematics and mathematical literacy passes in different types of schools. While there is a low base rate of math and math literacy passes, the likelihood of passing mathematics or mathematical literacy increases with the wealth of the school (Simkins, 2010a; Taylor & Yu, 2009). This trend is also true for physical science, another highly valued skill in the labour market. The scarcity of math and science passes places a premium on these skills in the labour market for matrics who seek work directly after school. Furthermore, achieving higher final scores in these subjects is also an advantage for matrics who go on to seek tertiary education. Therefore, improving the rate at which students pass math and math literacy in matric is important, both for individual students and for the level of skills available in the labour market, and will work towards decreasing South African inequality.

In 2010, Charles Simkins authored multiple reports for the Center for Development and Enterprise, which focused on matric pass rates. The fourth report focused on the transition in the South African mathematics syllabus in 2007, which made mathematics or mathematical literacy compulsory for every student, and which will be discussed further below. In this report, Simkins estimated correspondence scores and curves in order to compare mathematics and mathematical literacy scores achieved by similar students. This method allowed Simkins to comment on how well students were sorted into appropriate mathematics-based subjects, as well as the number of "potential math passes" that may have been achieved had students taken math classes for which they were better suited. These correspondence scores allow researchers and policy makers to assess how well students are choosing between math and math literacy, as well as the relative difficulty between the two subjects. While they are interesting and helpful statistics, correspondence scores have not been re-estimated subsequent to 2008.

This essay will therefore analyse matric results from 2010 to 2018, with a focus on creating correspondence scores between mathematics and mathematical literacy for these years. In order to do so, the following section will start by reviewing relevant literature and section 3 will discuss the data used in the analysis. Section 4 goes on to describe correspondence scores in greater detail, and gives the results of the analysis. Section 5 presents pass rates and potential pass rates in math and math literacy, while section 6 provides a discussion and concludes.

2. *Literature Review*

Multiple studies have been conducted which review inequalities in educational inputs and outcomes in different types of schools. These studies focus on which inputs to education have the largest effects on educational outcomes, and focus on how budgets and priorities should be structured in order to achieve better results. These studies are valuable, and have produced vital lessons for policy makers.

For example, a study conducted by Stephen Taylor in 2013 found that study guides for subjects similar to accounting and economics are unlikely to have a positive effect on overall matric outcomes, while study guides for subjects similar to geography and life sciences are likely to have a moderately positive effect. This runs contrary to the popular belief that textbooks are a relatively cost-effective and sure way in which to improve results (Taylor, 2013:10). This study suggests that inputs for learning math and math literacy may be different to the inputs for other subjects, and provides nuance to the debate on how textbooks should be distributed. Another approach is to estimate regressions as to the effect of inputs on certain educational outcomes. For example, Martin Gustafsson (2007) conducted a hierarchical linear production function model, and concluded that infrastructure, textbooks and nutrition schemes should be prioritized in school budgets (Gustafsson, 2007:97). These types of studies often conclude that more or different resources should be deployed to schools, and suggest which resources should be prioritized. This approach relies on the underlying ideology that resources and better prioritization of funds in schools is the key to better results. This paper takes a different approach, and argues that alongside more efficient resource allocation, educational outcomes can also be improved when students are directed towards the subjects in which they have a greater ability to pass.

In 2010, Charles Simkins authored a research report for the Center for Development and Enterprise in which he examined math and math literacy results in 2008 with a focus on the number of passes, fails and potential passes that were realised. This study revealed that math and math literacy pass rates are relatively low, and that the majority of students who take math do not achieve the 30 % pass rate. Moreover, failing mathematics or math literacy prevents students from achieving a bachelor's pass which enables them to go to university. Therefore, this study suggests that there are many students who take math who would be better suited to pass math literacy, as this would enable them to achieve a bachelor's pass (Simkins, 2010a:7). Secondly, this study estimated correspondence scores, which allows mathematics scores to be compared with math literacy scores in order to estimate whether students who failed mathematics could have passed math literacy.

These correspondence scores are valuable, in that they allow for the comparison of students across these different math-based subjects, and also allow for the estimation of how many extra math and math literacy passes could have been achieved if students had selected different subjects according to their ability in mathematics. These scores also allowed Simkins to estimate the number of "potential math passes", which is to say that some students who took math literacy could have passed mathematics. In 2008, Simkins estimates that an extra 35 495 could have passed mathematics had they taken it instead of math literacy. This represents a 38 % increase in the number of math passes, which is substantial (Simkins, 2010b:2). This increase in math passes represents a significant increase in the number of matric students who could go on to apply for university degrees which require a pass in mathematics. Furthermore, where there are students who have failed mathematics but would have passed math literacy, directing students toward math literacy would increase the number of students who pass with a bachelor's or a diploma.

These correspondence scores, and the rate of potential math passes are instructive in that they illuminate goodness of fit of students into the correct mathematics class. Correspondence scores and curves between mathematics and mathematical literacy have not been estimated for years other than 2008, however, which will therefore be the focus of the discussion hereafter.

3. Data

The data used for this analysis is supplied by the Department of Basic Education (DBE), and consists of the matric results for every subject achieved by every student who wrote matric in the years 2010 to 2018, excluding the year 2013. The data for 2013 is unfortunately incomplete, and not appropriate for use in the present analysis. The data includes the results of students in both public and private schools, and details the final percentage achieved for each subject as well as whether the student passed with a bachelor's pass, a diploma, a higher certificate or did not pass matric.

Following the study by Simkins (2010a), this analysis will focus on the mathematics and mathematical literacy results. Figures 1 and 2 below display the distribution of mathematics and mathematical literacy scores respectively. Figure 1 shows that the average result for mathematics is consistently below 30 %, with a long tail at higher percentages. The distribution of the mathematics results is different in 2018, however, with a greater density of students achieving above 30 %. Figure 2 shows that the bulk of students who took mathematical literacy achieve a final score between 30 and 50 % in most of the years. The distributions in both figures shift slightly from year to year, which is most likely caused by variability in the difficulty of the final exams. The overall pattern that emerges, however, is that the mathematics results are more skewed to the left, while the math literacy scores center around 40 %.

