A longitudinal study of learning, progression, and personal growth in Sierra Leone

FINAL REPORT

June 2019

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Chapter 1

Introduction and Description of the Study

1. Introduction

This time series longitudinal study follows the progress of students in the Rising Academy Network over a period of three school years. How much they learn and how fast they learn is compared to the progress made by matched samples in comparison schools - both private and Government-funded.

This paper presents the findings at the end of the third year of the study. To be certain of any conclusions we might draw about student learning, the study asks different questions of different sub-groups of students.

The questions are:

How much more on average have students learned in mathematics and how much better do they read[1] across a time series of 9 assessments, the last of which was completed in June 2018?

How fast are students on average progressing towards a learning target?[2]

What patterns of transition are observed as students move between different performance bands – those at risk of not learning at all; poor learners; moderate learners; and above average learners?

The analyses include:

Monitoring the gains in reading and mathematics from one time to another over 9 assessments in a period of three years. The sample consists of all registered students in three groups (the Rising Academy Network, Private Comparison schools, and Government-Funded Schools) who are present for the tests during each test interval. Because of the variability in sample sizes on each test occasion within and between groups, the data are not suitable for a comparison of groups.

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[1] Two domains of learning are assessed. These are described below:

Reading – that is, in vocabulary and understanding the meaning of words, comprehension (lexical and grammatical knowledge combined with attaching meaning to the written word, sentence or passage), responding (bringing individual experience and knowledge of the world to the text), and analysing (stepping back from the meaning of the text and considering it in relation to other theories and literary traditions and intentions of the author).

Mathematics – that is, in operations and algebraic thinking (whole numbers addition, subtraction, multiplication and division, and evaluation of numerical expressions), number and operations (fractions and decimals), and measurement and data (time, money, geometry.

The study also tracks the affective development of students defined as

Personal growth and independence – that is, learners engage with the learning process and become more independent, critical and self-aware. They reflect on the teaching they receive, their own attitudes and dispositions towards learning, and their own learning progress. These data are available at the beginning of the project and at the end (time 9).

[2] A defined standard of reading or mathematics at the end of a stage of schooling that lasts for three to four years - i.e., the junior secondary stage

Comparing the gains in reading and mathematics from one time to another over 9 assessments in a period of three years. The sample consists of students within each group who can be traced as having taken at least four assessments; these must include the baseline test (January 2016), the test at the end of the first year of the study (June 2016), the end of the second year of the study (June 2017) and the final test at the end of the third year of the study, June 2018.

Comparing the gains in reading and mathematics and the progression of students towards the end target from the baseline test (January 2016) to the final test at the end of the third year of the study, (June 2018).

Analysing student transitions, within groups between performance bands. Students in all cohorts were grouped into four performance bands (or levels of achievement) from their baseline scores in January 2016. The bands are:

Level 1: Students with very poor scores, well below the benchmark and in need of urgent intervention.
Level 2: Students with poor scores, working below the benchmark.
Level 3: Students with moderately good scores working just below or at the benchmark
Level 4: Students with good scores, working above the benchmark

The analysis traces the movement of students across these bands of achievement to understand whether all students, including the poorest performing students have benefited from teaching.

2. Design and Methods

The design of the study is longitudinal. It tracks the learning progressions of students from the Rising Academy Network of schools (the target schools) against the progression made by matched cohorts drawn from Government-funded and Private Comparison schools in Sierra Leone.

The cohorts are followed closely and assessed in reading and mathematics 9 times over the 3-year period of the study. The time series data are analysed to show trends in learning progression and to compare rates of progress between groups.

The study is interested also in the personal, social and emotional development of students and records the perceptions of students at the beginning and end of the study.

Background information on the students are collected at the beginning of the study.

The study employs a computer adaptive test (CAT) to test reading and mathematics.

A powerful component of the study is the methodology it employs to measure the rate of progress towards a growth target. Achieving gains in reading and mathematics, even if these are significantly better than comparison groups is an insufficient measure of progress in learning. The ultimate goal is to obtain a proficiency in reading and mathematics at a particular end point - normally the end of a stage of schooling. It is the progression towards that standard (a description of proficiency that takes into account a number of cognitive dimensions) that is observed.

The computer adaptive tests employed in this study are built on a 'learning progression' that ensures that a variety of skills, strongly linked to age and stage of schooling are tested. Increased proficiency in the test reflects increased cognitive growth.

Two 'growth' targets are used in this study as a measure of learning progression: a 'moderate' estimated growth target of based on the projected achievement of 8 scale scores per month and a 'modest' estimated growth target of a projected achievement of 4 scale scores per month.

Chapter 2

The sample and methods of analysis

Sample

The sample for RAN schools was drawn to include by-and-large all enrolled students in January 2016.[3] Matched samples were drawn from private and Government schools in the same localities as the RAN schools.

A questionnaire was used to gather background information on the social circumstances and household educational levels of selected students across all three cohorts.

Table 2.1 below shows the occupational structure of fathers across the sample. The most likely occupation across all cohorts is in the professional, managerial and technical, clerical sales, trading and services, and skilled manual categories. There is no significant variation in the profile of students across the sample.

Table 2.1 – Father's occupation

	RAN		Private comparison		Government comparison	
	n	%	n	%	n	%
Professional/ managerial/ technical	23	38.3%	16	40.0%	22	26.8%
Clerical sales, trading and services	21	35.0%	9	22.5%	26	43.9%
Skilled manual	9	15.0%	7	17.5%	6	7.3%
Unskilled manual	2	3.3%	0	-	3	3.7%
Domestic service	0	-	1	2.5%	0	-
Agricultural/farming	3	5.0%	6	15.0%	8	9.8%
Unemployed/in school	1	1.7%	1	2.5%	1	1.2%
Don't know	1	1.7%	1	2.5%	5	6.1%
Total with record	60	100%	40	100%	82	
Total skilled (category 1-3)		88.3%		80%		78%

Tables 2.2 and 2.3 below show the educational levels of mothers and fathers.

Both mothers and fathers in RAN schools are better educated than those parents of students in Private Comparison schools and Government schools.

Table 2.2 – Mother's education

	RAN		Private comparison		Government comparison	
	n	%	n	%	n	%
None	12	18.5%	8	20.0%	29	35.4%
Primary 1-3	1	1.5%	1	2.5%	4	4.9%
Primary 4-6	7	10.8%	3	7.5%	8	9.8%
JSS incomplete	3	4.6%	3	7.5%	5	6.1%
JSS certificate	7	10.8%	4	10.0%	3	3.7%
SSS incomplete	2	3.1%	5	12.5%	7	8.5%

[3] The number of schools and students in the network has grown in subsequent years.

SSS certificate	9	13.8%	3	7.5%	1	1.2%
University/vocational/higher	16	24.6%	6	15.0%	11	13.4%
Don't know	8	12.3%	7	17.5%	14	17.1%
Total with record	65		40		82	
Total SSS or higher		42.5%		35%		23.1%

Table 2.3 – Father's education

	RAN		Private comparison		Government comparison	
	n	%	n	%	n	%
None	6	9.2%	9	22.5%	18	22.0%
Primary 1-3	1	1.5%	1	2.5%	1	1.2%
Primary 4-6	2	3.1%	2	5.0%	10	12.2%
JSS incomplete	3	4.6%	2	5.0%	9	11.0%
JSS certificate	4	6.2%	3	7.5%	5	6.1%
SSS incomplete	5	7.7%	4	10%	5	6.1%
SSS certificate	8	12.3%	4	10%	11	13.4%
University/vocational/higher	25	38.5%	10	25%	8	9.8%
Don't know	10	15.4%	5	12.5%	15	18.3%
Total with record	65	100%	40	100%	82	
Total SSS or higher		58.5%		45.0%		29.3%

The Design

Following the learning progression of students through a longitudinal study is notoriously difficult under the best conditions for all the obvious reasons including attrition and absenteeism. In Sierra Leone these factors are compounded: poverty, seasonal work, natural disasters such as the recent floods and mudslides combine to confound both the notion of absenteeism and the stability of sample sizes. It is also clear that in Sierra Leone students are as likely to 'drop-in' as they are to drop out of school. But the study is less concerned with attendance as a classical measure of school outcomes. The methodology is concerned with the test results of those students in different cohorts who present or do not present themselves for assessments. It is perhaps more appropriate to refer to those who do not present, for whatever reason, as 'no shows'. Tables 2.4 and 2.5 below show the variability in the number of students presenting themselves for the reading and mathematics assessments across the three years of the study.

Table 2.4 – The number of students in the sample who present themselves for reading assessments at different test intervals

	RAN		Private comparison		Government	
	Number	%	Number	%	Number	%
Test 1 (Jan 2016)	181	100	103	100	145	100
Test 2 (April 2016)	156	86				
Test 3 (Jun 2016)	166	92	84	82	90	62
Test 4 (Nov 2016)	163	90	90	87	134	92
Test 5 (Mar 2017)	68	38				
Test 6 (Jun 2017)	105	58	56	54	80	55
Test 7 (Oct 2017)	89	49	43	42	114	79

Test 8 (Feb 2018)	83	46				
Test 9 (May 2018)	73	40	31	30	63	43
Attrition	108	59.6	72	69.9	82	56.5

* At every test period, enumerators visit after consulting the schools. School visits are attempted more than once.

For the RAN cohort taking the reading assessments there was a loss in sample size by the final assessment in the third year of 59.6%. The figure for Private Comparison schools was 69.9%; and for government funded comparison schools, the attrition was 56.5%. 'No shows' across the cohorts was, for various reasons, high (well over half the original sample). Government schools offered a slightly more stable sample over time than other cohorts.

For those students taking the mathematics assessment, the loss in sample size by the final assessment in the third year was 62.8% for RAN schools, 67.6% for Private Comparison schools and 57.3% in Government-funded schools. Here again, the loss of students across the cohorts was high. Government schools offered a slightly more stable sample over time than other cohorts.

Table 2.5 – The number of students in the sample who present themselves for Mathematics assessments at different test intervals

	RAN		Private comparison		Government	
	Number	%	Number	%	Number	%
Test 1 (Jan 2016)	183	100	111	100	150	100
Test 2 (April 2016)	171	93				
Test 3 (Jun 2016)	167	91	88	79	93	62
Test 4 (Nov 2016)	128	70	67	60	108	72
Test 5 (Mar 2017)	97	53				
Test 6 (Jun 2017)	125	68	54	49	60	40
Test 7 (Oct 2017)	90	53	41	37	96	64
Test 8 (Feb 2018)	86	47				
Test 9 (May 2018)	68	37	36	32	64	43
Attrition	115	62.8	75	67.6	86	57.3

We were concerned that the variability in sample sizes and importantly the high numbers of 'no shows' in all the tests might influence the mean scores achieved by cohorts and confound the comparability of results. The common assumption is of course that those more likely to be in school during periods of hardship and presenting themselves for the assessment are students that are working at higher levels of achievement rather than those who have lower achievement scores. This would make comparison difficult.

It is worth noting, as in shown in table 2.6 below that shows the profile of the sample at the final test, that in the population assessed here, reading and mathematics performance levels for all

schools was not normally distributed. This is not unusual in developing countries. All test takers were, on the strength of their scores, allocated to four performance bands.

In all cohorts the largest share by far of the students presenting themselves for the assessments were those located in the weaker performing bands. At the end of 2018, in the final tests, 74.7% of RAN students are still working in the two poorest performance bands in reading and 69% in Mathematics. For Private Comparison schools, 88.3% of students presenting in the final reading test are in the two poorest performance groups, and in mathematics, 80.6%. In Government-funded schools the profile of students in the final reading test shows that 87.7% are in the poorest performing bands and in mathematics, 73.5% are working in these achievement bands.

It is therefore worth revisiting the arguments about the relationship between weak scholastic performance and school drop out rates. For now, we can presume that 'no shows' are by and large students who have not made significant progress but no more so perhaps than those weaker performing students who have persisted.

Table 2.6 - Profile of sample at Time 9

	Level 4		Level 3		Level 2		Level 1	
	Reading	Maths	Reading	Maths	Reading	Maths	Reading	Maths
All RAN students	8.0	39.7	17.3	17.6	40.0	13.2	34.7	29.4
All Private Comparison	2.9	2.8	8.8	16.7	47.1	13.9	41.2	66.7
All government comparison	6.8	12.5	5.5	14.1	35.6	34.4	52.1	39.1

Level 4: Good performance. Working at or above the benchmark
Level 3: Moderately good performance. Working just below the benchmark
Level 2: Poor performance. Working well below the benchmark
Level 1: Very poor performance and in need of urgent intervention

Chapter 3

Reading

Introduction

As discussed in Chapter 1 above, students are asked to take two learning assessments – in reading and in mathematics. For the reading assessment the computer adaptive software generates a short test consisting of 20 to 25 short reading items. Each test item is a complete, contextual sentence with a tightly controlled vocabulary level. The sentences typically range from 10 to 14 words depending on grade level. The student must interpret the meaning of the sentence in order to choose the correct answer. Because all of the answer choices 'fit' the context sentence either semantically or syntactically, the student is asked to demonstrate the ability to interpret the correct meaning.

Four skills areas are covered by the test: vocabulary and understanding the meaning of words, comprehension, responding, and analysing. 3 multiple-choice questions are given and students are asked to select the correct response. They have 60 seconds in which to choose their answer.

The computer adaptive test records the number of correct responses and converts the raw scores into scaled scores.[4]

As discussed above, the findings are presented as follows:

- Monitoring: For all students who take assessments at different test intervals: an analysis of the learning trends of the cohorts and their average gains in learning over three academic years.
- Time series comparisons: A comparison of the learning gains and rates of progression for only those students who have taken the following 4 tests over three years – the baseline test in January 2016; the end of year tests in 2016; the end of year test in 2017; the end of year tests in 2018.
- Baseline - end line comparisons: A comparison of the learning gains and rates of progression for only those who take the baseline test (2016) and the end-line test (2018): These analyses are disaggregated by gender.
- Within group transition analysis: The patterns of transition between performance quartiles for each cohort. These analyses are disaggregated by gender and allow us to understand whether the benefits of education favour all.

3.1 Analysis of the reading attainment of students in all cohorts presenting for assessment at different test intervals over three academic years

a. Changes in reading scores

Changes in average reading attainment were calculated across a time series of 9 assessments from January 2016 to June 2018. As per the design of the study, the cost of data collection being the main consideration, only the intervention schools were assessed on all 9 occasions over the period of the study. 3 of these assessments, that all fell in the middle of an academic year, were not taken by

[4] Scale scores are useful in comparing student performance over time and is calculated based on the difficulty of items and the number of correct responses. Because the same range is used for all students, scaled scores are also useful for comparing student performance across grade levels. The reading scaled scores in this assessment range from 0 to 1400.

comparison groups. For the purposes of the discussion here, only the 6 assessment points in which all cohorts participated are considered.

Data are presented for the samples of students who took a given test during the period of the study. Periodic absenteeism means that these samples contain different students and are therefore not directly comparable. While these results are indicative and important to report, they are likely to be confounded and therefore cannot be interpreted as true learning gains.

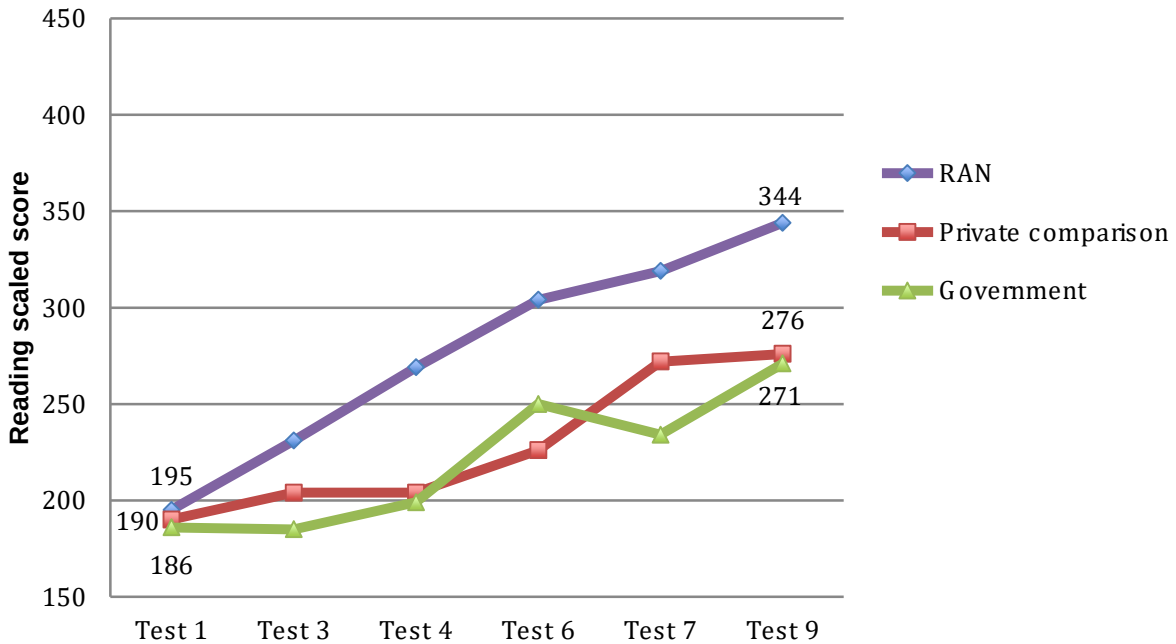
Table 3.1 below shows the results of the reading assessments over three academic years.

Table 3.1 – Reading test results by test date (unmatched samples)

	N	Scaled Score	N	Scaled Score	N	Scaled Score	N	Scaled Score	N	Scaled Score	N	Scaled Score
RAN	181	195	166	231	163	269	105	304	88	319	75	344
Private Comparison	103	190	84	204	90	204	56	226	41	272	34	276
Government	145	186	90	185	134	199	80	250	113	234	73	271
	Test 1 Jan 2016		Test 3 June 2016		Test 4 Nov 2016		Test 6 June 2017		Test 7 Oct 2017		Test 9 May 2018	
	Year I				Year II				Year III			

The changes in reading scores for all cohorts at each assessment point over the three years of the study are represented graphically in Figure 3.1 below.

Figure 3.1: Progress monitoring of all assessed students at each assessment interval (reading)



b. Reading age

Another, and extremely important way to assess reading, is by reading age over chronological age. We know from the baseline data that reading levels of students across all cohorts are weak when their reading ages are compared to their chronological ages. The importance of reporting reading levels by reading age is that they tell us what kinds of texts students might be able to read with understanding. A crude example is that reading and understanding writing in a good quality newspaper or magazine will require a reading age of between 13 and 14 years. Reading non-fiction texts in say the secondary school science curriculum comfortably and with understanding is likely to require a reading age of 10 or 11 years.

Table 3.2 below shows changes in the recorded reading ages for students in all three cohorts at each assessment point. Again, because the sample of students taking each test is not identical, these changes should not be interpreted as true learning gains.

Table 3.2 – Changes in recorded reading ages (unmatched samples)

	N	Average Reading Age	N	Average Reading Age	N	Average Reading Age	N	Average Reading Age	N	Average Reading Age	N	Average Reading Age
RAN	181	7:03	166	7:07	163	7:10	105	8:02	88	8:03	75	8:06
Private Comparison	103	7:02	84	7:04	90	7:04	56	7:06	41	7:11	34	7:11
Government	145	7:02	90	7:02	134	7:03	80	7:08	113	7:07	73	7:11
	Test 1 Jan 2016		Test 3 June 2016		Test 4 Nov 2016		Test 6 June 2017		Test 7 Oct 2017		Test 9 May 2018	
	Year I				Year II				Year III			

The average reading age of students in RAN schools was broadly similar to those of Private Comparison schools and Government-funded schools in the pre-test (test 1): 7 years and 3 months for RAN schools, 7 years and 2 months for Private Comparison schools and 7 years for government funded schools.

3.2 A comparative analysis of the average gains in reading made by students in all cohorts who have taken four tests that must include the baseline test and the end of year tests in each of the three years of the study.

a. Comparative analysis of reading gains

As discussed in Chapter 1, the study suffered from high 'no show' rates and therefore high levels of variability in who takes a test on a particular occasion. Table 3.3 below shows the scores for the panels of students who are followed throughout the study. All the students here have taken the baseline assessment in 2016, and end of year assessments in 2016, 2017, and 2018.