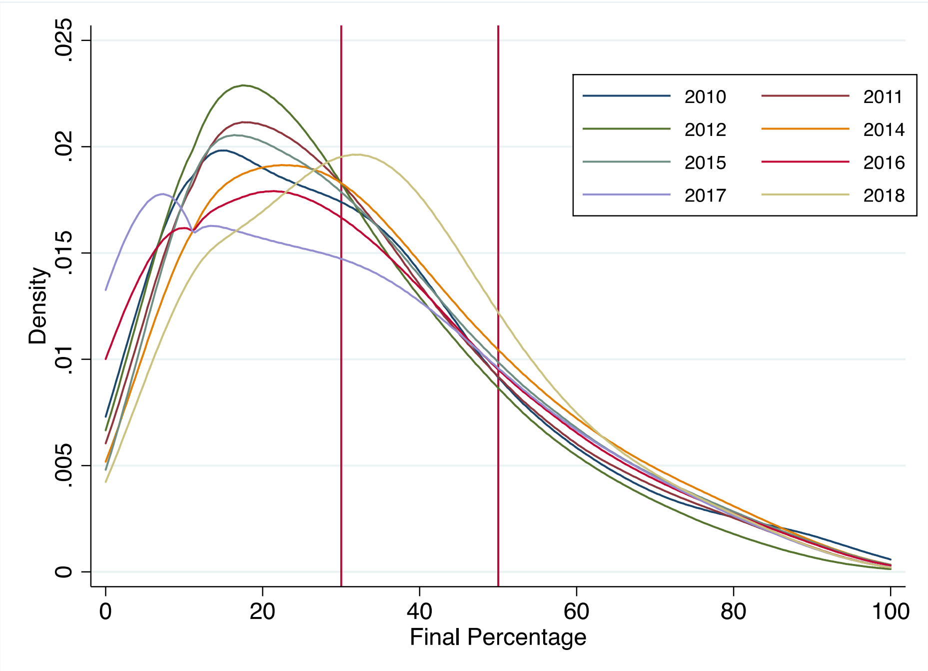

Figure 1: Kernel density of mathematics results, 2010 to 2018. Vertical lines at 30 and 50 %. Source: own calculations from DBE data.

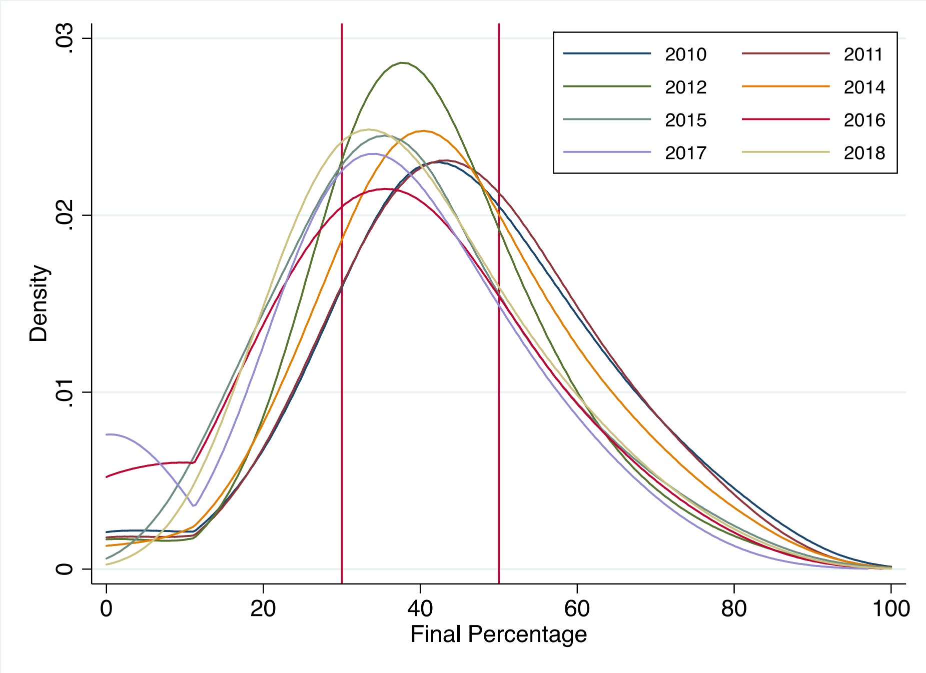

Figure 2: Kernel density of mathematics results, 2010 to 2018. Vertical lines at 30 and 50 %. Source: own calculations from DBE data.

While these figures give an idea of the average results as well as the distribution of results over time, it is instructive to examine which students are more likely to do well. In the figures below, the Lorenz curves for mathematics, mathematical literacy and science passes are presented for 2010, 2015 and 2018. These three years will be analysed throughout the discussion in order to view the change in trends over time. Where possible and appropriate, however, all the years will be analysed. Science is included here for interest, as it is also a subject with a low pass rate, and which is sought after in the labour market.

Figure 3 displays the Lorenz curves for math, math literacy and science in 2010, and shows that passes in mathematics are the least equally distributed out of these three subjects. That is, the top 10 % of schools achieved 55 % of the passes in mathematics in 2010. In 2015, although the distribution of mathematics passes did become relatively more equal, 48 % of math passes were still achieved by the top 10 % of schools. Figure 5 shows the same curves in 2018, which again have not changed substantially. In 2018, the top 10 % of schools achieved 40 % of mathematics passes, another slight reduction in inequality in mathematics passes between schools. Discouragingly, the disparity in mathematics results has become only marginally more equal over time, implying that students at schools which have achieved well in the past are more likely to do well in mathematics.