Table 3.3 - Reading test results for students in all cohorts taking 4 defined tests over the course of the study

		Baseline 2016	Year 1 End 2016	Year 2 End 2017	Year 3 End 2018	Change in scaled scores baseline-year 3 end
RAN	Mean	197.3	246.8	302.7	337.8	+140.5
	N	63	63	63	63	
	S.D.	93.7	115.5	106.8	121.8	
Private comparison	Mean	184.2	195.1	225.1	263.7	+79.5
	N	21	21	21	21	
	S.D.	82.9	96.4	89.8	107.5	
Government	Mean	252.7	239.7	283.9	308.6	+55.9
	N	35	35	35	35	
	S.D.	115.8	90.9	127.5	149.0	
Total	Mean	210.1	234.2	283.5	312.2	+102.1
	N	119	119	119	119	
	S.D.	101.5	106.4	113.4	130.5	

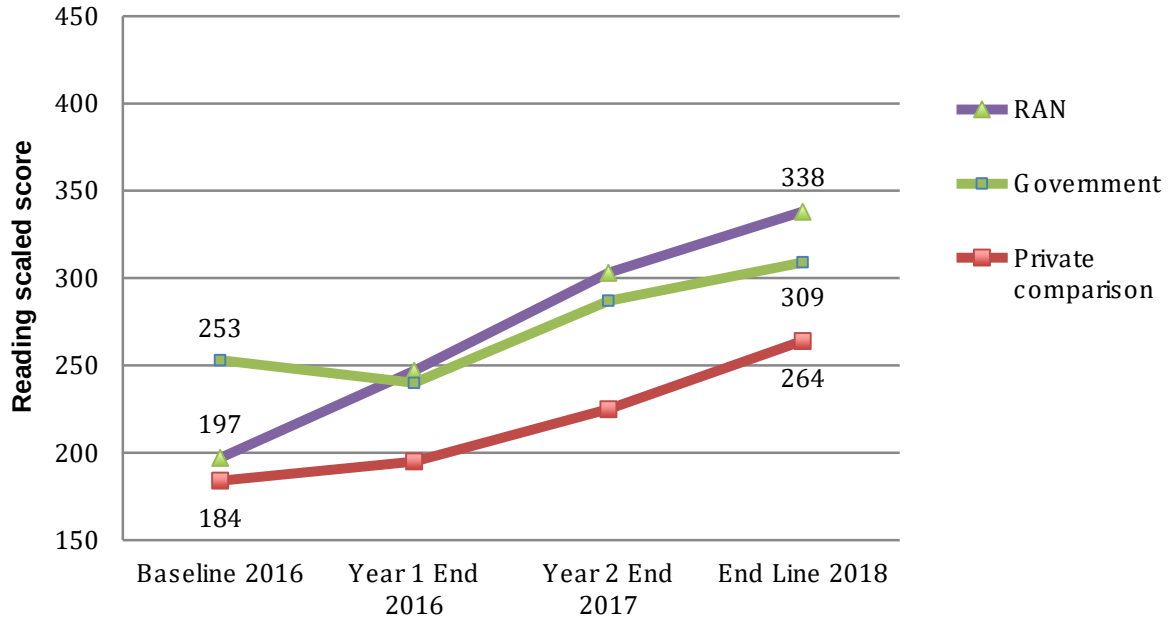
In RAN schools, 63 students (of 181 enrolled) were found to have taken all the tests in question. In Private Comparison schools, only 21 students from an original enrolment of 103 enrolled in the test in 2016 were found to have taken the baseline test and the three end of year tests that followed. The number of students in Government schools who took all the tests throughout the three-year period was 35 (out of 145 originally enrolled).

The mean score of this sub-sample of students for the Government-funded schools at the baseline assessment (252.7) is significantly higher than those for the sub-samples in RAN (197.3) and Private Comparison school (184.2).

Table 3.3 above shows that the average gain for RAN students was 140.5 scale scores. Students in the Private Comparison school sub-sample gained 79.5 scale scores. This is higher than the average scale score of Government-funded schools who achieved a gain of 55.9 scale scores, but significantly lower than the average gains achieved by the RAN school sub-sample.

Figure 3.2 below shows the gains made by all three cohorts over the course of the study.

Figure 3.2 – Reading progress baseline to endline (students taking all four defined tests only)



b. Comparative analysis of progress towards reading proficiency

We can also look at the rates of progress that different cohorts have made against growth targets. Growth targets are an indication of an overall standard of reading or mathematics that students are expected to achieve at the end of a defined period of study – normally a stage of schooling, normally a period of three to four years. Most educational systems define the standards of achievement explicitly in their curriculum documents. Assessments of whether standards are met are usually comprehensive and rely on more than one form of assessment.

For the purposes of this study, where a computer adaptive reading and mathematics test capable of assessing progression over time was used, two targets for reading and mathematics were set using a simple formula. To achieve a fairly 'modest' reading target and mathematics target and the end of the study (three years), the scale scores of students need to grow by 4 scale scores per month. To achieve a 'moderate' reading target or moderate mathematics target, their scale scores need to grow by at least 8 scores per month over the three years.

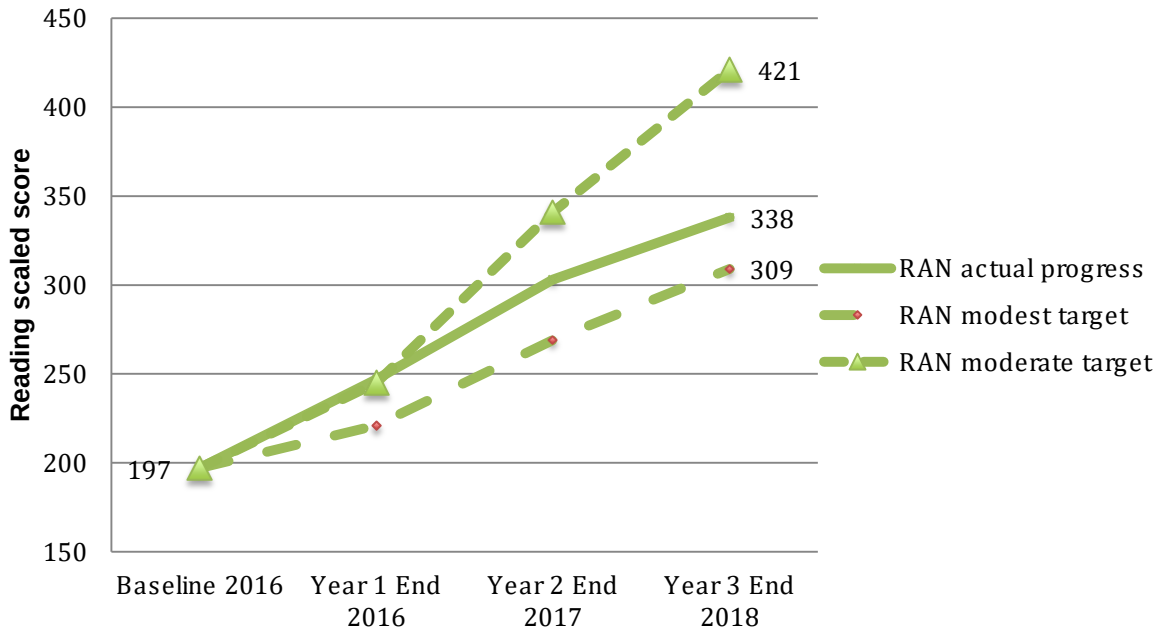
To put these targets in context, a growth of 2 to 3 scaled scores per week would be approximately the rate of progress that 50% of students in the US/UK with the same starting score would reach. It is important to note that these targets are not normed against a Sierra Leonean student population.

Targets are calculated for each group from the average baseline score recorded. So a cohort that records a lower baseline (time 1) score will have a lower target line (based on the formula) than a cohort with a higher recorded average baseline score. This analysis is important because it gives us a better understanding of the contributions that a school or schools might make towards learning. The argument is that students in a school or cluster of schools might at the baseline score lower than students in another cluster when their scaled scores are compared, but make faster gains towards their respective targets.

So what do the data say?

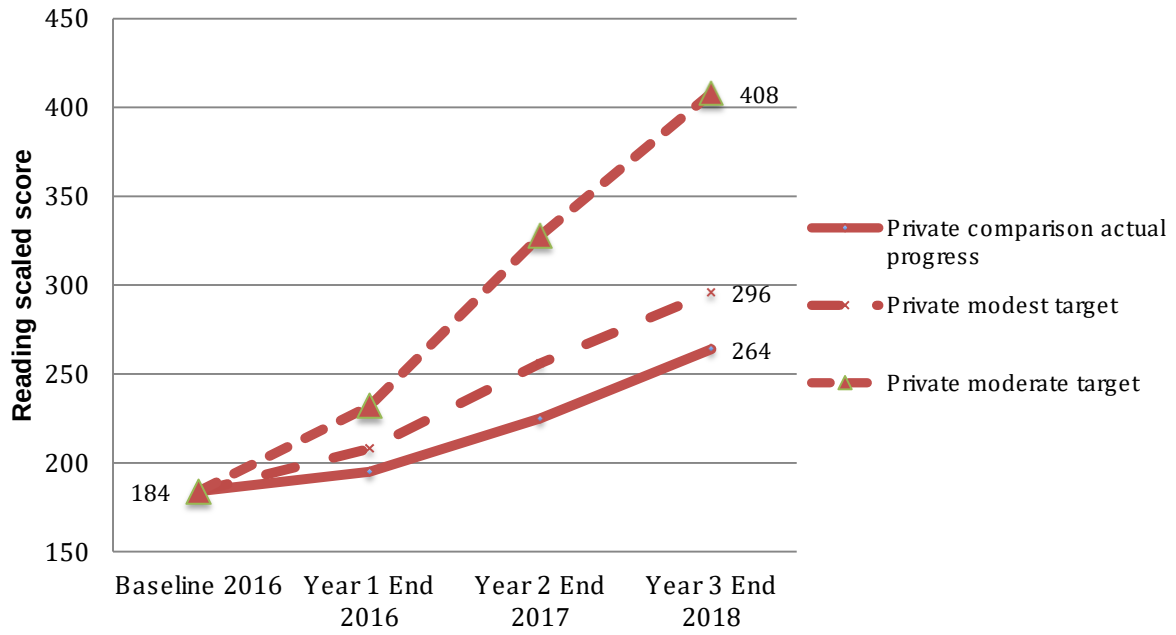
RAN schools made good progress against the 'moderate' target line for the first school year of the study. However, gains were not sustained and the trend reverted towards the 'modest' projected target line (see Figure 3.3). At endline, the sample exceeds the modest target by 29 scale scores but misses the moderate target by 83 scale scores.