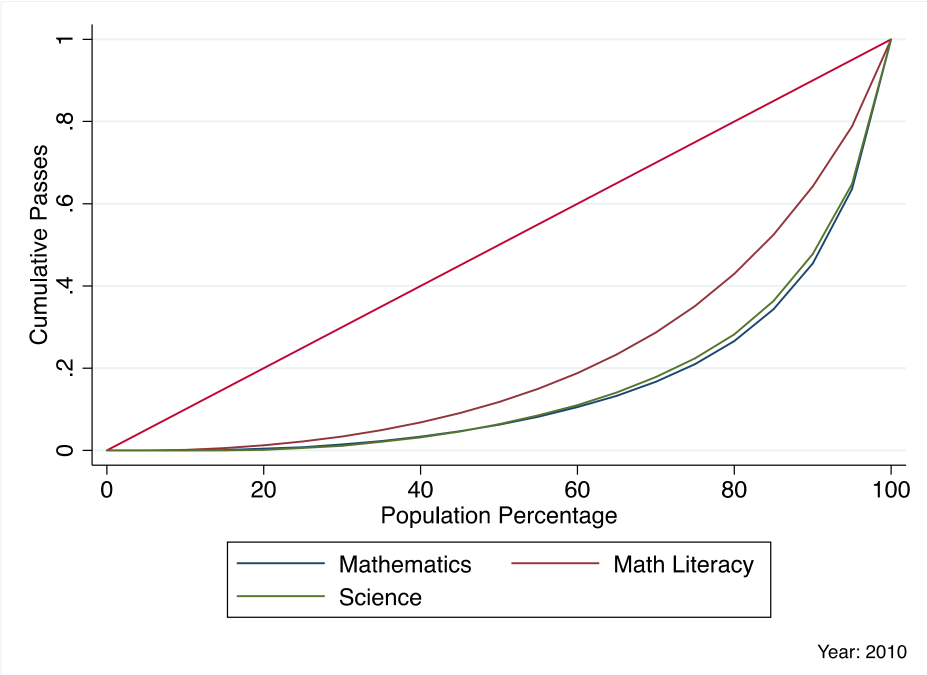

Figure 3: Lorenz curves for math, math literacy and science in 2010. Source: own calculations from DBE data.

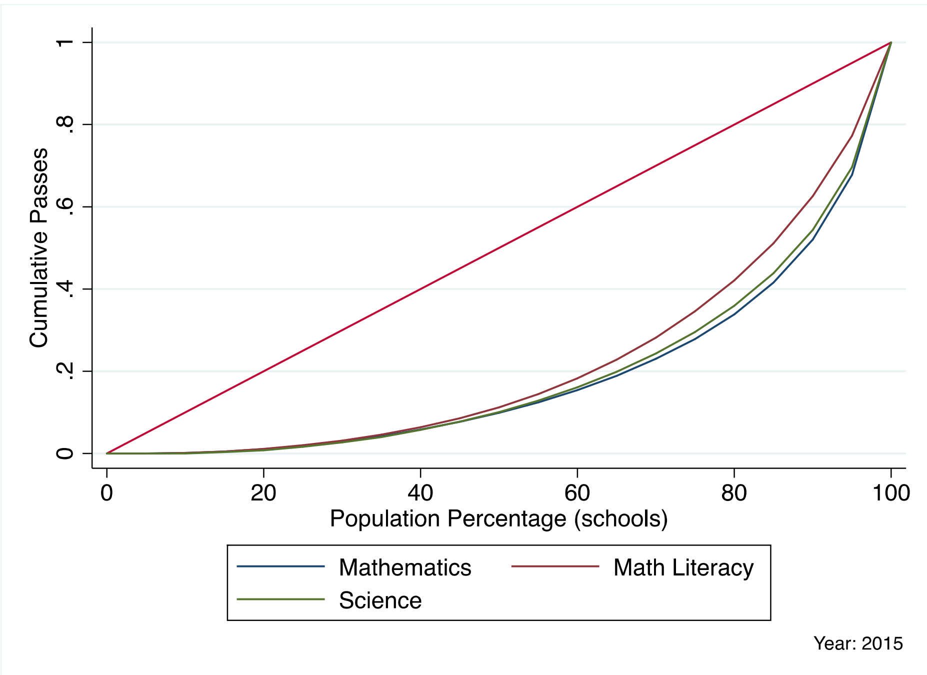

Figure 4: Lorenz curves for math, math literacy and science in 2015. Source: own calculations from DBE data.