Figure 3.3 - RAN schools progress against their modest and moderate targets



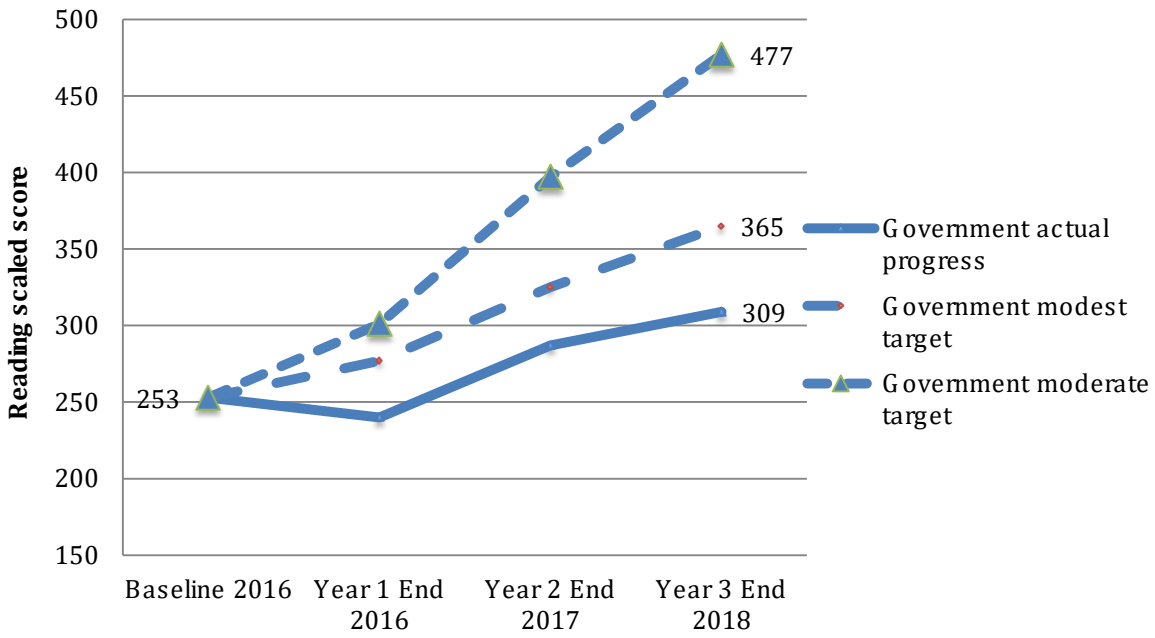
The Private Comparison schools match the 'modest' target in Year 3 but reach the endline 28 scaled scores below target having fallen behind trend in the first two years of the study (see Figure 3.4). These schools miss the 'moderate' target by a large margin (144 scaled scores).

Figure 3.4 – Private Comparison schools progress against their modest and moderate targets



Government-funded schools perform most erratically, falling back in the first year of the study (from a high baseline), then tracking the modest target line Year 2 before falling off the pace again in Year 3. At endline these schools fall 56 scale scores below the modest target and 168 scale scores below the moderate target (see Figure 3.5). While Government-funded schools achieve a higher endline score than Private Comparison schools, their growth rate when calculated against their achievement targets is slower. The conclusion here is that despite their lower average scale score at the end, Private Comparison schools are making faster progress towards their targets.

Figure 3.5 – Government schools progress against their modest and moderate targets



Importantly, neither Private Comparison schools, not Government schools are predicted to meet even the modest target. RAN schools exceed the modest target but the gains are not rapid enough to achieve the good standard of reading proficiency represented by the moderate target within one school stage (three years).

3.3 A comparative analysis of the average gains in learning made by students in all cohorts who have taken the baseline test (January 2016) and the final test of the project in June 2018.

a. When students taking the baseline and endline tests are considered comparatively, what gains in reading do RAN schools achieve?

This third level of analysis concerns students in all three cohorts who have taken both the baseline and the endline tests. The sample sizes for this comparison are slightly larger. 73 students in RAN schools were traced as having completed both baseline and endline reading tests, 31 students from Private Comparison schools, and 63 students from Government-funded schools.

Table 3.4 below shows the gains made by each cohort between test 1 and test 9.

The analysis of results confirm that RAN students have made much better gains in average reading scale scores between the first test and the ninth. The gain is 133.

Private Comparison schools have made gains too, of 90 scale scores between tests 1 and 9.

For this sub-sample, students in Government-funded schools started from a higher baseline than RAN and Private Comparison schools but their endline result of 269, although higher than that of Private Comparison schools, reflects a lower overall gain (of 51 scale scores).

An important interpretation of the gains towards reading proficiency is provided in the analysis of the gains in reading age (see Table 3.4). RAN schools recorded steady improvement in development of reading over the three years of the study. In RAN schools, students gained an average reading age of 13 months. This is significantly better than the average gain in reading age for Private Comparison schools (9 months) and for Government schools who gained 5 months on average.

Table 3.4 – Gains in reading and reading age (students assessed at baseline and end of the term Year I and Year 3 only)

	N		Scaled score	Estimated Reading Age
RAN Schools	73	January 2016	204	7:04
		May 2018	338	8:05
		Change**	+133	+1 year 1 month
Private Comparison Schools	31	January 2016	172	7:01
		May 2018	261	7:10
		Change**	+90	+9 months
Government Schools	63	January 2016	218	7:05
		May 2018	269	7:10
		Change	+51	+ 5 months

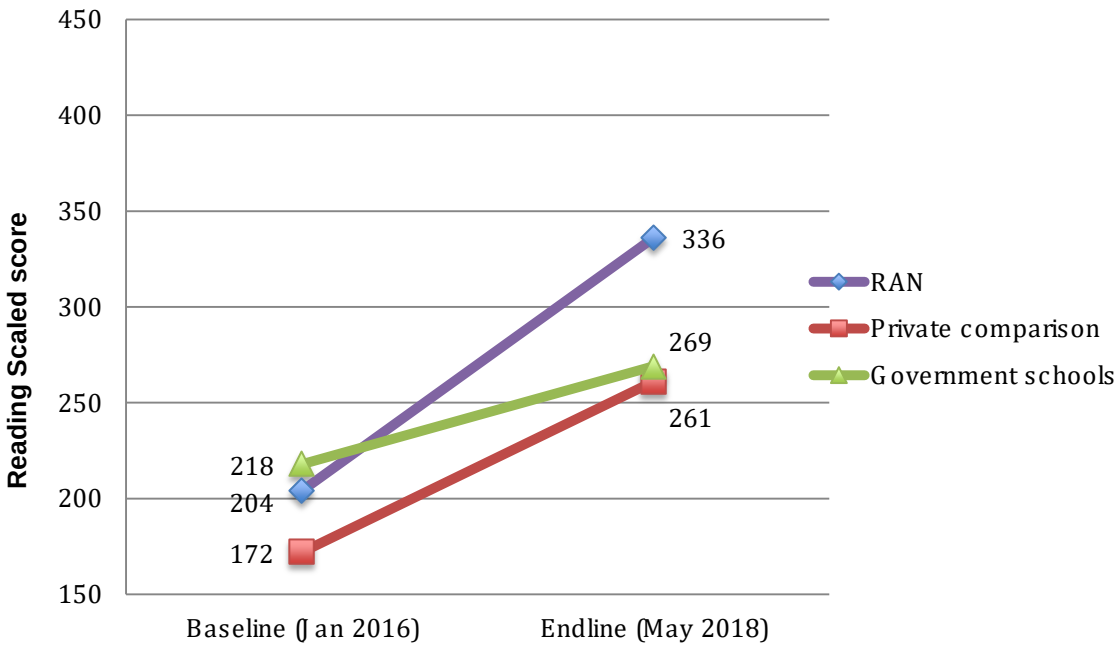
Though the estimated average reading age increased by 13 months over a period of the study, it is still some way below the chronological ages of the student cohort. An average reading age of 8 years and 5 months suggest that on average, students are still some way to reading texts that require better vocabulary, including that that would be found in text types other than narrative, comprehension of meaning and the ability to respond to and analyse text.

But it is important to add to that the literature points out that rapid growth in reading ages at the later stages of chronological development is harder to achieve than in the early years – and more so for second language learners. Improving vocabulary though reading more is easier to achieve than the process of reasoning or responding to text, the implicit cues to which are deeply buried in socio-cultural understandings and uses of the language.

With this in mind, the improvements in reading when the age of the students and their language background is taken into account are noteworthy.

The growth in performance for all cohorts can be seen in Figure 3.6 below.

Figure 3.6 - Change in reading scaled score baseline to endline, traceable students only



When the results are subjected to statistical analysis, it is clear from Table 3.5 below that the size of the effect achieved by RAN schools compared to comparison schools is practically and statistically significant.

Table 3.5 – Reading increase Effect size, students tested at baseline and end line only

	RAN (N=74)		Private comparison (N=31)		Government (N=63)	
	Jan 2016	May 2018	Jan 2016	May 2018	Jan 2016	May 2018
Mean Scaled score	203.7	336.2	171.6	261.2	218.4	269.0
Standard Deviation	100.3	115.6	84.2	105.2	107.9	84.2
Standard Errors	11.7	13.4	15.1	18.9	13.6	17.1
Mean SS change	+132.5		+89.6		+50.6	
Paired samples T-test	t(73)=10.3 p<.001***		t(30)=5.7 p<.001***		t(62)=4.0 p<.001***	
Effect size r	0.524		0.426		0.253	
Effect size d within school type	1.232 (large*)		0.940 (large*)		0.523 (medium*)	
Effect size g RAN v.s. Private comparison**	SS Difference Test 1 and Test 9: RAN= 132.5 Private comparison school =87.4 g=0.41 p< .05*					

Effect size g RAN v.s. Government**	SS Difference Test 1 and Test 9: RAN = 132.5 Government comparison schools = 50.6 g=0.77 p<.05*

*Cohen's standard
**Hedges' g for different sample sizes

b. How do girls perform within and between cohorts relative to boys?

Table 3.6 below shows that when time 1 scores are compared to time 9 scores for the same students, girls in RAN schools, although their end-line scores are lower than those of boys, have made faster progress (average gain of 131 scale scores) than boys (average gain of 127 scale scores). Although the finding is not statistically significant it is an important illustration nevertheless of the progression of girls compared to that of boys.

It is interesting that girls in RAN schools make significantly better gains than girls in both Private Comparison schools and Government schools. They make better progress than boys in Government schools and achieve a score similar to that of boys in Private Comparison schools.

The gains made by boys in RAN schools far exceed that of girls in comparison schools but are slightly poorer than those of boys in Private Comparison schools.

Boys in Private Comparison schools achieve a lower scale score (328) than boys in RAN schools (341) but they have made better progress in reading (a gain of 132) than boys in RAN schools (a gain of 127) and Government Schools (a gain of 70) and girls in Government schools (32) and in RAN schools (131).

Table 3.6 - Reading Scale Scores by gender, students taking assessments at Time 1 and Time 9

	Gender	Number of students	Time 1 Scaled Score	Time 9 Scaled Score	Change
RAN	Female	45	197	328	+131
	Male	29	214	341	+127
Private comparison	Female	19	156	219	+63
	Male	12	196	328	+132
Government	Female	32	238	270	+32
	Male	31	198	268	+70

When we look at the gains by reading age, Table 3.7 shows that girls in RAN schools have made as much progress as boys. Both groups have increased their reading ages by 10 months although boys have a slightly higher average reading age (2 months) than girls. The average reading age of RAN girls is 9 months higher than girls in Private Comparison schools and 5 months higher than girls in Government schools. Boys in Private Comparison schools have on average a higher reading age that girls in Private Comparison schools (5 months) but interestingly this is only just higher (by one

month) than the average reading age of girls in Government schools. Girls in Government schools have on average a slightly higher reading age than boys in Government schools (1 month).

Table 3.7 - Reading Age by gender, students assessed at both Time 1 and Time 9 only

	Gender	Number of students	Time 1 Reading Age	Time 9 Reading Age	Change
RAN	Female	45	7:03	8:04	+13 months
	Male	29	7:05	8:06	+ 13 months
Private comparison	Female	19	6:11	7:05	+ 6 months
	Male	12	7:03	8:04	+ 13 months
Government	Female	32	7:07	7:11	+ 4 months
	Male	31	7:03	7:10	+ 7 months

Figure 3.7 below compares the performance of female students across all cohorts and Figure 3.8 compares the performance of male students across all cohorts.

Figure 3.7 - Comparative reading performance of female students, baseline to endline

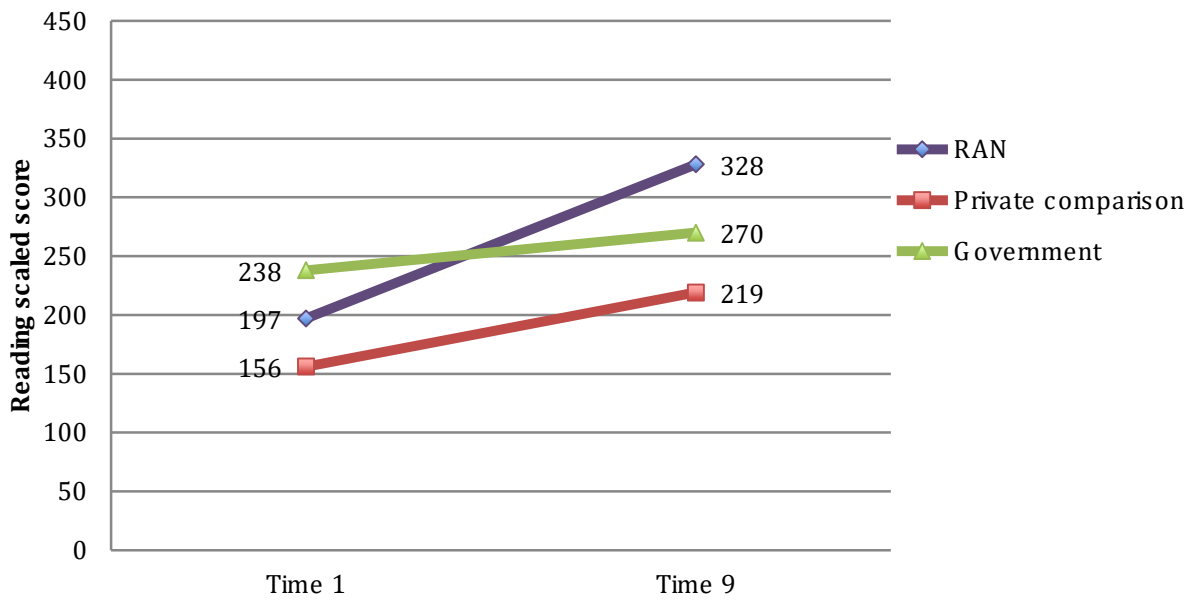
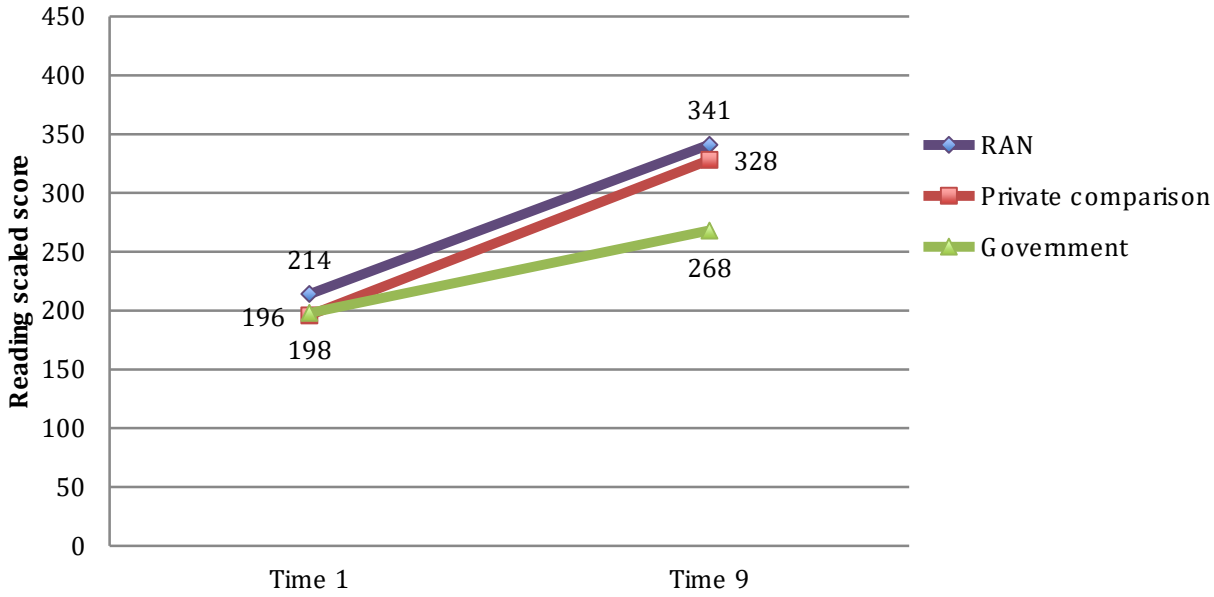


Figure 3.8 - Comparative reading performance of male students, baseline to endline



c. How do profiles of learning within cohorts change over time and how do these profiles compare?

The next level of analysis looks at changes in the profiles of learning within cohorts and compares these profiles across cohorts. This level of analysis is an important indicator of the sensitivity of a variety of teaching strategies and other inputs on the cross section of students stratified by performance bands.

Student transitions across reading performance bands for all three cohorts are shown graphically in Figures 3.9, 3.10, and 3.11 below.

Figure 3.9 – Student transitions across reading performance bands: RAN Schools

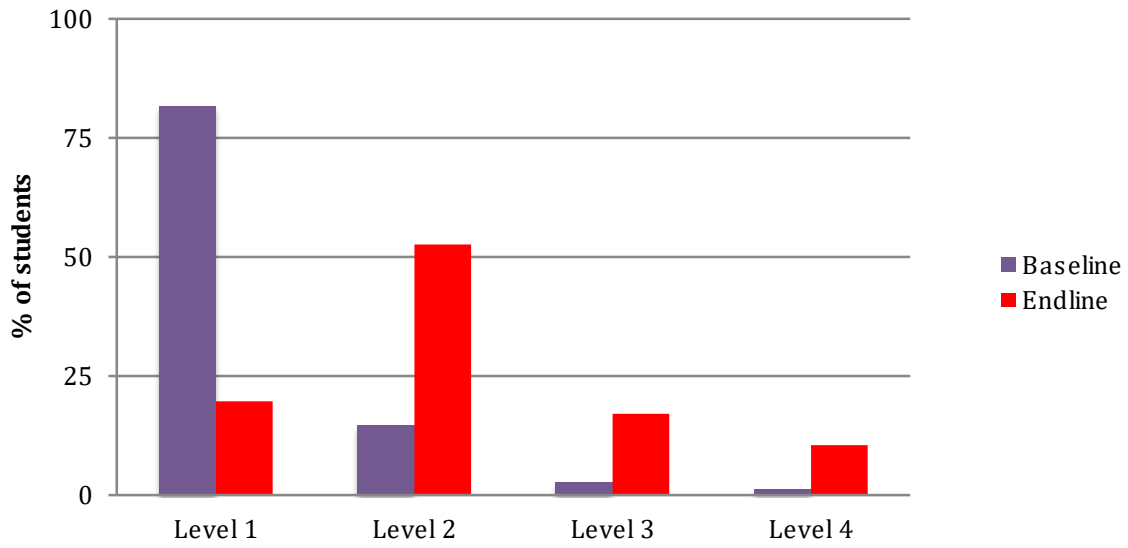
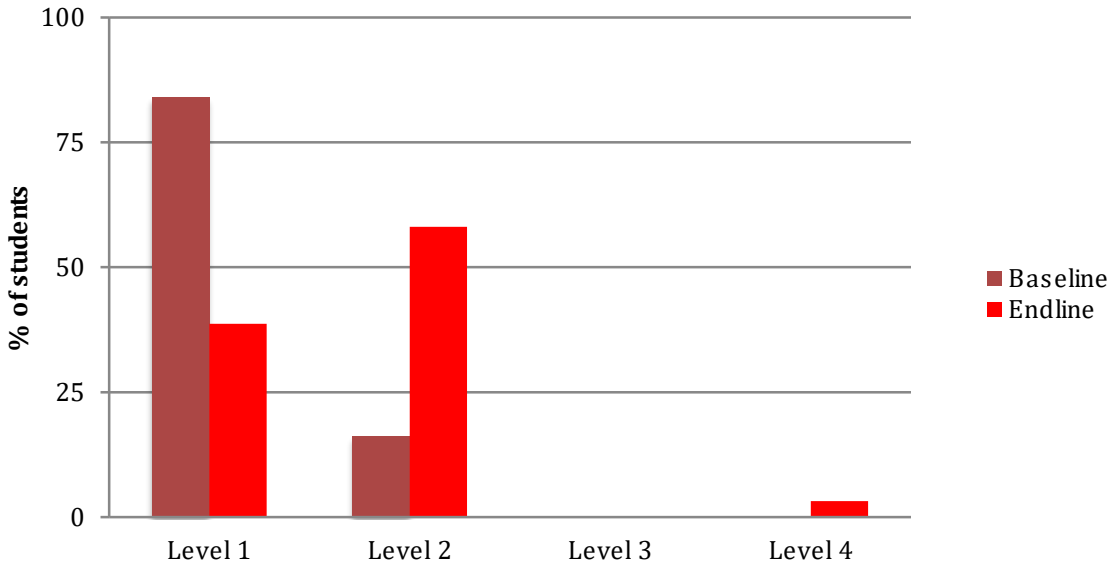


Figure 3.10 above shows that the percentage of students in the weakest performance band decreased from 81.5% at the baseline test to19.7% at the end line. The number of students performing at the next level of achievement (Level 2) increased as a result, from 14.4% at baseline to 52.6% at end-line. The number of students performing at level 3 as increased from 2.6% to 17.1% and in the top performance band (level 4) from 1.3% to 10.5% at end line test.