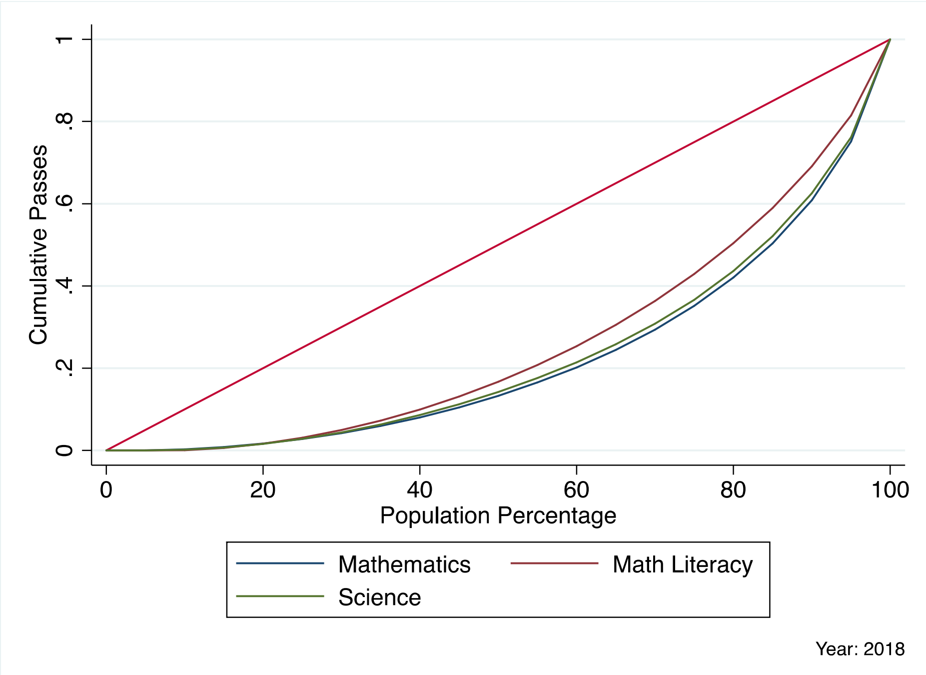

Figure 5: Lorenz curves for math, math literacy and science in 2015. Source: own calculations from DBE data.

The persistence of this pattern of inequality is certainly due to inequality in instructional quality and well as the different levels of resources at different schools, among other inputs to schooling (Van der Berg, S., Taylor, Gustafsson, M., Spaull & Armstrong, 2011; Van der Berg, Mabogooane & Taylor, 2013), however, Simkins (2010a) also argues that better sorting of students into appropriate subjects will also necessarily improve educational outcomes. In order to analyse this line of argument further, the follow section will construct correspondence scores comparable to those of Simkins (2010a).

4. *Correspondence Scores for 2010 to 2018*

In 2008, the final school examination curriculum was changed from the Senior Certificate to the National Senior Certificate. During this transition, the mathematics syllabus changed such that mathematics was no longer an optional subject, with higher grade (HG) and Standard Grade (SG) options. Instead, mathematics became a compulsory subject, although students could choose between mathematics and mathematical literacy (Simkins, 2010a:1). This change resulted in a lack of comparability between the 2007 and 2008 matric results in mathematics, which caused problems in being able to compare the change in mathematics performance over the transition. In order to rectify this issue, Simkins estimated correspondence tables which compared mathematics performance in 2007 HG and SG mathematics, with mathematics and mathematical literacy performance in 2008. These correspondence scores, therefore, also allow for the comparison between mathematics and mathematical literacy results going forward.

There are two primary reasons why correspondence scores are interesting. First, these results allow the researcher to compare mathematics and math literacy results and estimate how many "extra" mathematics passes may have been realised if high performing math literacy students had taken mathematics. Concurrently, these correspondence scores also reveal how many students who failed mathematics would have been likely to pass math literacy. This estimation is a central concern of Simkins (2010a). Second, correspondence scores across multiple years allow the researcher to track the stability of the conversion between math and math literacy results. This implies that they elucidate the relative difficulty of the math and math literacy exams over multiple years.

In order to construct correspondence scores which are similar to those created by Simkins (2010a), the following steps were taken. First, for each year the average score for each individual student was calculated excluding their math or math literacy score. Second, the data was divided into percentiles, and the average math and math literacy mark in each percentile was calculated for each year. These averages can then be used to create correspondence curves, as in Figure 3 below. Importantly, these correspondence curves assume that the math and math literacy results of students in each percentile are comparable to each other due to the similar average score (excluding their math result) achieved by students in the same percentile.

Figure 6 below shows the correspondence curves for 2010, 2015 and 2018. These curves show that the relative difference in math and math literacy performance diminished over this time period because the curves become flatter and closer to the diagonal. The 45 degree line of equality is the line along which the values on both axes correspond exactly, which would imply that the same math and math literacy result would be achieved in each percentile. Therefore, where mathematics scores are on the horizonal axis, correspondence curves which bow outwards from the diagonal toward the vertical axis suggest that low mathematics scores correspond with higher math literacy scores. This is indeed the case for all years from 2010 to 2018. In 2010, students who achieved 40% in math are comparable to those who achieved 63 % for math literacy, while students who achieved 40 % in math in 2015 are comparable to those who scored 57 % in math literacy. However, students achieving 40 % for math in 2018 are comparable to students who achieved 54 % for math literacy, which suggests a decline in the relative difficulty between math and math literacy.

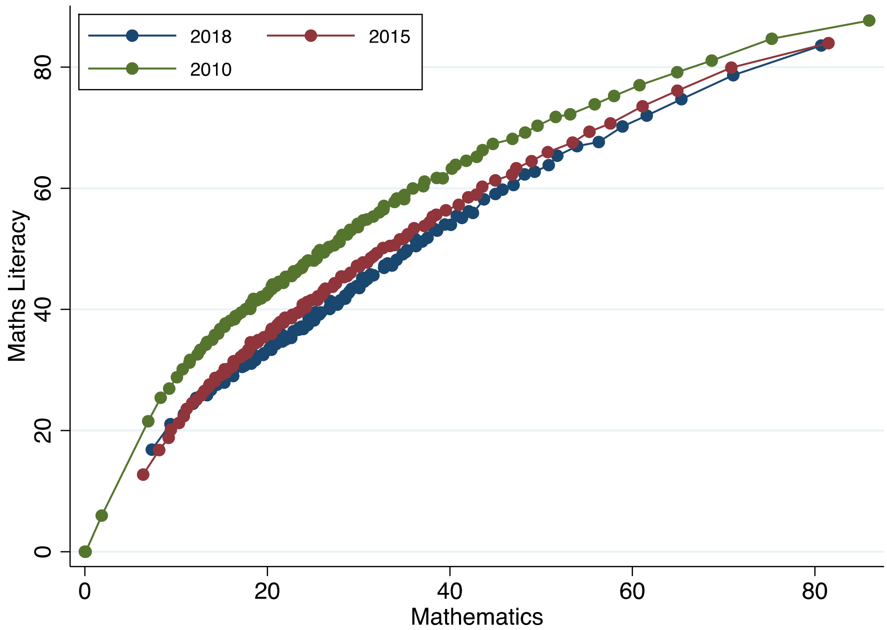

Figure 6: Correspondence curves between Mathematics and Math Literacy for 2010, 2015 and 2018. Source: own calculations from DBE data.

A summary of the correspondence scores can be seen in table 1 below. Table 1 also includes the conversion table estimated by Simkins (2010a) in columns 1 and 2. Columns 3 to 8 were inserted such that the math score in 2012, 2015 and 2018 would be comparable to that chosen by Simpkins (2010a) for the 2008 results. This allows for a more interesting comparison over time. This table corresponds with the curves displayed in figure 1. Specifically, it is interesting to note the decrease in the math literacy score which corresponds to a score of 13 % in math. The corresponding math literacy score is 30 and 35 % in 2008 and 2010 respectively, but drops to 27 and 26 % in 2016 and 2018. The math literacy score which corresponds to a score of 36 % in math also declines. The corresponding math literacy score in 2008 and 2010 is 60 %, while in 2015 and 2018 the corresponding math literacy score is 53 and 50 % respectively. In general, for math scores below 50, the corresponding math literacy score decreased by 10 %. The reason for this decrease is not examined further here. The corresponding math literacy result for math scores above 50 % do not show any such clearly discernable pattern. Full correspondence tables which show the correspondence scores for each percentile in all the available years can be seen in table A1 in the appendix.

Math 2008	Math literacy 2008	Math 2010	Math Literacy 2010	Math 2015	Math Literacy 2015	Math 2018	Math Literacy 2018
13	*30*	*13*	*35*	*13*	*27*	*13*	*26*
19	*40*	*19*	*42*	*19*	*35*	*19*	*32*
26	*50*	*26*	*49*	*26*	*42*	*26*	*40*
30	*54*	*30*	*54*	*30*	*47*	*30*	*44*
36	*60*	*36*	*60*	*36*	*53*	*36*	*50*
40	*64*	*40*	*63*	*40*	*56*	*40*	*54*
47	*70*	*47*	*68*	*47*	*63*	*47*	*61*
50	*72*	*50*	*70*	*51*	*66*	*51*	*64*
54	*75*	*53*	*72*	*55*	*69*	*54*	*67*
60	*78*	*61*	*77*	*58*	*71*	*59*	*70*
62	*80*	*65*	*79*	*61*	*74*	*62*	*72*
66	*82*	*69*	*81*	*65*	*76*	*65*	*75*
70	*84*	*75*	*85*	*71*	*80*	*71*	*79*
80	*86*	*86*	*88*	*81*	*84*	*81*	*84*

Table 1: Correspondence table for math and math literacy scores. Columns 1 and 2 from Simkins (2010). Columns 3-8 own calculations from DBE matric data.

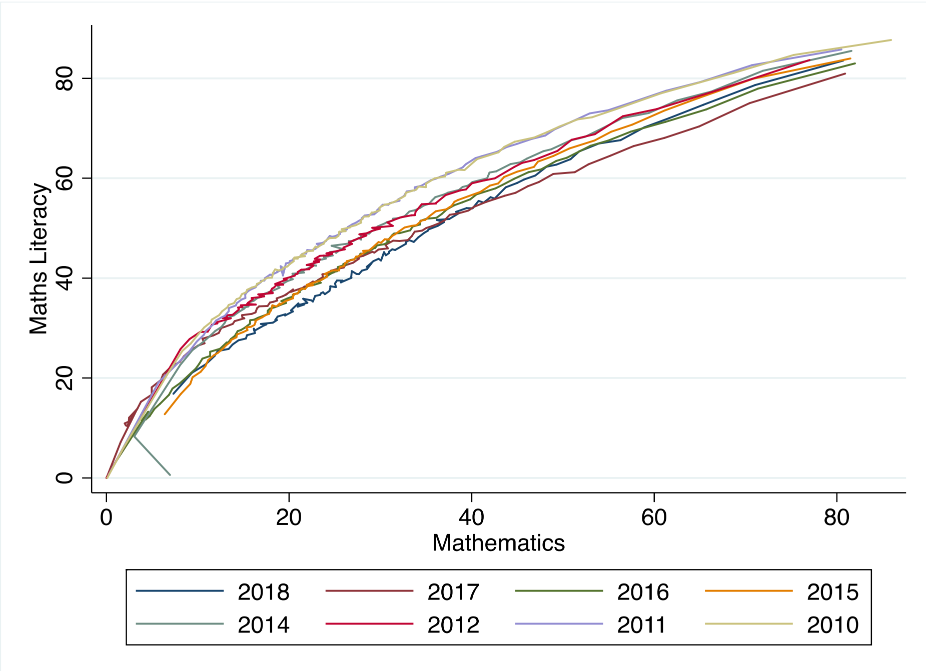

Figure 7: Correspondence curves between Mathematics and Math Literacy for all years. Source: own calculations from DBE data.

Figure 7 shows the correspondence curves for each year. The 2010 and 2011 curves are indistinguishable from each other, and are also the furthest away from the diagonal. At mathematics scores between 20 and 37 %, the curve for 2018 lies below the other years, which implies that comparable students scored more similarly in mathematics and math literacy within each percentile in 2018. Overall, the correspondence curves have shifted marginally closer to the diagonal over this period. This implies that comparable students are scoring similarly whether they take mathematics or math literacy, which in turn implies that the relative difficulty between these subjects has declined. The decline in relative difficulty could be due to either easier mathematics exams, more difficult math literacy exams, or both. In order to investigate which may be the case, the following section will examine math and math literacy pass rates, as well as potential pass rates, following Simkins (2010a).