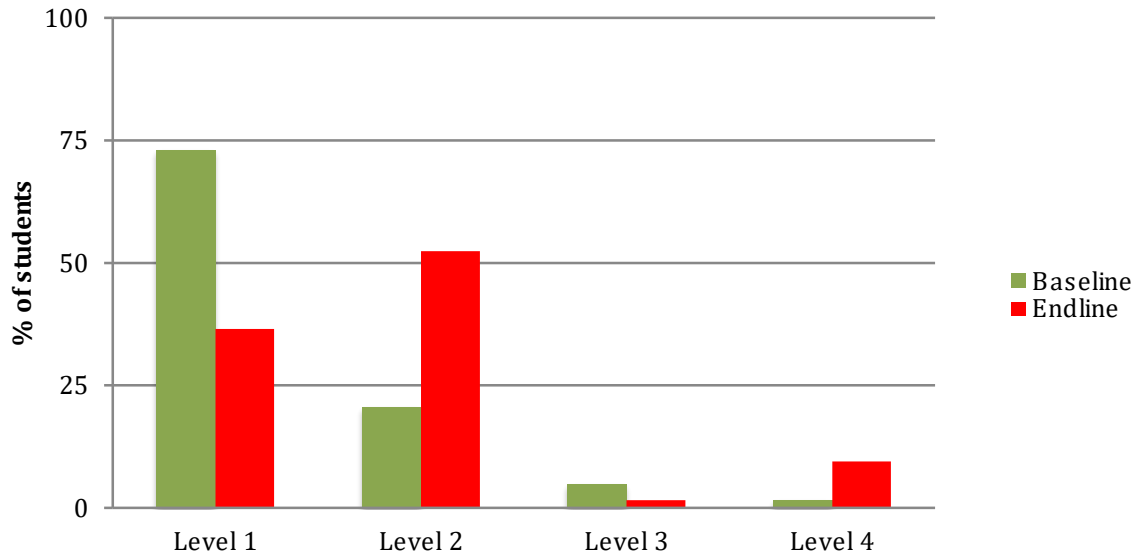
Figure 3.10 – Student transitions across reading performance bands: Private Comparison Schools



A similar analysis for private Comparison Schools in Figure 3.10 above shows that the percentage of students in the weakest performance band decreased from 83.9% at the baseline to 38.7% at the end-line. The number of students performing at the next level of achievement (Level 2) increased as a result, from 16% at baseline to 58% at end line. There were no students performing at level 3 at baseline and at the end line test this increased to one student (3.2%). There were no students in Level 4 at the baseline and this remained as it was at the end line.

For Government-funded schools in Figure 3.11 below shows that the percentage of students in the weakest performance band decreased from 73% at the baseline to 36.5% at the end line. The number of students performing at the the next level of achievement (Level 2) increased as a result, from 20% at baseline to 52.3% at end-line. The number of students performing at level 3 decreased from 4.7% to 1.6% but increased in the top performance band (level 4) from 1.6% to 9.5% at the end line.

Figure 3.11 – Student transitions across reading performance bands: Government Schools



d. How do profiles of learning within cohorts change for male and female students over time and how do these profiles compare?

Table 3.8 below shows the changes in the learning profiles of male and female students that have taken both tests 1 and 9 by performance band.

Table 3.8 - Change in reading profiles by sex - baseline to endline, students taking both tests only

		Level 4		Level 3		Level 2		Level 1		Total
		Test 1	Test 9	Test 1	Test 9	Test 1	Test 9	Test 1	Test 9	
RAN	Female	0	6 (13%)	1 (2%)	5 (11%)	7 (15%)	28 (60%)	39 (83%)	8 (17%)	47 (100%)
	Male	1 (3%)	2 (7%)	1 (3%)	8 (28%)	4 (14%)	12 (41%)	23 (79%)	7 (24%)	29 (100%)
Private comparison	Female	0	0	0	0	2 (11%)	10 (53%)	17 (90%)	9 (47%)	19 (100%)
	Male	0	1 (8%)	0	0	3 (25%)	8 (67%)	9 (75%)	3 (25%)	12 (100%)
Government	Female	0	4 (13%)	3 (9%)	0	8 (25%)	18 (56%)	21 (66%)	10 (31%)	32 (100%)
	Male	1 (1%)	2 (7%)	0	1 (3%)	5 (16%)	15 (48%)	25 (81%)	13 (42%)	31 (100%)

In RAN schools, there were no female students (of the sub-sample that is traced here) performing above expectation (level 4) at the beginning of the study (baseline). This increased to 6 students (13%) at end line. At the other end of the spectrum, 39 female students (83% of the total) were in

the worst performance banding at the beginning of the study. By the endline, the number of female students in the worst performing band reduced to 8 (17% of the total).

Male students too responded well to schooling over time. There was only 1 male student (in the traceable sub-sample) in the highest performing group at the beginning of the study, and only 2 (7%) by the endline test. But the number of male students in the lowest performance band was reduced from 23 (79%) to 7 (24%) between baseline and endline.

In Private Comparison schools, none of the students of the sub-sample that is traced here was performing at or above expectation (Level 3 and 4) at the beginning of the study. At endline, only one student achieved this level. At the other end of the spectrum the share of female students in the lowest performing groups were reduced from 17 (90%) to 9 (47%) and the share of male students in this band from 9 students (75%) to 3 (25%).

In Government-funded schools, only one male student of the sub-sample that is traced here was performing above expectation (band 4) at baseline but there were 6 students achieving this level at the end-line tests. At the other end of the spectrum the share of female students in the lowest performing groups were reduced from 21 (66%) to10 (31%) and the share of male students in this band from 12 students 25 (81%) to 13(42%).

The results for all cohorts are promising in that they show a reduction of the worst performing students and an increase in the share of better performing students over time. What the results do not show us are those students who might leap frog one or more performance bands or indeed regress. It is interesting therefore to ask what the transition patterns of individual students look like over the three years of the study.

e. What are the patterns of transition for individual students over time and how do their learning pathways compare?

The transition analysis below shows us advances or regressions in the learning pathways of students from the beginning of the study to the final test and the end of the study.

Figure 3.12 below represents an analysis of the transitions of students in RAN schools between different levels of achievement from the baseline reading assessment in 2016 to the end line assessment in 2018.

As noted, the sample comprised of 76 students who were tracked over three years. At the first assessment point, 62 of the 76 students were working well below the benchmark and located in the 'poorest' achievement level (Level 1). 11 students were working below the benchmark and located in the 'poor' level of achievement band (Level 2). 2 students were working just below or at the benchmark and located in the 'moderately good' level of achievement band (Level 3). Only 1 student was working above the benchmark and located in the 'highest' level of achievement band (Level 4).

At the end of the study, the 76 students were found to have made the following transitions:

- Of the 62 students in Level 1 at the baseline assessment, only 14 remained in that level of achievement band. 36 of these students transitioned into Level 2, 9 transitioned two levels up, into Level 3 and 3 students transitioned into level 4, the highest achievement level.

- Of the 11 students that were in Level 2 at the baseline assessment, 1 student regressed to Level 1, 4 students remained in this level of achievement, 3 students moved up to the next level of achievement (level 3) and a further 3 students had moved to the highest performance level (level 4).

- Of the 2 students in level 3 at the baseline assessment, both transitioned to Level 4.

- The only student in Level 4 at the baseline assessment regressed to the level below – Level 3.

Figure 3.12 shows an increase of students in Level 4 from 1 in Test 1, to 8 in Test 9. The 8 students in Level 4 at the end of the study comprise of 6 girls and 2 boys. At the other end of the scale, students in Level 1 in Test 1 decreased from 62 to 15. The number is made up of 8 girls and 7 boys.