5. Pass Rates and Potential Pass Rates

Table 2 below shows the pass rates for math and math literacy in the first two sections, for 2010, 2015 and 2018. The final section of this table shows the number of extra passes that could have been achieved if students had taken math classes which better suited their aptitude for math. These statistics in each year can be seen for all years in Table A2 of the appendix.

	2018	2015	2010
MATHEMATICS			
Total Math Pass (30%)	*170 359*	*127 812*	*128 138*
Pass rate	*63,0*	*49,8*	*47,1*
Total Math Passes (50%)	*87 290*	*56 991*	*50 582*
Pass rate	*32,3*	*22,2*	*18,6*
MATH LITERACY			
Total passes (30%)	*257 787*	*273 761*	*242 283*
Pass rate	*75,2*	*71,5*	*83,6*
Total passes (50%)	*123 038*	*102 069*	*114 025*
Pass rate	*35,9*	*26,7*	*39,4*
PROJECTIONS			
Extra Math Passes (30-50)	*86 930*	*84 764*	*66 860*
Proportion extra	*32,1*	*33,0*	*24,6*
Extra math passes above 50	*74 917*	*36 085*	*24 089*
Proportion extra	*27,7*	*14,1*	*8,9*
Would have passed math lit	*54 243*	*69 950*	*98 254*
Proportion extra	*15,8*	*18,3*	*33,9*
Total students	**624 734**	**639 481**	**561 904**

Table 2: Mathematics and Math Literacy pass rates and potential passes in 2010, 2015 and 2010. Source: own calculations from DBE data.

This table indicates that the pass rates for mathematics at 30 and at 50 % have increased over these years, from 47 to 63 % and from 18 to 32 % respectively. This significant increase in pass rate is only true for 2018, as table A2 shows that the 30 % mathematics pass rates hover around 45 %, and the 50 % pass rate hovers around 20 % from 2010 to 2017. The table above also indicates that the 30 and 50 % pass rates for math literacy have declined slightly, from 83 to 75 % and from 39 to 35 % respectively. Table A2, however, reveals that the pass rates were declining more dramatically between 2010 and 2017, and that the pass rates increase dramatically between 2017 and 2018. These results indicate that the distribution of results in 2018 is fundamentally different from those of the previous years.

The two-sample Kolmogorov-Smirnov test for equality of distribution suggests that the difference in distributions for both math and math literacy scores between 2017 and 2018 is significantly larger than the difference in distributions between other years in the sample. This statistical test determines if there are significant differences between two distributions of the same variable (Præstgaard, 1995). While it is true that the distribution of math and math literacy results is significantly different between any two years, the difference in distribution between 2017 and 2018 is significantly larger, and departs from the pattern. This difference could be the result either of a different test setting in 2018, or more lenient marking in 2018. This discussion will not attempt to determine which is the case, except to say that it is likely that the final mathematics exam was significantly less difficult, given the higher pass rates. This result would also explain why the correspondence curve between math and math literacy is closer to the diagonal in 2018.

The third section of table 2 projects the potential math passes at 30 and 50 %, as well as the potential math literacy passes. That is, using the correspondence scores, it is possible to calculate how many students who took math literacy would have passed mathematics had they taken it instead. Simkins (2010a) estimates these potential pass rates, and calls them "wasted" potential, in that students would have been able to pass mathematics, but did not. In 2010, an extra 66 860 (24 %) more passes in mathematics between 50 and 30 p% could have been achieved, and a further 24 089 (8,9 %) passes above 50 % could have been achieved. These statistics increase in the period between 2010 and 2018, and in 2018, and extra 86 930 (32 %) more math passes between 30 and 50% and 74 917 (27,7 %) more math passes above 50 % could have been achieved.

The final estimation in table 2 predicts the number of students who failed mathematics, but could have passes math literacy had they taken it instead. In 2010, most of the students who failed mathematics with below 30 % would have been able to achieve a 30 % pass in math literacy. This would have increased the math literacy pass rate by almost 34 %. In 2018, this statistic drops to 15 %. This statistic is particularly interesting because achieving less than 30 % for mathematics often prevents a student from passing matric. Students who fail more than one subject do not pass matric; due to fact that mathematics is consistently the most failed subject, lowering the rate of failure in mathematics is likely to improve overall matric pass rates. Therefore, the students who might have been able to pass matric had they taken math literacy instead of math are a critical group, and sorting these types of students into the correct math-based class may improve matric pass rates across the board.

Simkins (2010a:7) notes that the magnitude of these potential pass rates indicate that students are not sorted into math and math literacy classes particularly well. This is certainly also true for the years represented here. Further analysis of the correspondence curves in different quintiles illuminates interesting nuances in the story. Figure 8 to 10 below show the correspondence scores between math and math literacy, calculated within quintile 5 schools, and then separately within quintile 1 and 2 schools, for the years 2010, 2015 and 2018. For each of these years, the correspondence curve for quintile 5 schools lies significantly further from the diagonal in comparison to the correspondence curve of quintile 1 and 2 schools. This implies comparable students in quintile 1 and 2 schools are achieving more similar marks in mathematics and math literacy than comparable student in quintile 5 schools. That is, more math passes could be achieved in quintile 5 schools if students were more appropriately sorted into mathematics instead of math literacy.

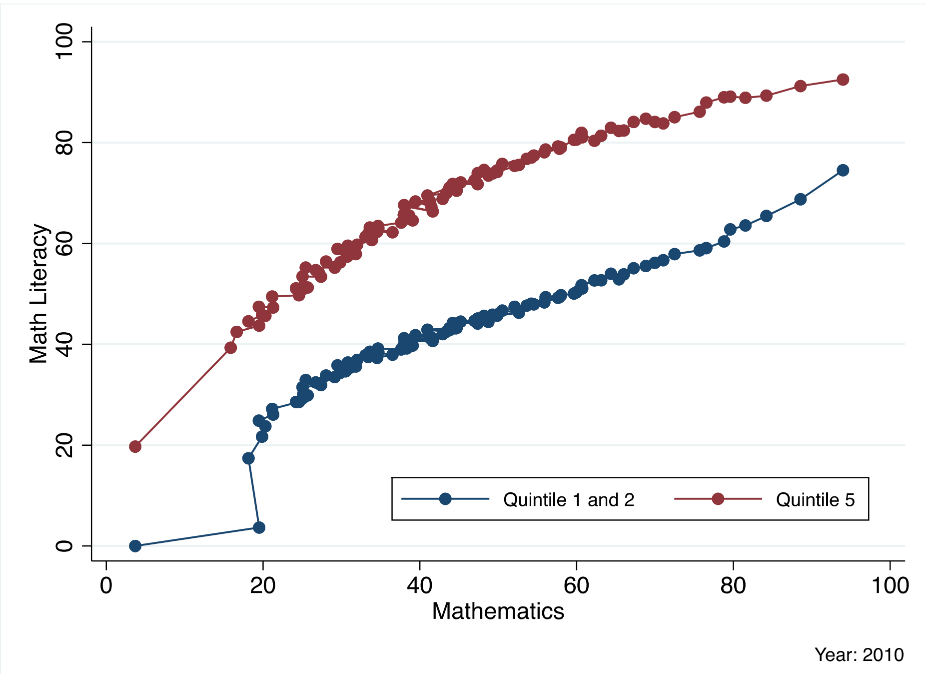

Figure 8: Correspondence curves for quintile 5 and quintile 1 and 2 schools in 2010. Source: own calculations from DBE data.

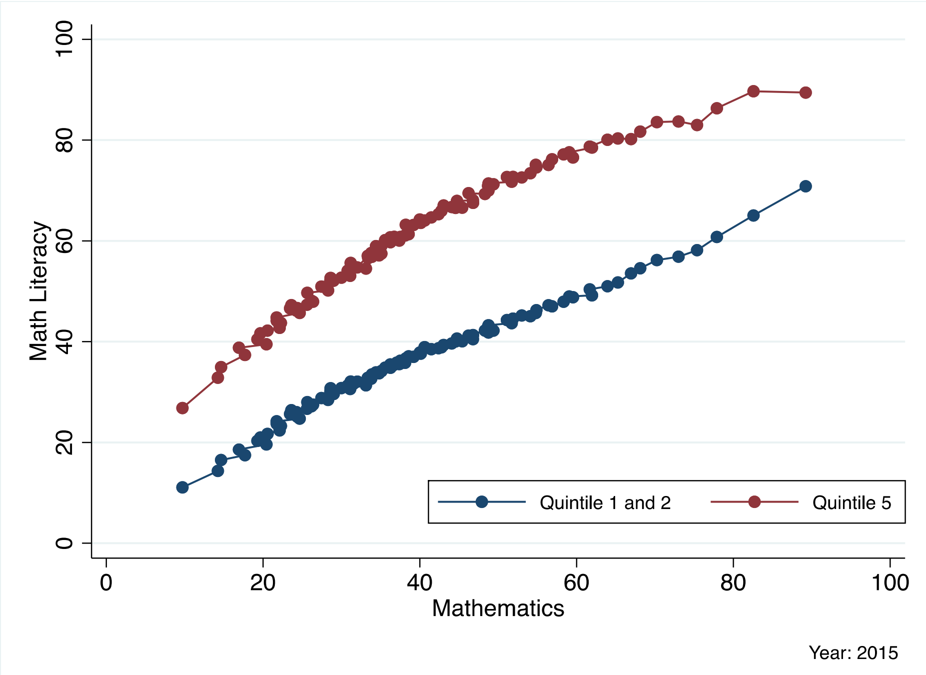

Figure 9: Correspondence curves for quintile 5 and quintile 1 and 2 schools in 2015. Source: own calculations from DBE data.

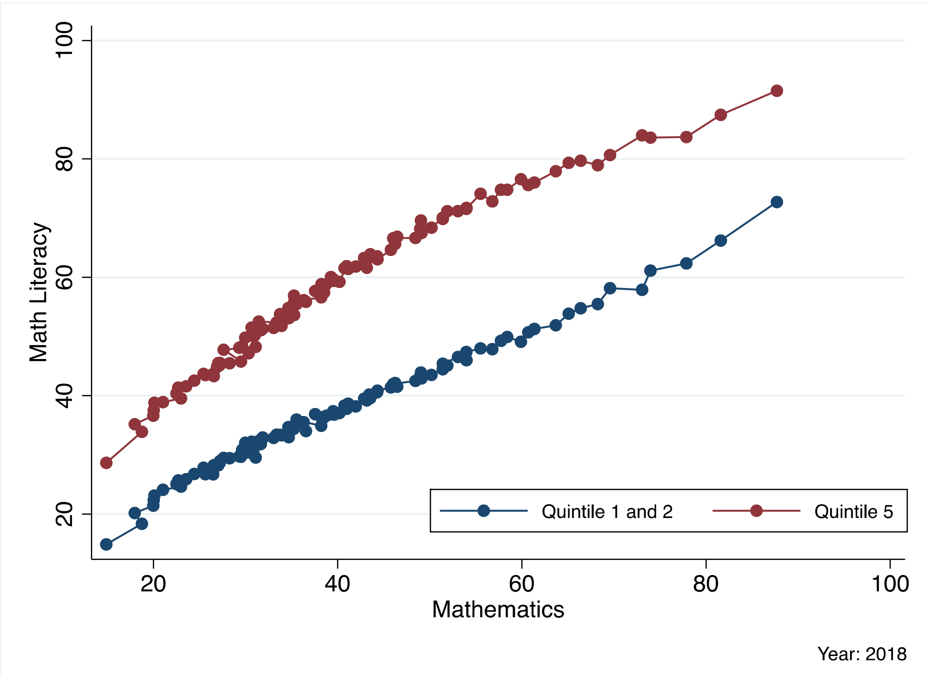

Figure 10: Correspondence curves for quintile 5 and quintile 1 and 2 schools in 2018. Source: own calculations from DBE data.