Figure 3.12 - Learning Pathways: Individual Reading Progress Patterns over Time. RAN Schools

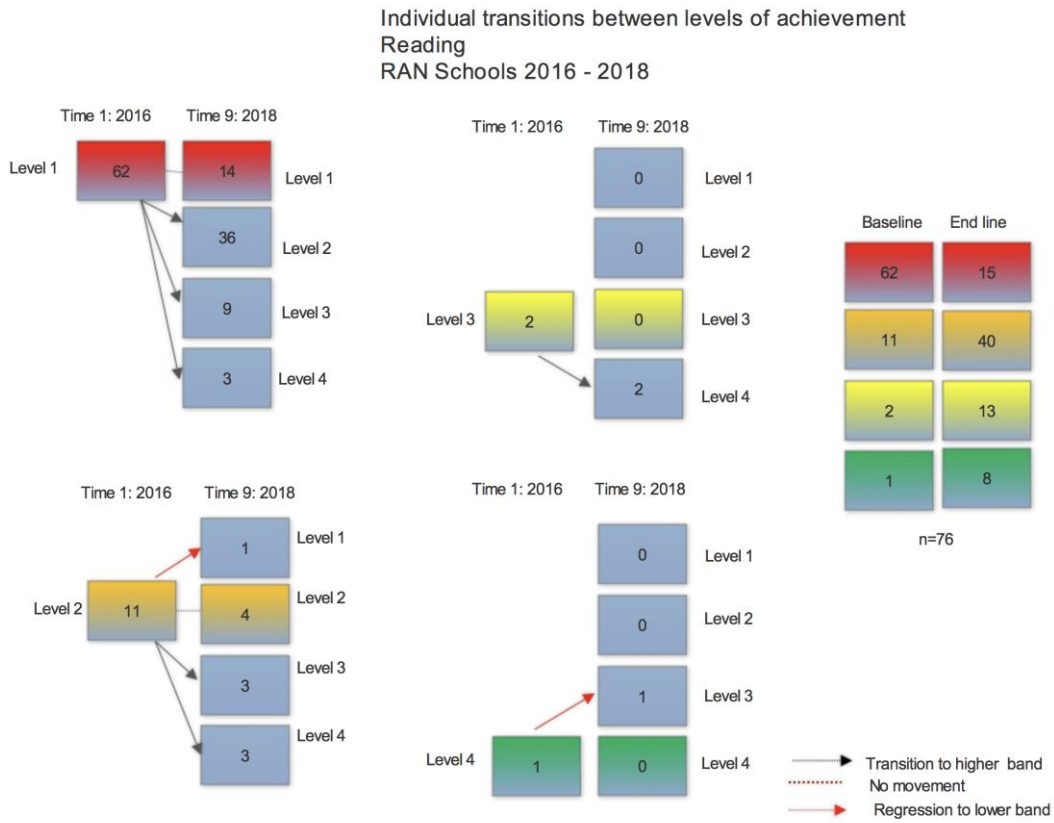


Figure 3.13 below represents an analysis of the transitions of the students in Private Comparison schools between different levels of achievement from the baseline reading assessment in 2016 to the end line assessment in 2018.

The traceable sample comprises of 31 students who were tracked over three years. At the first assessment point, 26 of the 31 students were working well below the benchmark and located in the 'poorest' achievement level (Level 1). The remaining 5 students were working below the benchmark and located in the 'poor' level of achievement band (Level 2).

At the end of the study, the 31 traceable students were found to have made the following transitions:

- Of the 26 students in Level 1 at the baseline assessment, only 12 remained in that level of achievement band. 14 students transitioned into Level 2.

- Of the 5 students that were in Level 2 at the baseline assessment, 4 students remained in Level 2 while 1 student transitioned to Level 4.

Figure 3.13 below represents an analysis of the transitions of the students in Private Comparison schools between different levels of achievement from the baseline reading assessment in 2016 to the end line assessment in 2018.

Figure 3.13 - Learning Pathways: Individual Reading Progress Patterns over Time. Private Comparison Schools

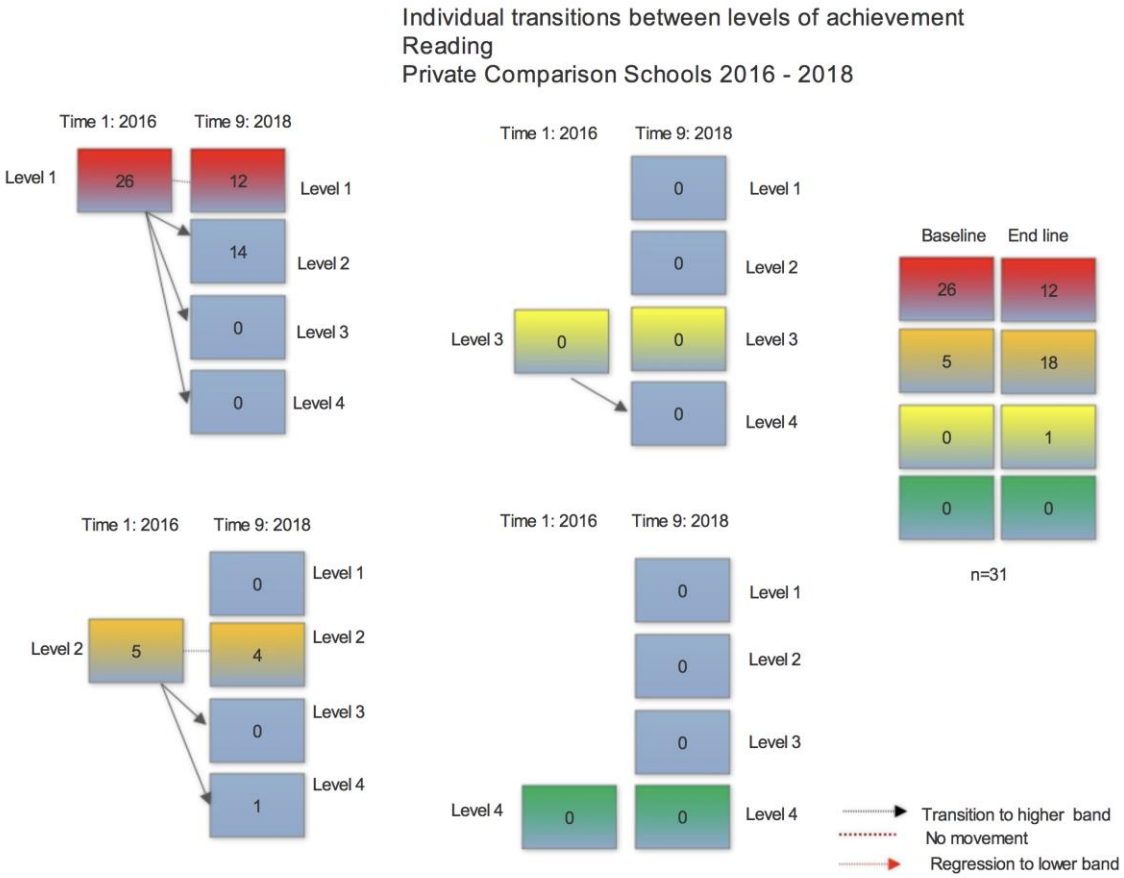


Figure 3.14 below represents an analysis of the transitions of the students in Government schools between different levels of achievement from the baseline reading assessment in 2016 to the end line assessment in 2018.

The traceable sample consisted of 63 students. Of these, 46 were in Level 1 at the baseline. At the end of the study, only 21 remained in that level of achievement band. 24 students transitioned into Level 2. No students were found in Level 3 in test 9 and one student had transitioned over three levels into level 4, the highest achievement level.

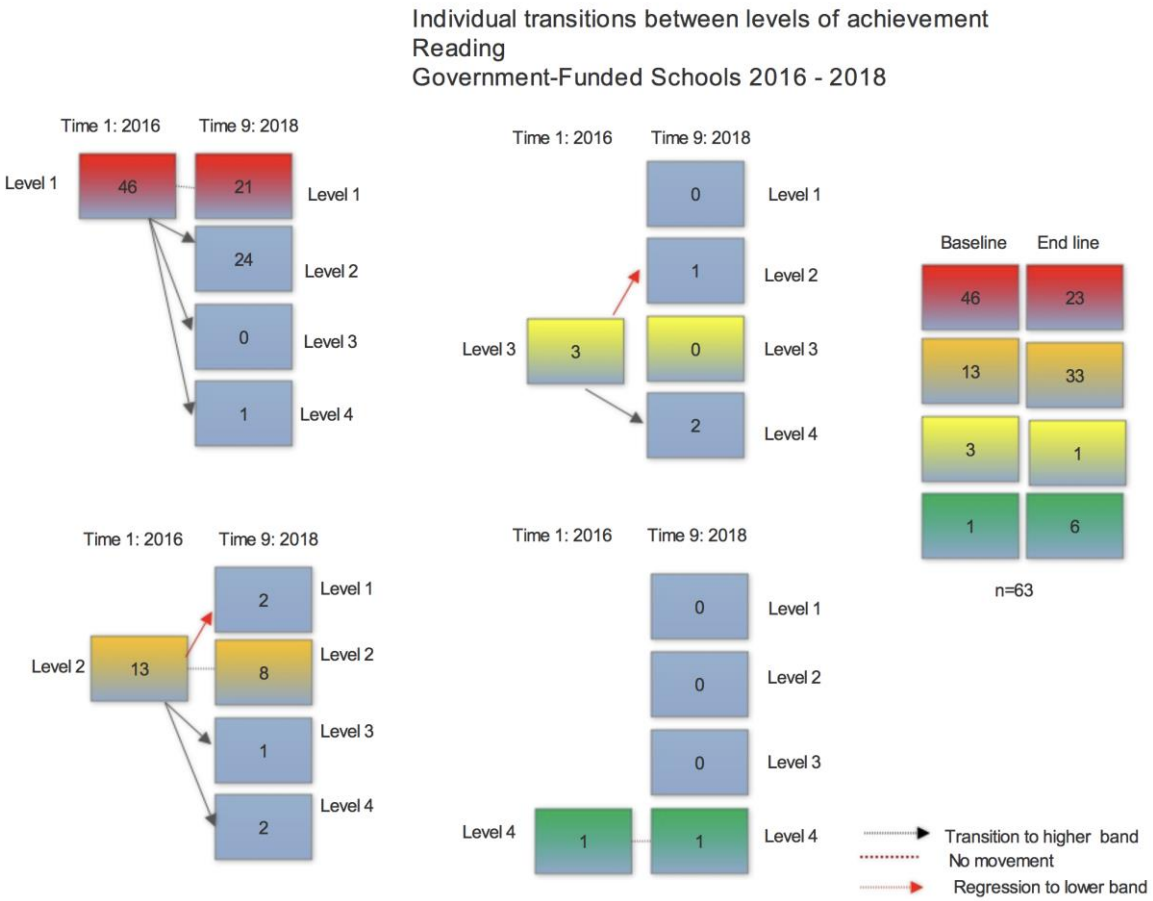
Of the 13 students that were in Level 2 at the baseline assessment, 2 students regressed to Level 1, 8 students remained in this level of achievement, 1 student moved up to the next level of achievement (level 3) and a further 2 students had moved to the highest performance level (Level 4).

Of the 3 students in level 3 at the baseline assessment, one regressed by one level to Level 2 but two moved up one level (to Level 4). One student was at level 4 in the baseline assessment and remained at this level at the end of the study.

Figure 3.14 below shows that there was 1 student in Level 4 (a boy) at the beginning of the study. At the end of the study, 6 students were reading at this level of achievement. They are made up of 4 girls and 2 boys.