6. *Discussion and Conclusions*

The results above suggest that both math and math literacy pass rates as well as overall matric pass rates could improve if students were better sorted into math classes according to their level of proficiency in mathematics. This implies that higher pass rates could be achieved without necessarily changing the level of resources dramatically. One caveat that should be mentioned is that students who choose to take math are different to those who choose to take math literacy, which implies that if students are forced to take mathematics, they will not necessarily perform as well at the above correspondence scores suggest. However, even where this is the case, it is still true that a greater number of math and math literacy passes could be achieved if students were more carefully allocated to math and math literacy classrooms.

However, this argument begs the question as to how this better sorting of students can be achieved. It may be possible to use the DBE data sets combined with earlier marks (such as those achieved in grade 9) to predict matric marks, and offer informed suggestions as to which math class students should choose in grade 10. This exercise would require results in earlier grades, however. Using only final matric scores present two major problems; first matric scores are not appropriate to use for predictions as the student will already have written matric; and second, there are too many different combinations of subject choices to yield accurate comparisons. Therefore, this argument provides added impetus to the need for nationally standardised exams at an earlier grade level such as grade 9.

Those who oppose to the idea of sorting students into math and math literacy classes may argue that this is a slippery slope argument that ends in prescribing the subjects that students can take. This is certainly true, and a student's freedom to choose their final subjects should always be taken into account. However, the benefits of a better fit between students and math classes would be of great benefit to the labour market, as it would increase the number of skilled individuals who are able to be employed. Furthermore, in conjunction with better allocation and prioritisation of resources, better sorting of students into math classes will further improve overall matric results.

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8. *Appendix*

8.1. Table A1: correspondence math and math literacy scores for percentiles across all years.

	2010		2011		2012		2014		2015		2016		2017		2018	
Percentile	Maths	Maths Lit	Maths	Maths Lit	Maths	Maths Lit	Maths	Maths Lit	Maths	Maths Lit	Maths	Maths Lit	Maths	Maths Lit	Maths	Maths Lit
1	*0*	*0*	*0*	*1*	*0*	*0*	*7*	*1*	*6*	*13*	*0*	*0*	*0*	*0*	*7*	*17*
10	*12*	*32*	*13*	*32*	*14*	*32*	*13*	*32*	*13*	*26*	*7*	*18*	*3*	*13*	*15*	*29*
20	*15*	*38*	*16*	*38*	*16*	*35*	*17*	*36*	*16*	*31*	*13*	*27*	*9*	*25*	*19*	*32*
30	*18*	*42*	*19*	*41*	*18*	*37*	*20*	*40*	*19*	*34*	*17*	*32*	*15*	*32*	*22*	*35*
40	*22*	*44*	*21*	*44*	*18*	*39*	*22*	*43*	*21*	*38*	*20*	*36*	*19*	*36*	*25*	*38*
50	*24*	*48*	*24*	*47*	*22*	*42*	*26*	*46*	*24*	*41*	*24*	*40*	*23*	*39*	*27*	*41*
60	*28*	*51*	*27*	*51*	*24*	*45*	*29*	*49*	*27*	*44*	*27*	*44*	*26*	*42*	*30*	*45*
70	*32*	*55*	*31*	*55*	*28*	*49*	*33*	*52*	*31*	*48*	*31*	*47*	*31*	*46*	*34*	*48*
80	*37*	*61*	*37*	*60*	*34*	*53*	*39*	*58*	*37*	*54*	*37*	*53*	*36*	*51*	*39*	*54*
90	*48*	*69*	*47*	*68*	*43*	*60*	*48*	*65*	*47*	*62*	*46*	*61*	*46*	*58*	*48*	*62*
100	*86*	*88*	*80*	*86*	*77*	*84*	*82*	*85*	*81*	*84*	*82*	*83*	*81*	*81*	*81*	*84*

8.2. Table A2: Mathematics and Math Literacy pass rates and potential passes for all years.

	2018	2017	2016	2015	2014	2012	2011	2010
MATHEMATICS								
Total Math Pass (30%)	170 359	125 256	133 492	127 812	118 548	53 139	105 882	128 138
Pass rate	63,0	45,3	46,8	49,8	51,6	41,7	45,9	47,1
Total Math Passes (50%)	87 290	54 417	56 599	56 991	50 497	19 589	42 072	50 582
Pass rate	32,3	19,7	19,8	22,2	22,0	15,4	18,2	18,6
MATH LITERACY								
Total passes (30%)	257 787	227 479	253 911	273 761	260 377	124 300	237 007	242 283
Pass rate	75,2	64,4	65,2	71,5	81,8	80,6	83,9	83,6
Total passes (50%)	123 038	74 044	92 756	102 069	107 206	39 110	111 868	114 025
Pass rate	35,9	21,0	23,8	26,7	33,7	25,4	39,6	39,4
PROJECTIONS								
Extra Math Passes (30-50)	86 930	74 420	90 776	84 764	96 529	32 501	67 054	66 860
Proportion extra	32,1	26,1	31,8	33,0	42,0	25,5	29,1	24,6
Extra math passes above 50	74 917	29 677	29 362	36 085	31 790	9 666	21 175	24 089
Proportion extra	27,7	10,4	10,3	14,1	13,8	7,6	9,2	8,9
Would have passed math lit	54 243	73 298	77 269	69 950	61 971	54 221	91 999	98 254
Proportion extra	15,8	20,7	19,9	18,3	19,5	35,2	32,6	33,9
Total students	**624 734**	**629 927**	**674 451**	**639 481**	**548 237**	**281 539**	**513 016**	**561 904**