At the other end of the scale, students in Level 1 in Test 1 decreased from 46 to 23. The number of students remaining in Level 1 is made up of 10 girls and 13 boys.

Figure 3.14 - Learning Pathways: Individual Reading Progress Patterns over Time. Government Schools



Chapter 4

Mathematics

For the mathematics assessment, four skills areas were covered by the test – numbers and operations, algebra, geometry and measurement, and data analysis, statistics and probability. A number of multiple-choice questions are given and students are asked to select the correct response. They have 60 seconds in which to choose their answer.

The computer adaptive test records the number of correct responses and converts the raw scores into scale scores.

As discussed above, the findings are presented as follows:

- Monitoring: For all students who take assessments at different test intervals: an analysis of the learning trends of the cohorts and their average gains in learning over three academic years.
- Time series comparisons: A comparison of the learning gains and rates of progression for only those students who have taken the following 4 tests over three years – the baseline test in January 2016; the end of year tests in 2016; the end of year test in 2017; the end of year tests in 2018.
- Baseline - end line comparisons: A comparison of the learning gains and rates of progression for only those who take the baseline test (2016) and the end-line test (2018): These analyses are disaggregated by gender.
- Within group transition analysis: The patterns of transition between performance quartiles for each cohort. These analyses are disaggregated by gender and allow us to understand whether the benefits of education favour all.

4.1 Analysis of the mathematics attainment of students in all cohorts presenting for assessment at different test intervals over three academic years

a. Changes in mathematics scores

Changes in average maths attainment were calculated across a time series of 9 assessments from January 2016 to June 2018. As with the reading assessments, only the intervention schools were assessed on all 9 occasions over the period of the study.

Data are presented for the samples of students who took a given test during the period of the study. Periodic absenteeism means that these samples contain different students and are therefore not directly comparable. While these results are indicative and important to report, they are likely to be confounded and therefore cannot be interpreted as true learning gains.

Table 4.1 below shows the results of the mathematics assessments over the three years of the study

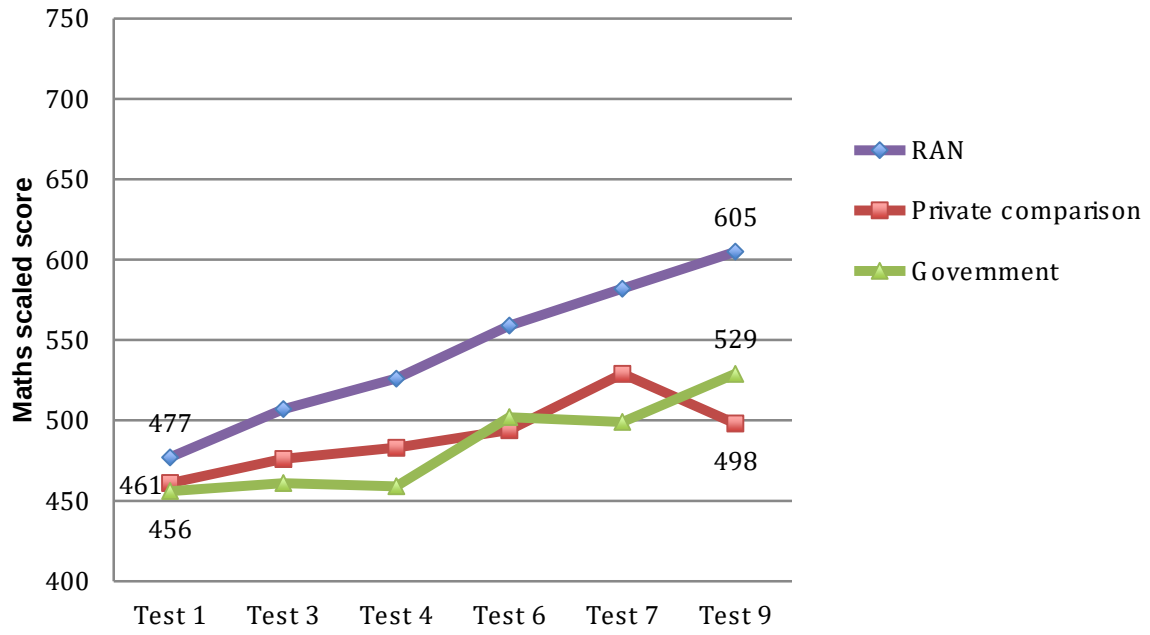
Table 4.1 – Mathematics – comparison of mean scores for all cohorts

	N	Scaled Score	N	Scaled Score	N	Scaled Score	N	Scaled Score	N	Scaled Score	N	Scaled Score
RAN	183	477	167	507	128	526	125	559	90	582	68	605
Private Comparison	111	461	88	476	67	483	54	494	41	529	36	498
Government	150	456	93	461	108	459	60	502	96	499	61	529
	Test 1 Jan 2016		Test 3 June 2016		Test 4 Nov 2016		Test 6 June 2017		Test 7 Oct 2017		Test 9 May 2018	
	Year I				Year II				Year III			

The pre-test scaled scores for RAN schools and those of Private Comparison and Government-funded schools were broadly similar: 477 for RAN schools, 461 for Private Comparison schools and 456 for government funded schools.

The changes in maths scores for all cohorts at each assessment point are shown in Figure 4.1 below.

Figure 4.1 – Mathematics progress monitoring of all students assessed at each assessment interval



4.2 A comparative analysis of the average gains in Mathematics made by students in all cohorts who have taken four tests that must include the baseline test and the end of year tests in each of the three years of the study.

a. Comparative analysis of mathematics gains

Table 4.2 below shows the scores for the panels of students who are followed throughout the study. All the students here have taken the baseline assessment in 2016, and end of year assessments in 2016, 2017, and 2018. There is significant attrition in this sub-sample. In RAN schools, only 47 students (of 181 enrolled) were found to have taken all the tests in question, in Private Comparison only 18 students (out of 103) and in Government schools only 24 (out of 145).

Table 4.2 - Maths test results for students in all cohorts taking 4 defined tests over the course of the study

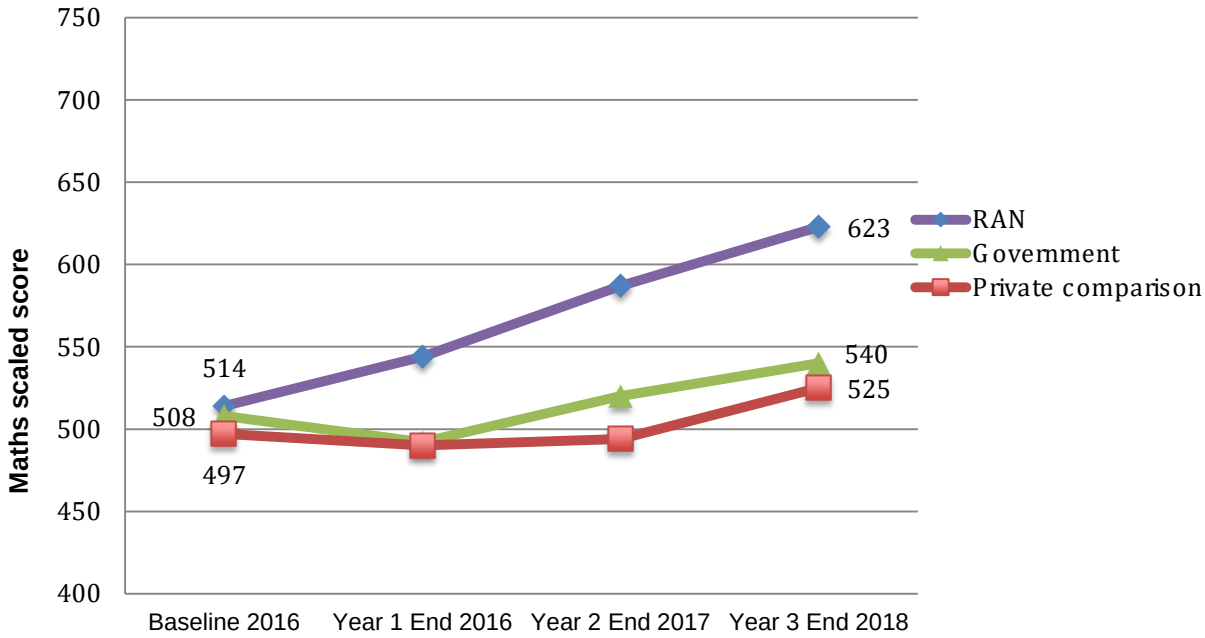
Maths Scaled Score						
		Baseline 2016	Year 1 End 2016	Year 2 End 2017	Year 3 End 2018	SS Change baseline-year 3 end
RAN	Mean	514.3	543.7	586.7	623.3	+109
	N	47	47	47	47	
	S.D.	93.3	96.5	100.3	119.8	
Private comparison	Mean	497.4	489.7	493.8	524.5	+27.1
	N	18	18	18	18	
	S.D.	85.5	95.1	85.9	84.8	
Government	Mean	507.6	491.9	519.7	540.4	+32.8
	N	24	24	24	24	
	S.D.	114.5	121.0	101.0	110.5	
Total	Mean	509.1	518.8	549.8	580.9	+71.8
	N	89	89	89	89	
	S.D.	97.1	105.6	104.7	118.9	

In the first test in 2016, the mean scores of the sub-samples of students were roughly similar. The RAN subsample (n=47) achieved a mean score of 514.3 as a baseline measure. The Private Comparison Schools sub sample (n=18) achieved a mean score of 497.4 in the baseline test while Government schools (n=24) achieved a baseline score of 509.1.

At endline, the RAN school sample has made an average gain of 109 scale scores, significantly better than the gains achieved by both Private Comparison Schools (27.1) and Government Schools (32.8).

Figure 4.2 below shows these gains graphically.

Figure 4.2 - Maths Progress Baseline to Endline (students taking all four defined tests only)



b. Comparative analysis of progress towards mathematics proficiency

Here, as in the reading analysis above, we look at the comparative rates of progress that different cohorts have made. The average lines of progress are set in accordance with the baseline performance of each group: a modest target of 4 scaled scores per month and a moderate target 8 scaled scores per month.

The results show that RAN schools track the modest target all the way through the study but fall short of achieving the moderate target. Both Government-funded and Private Comparison schools fail to reach either the modest or moderate growth targets.

Figure 4.3 - RAN schools Maths progress against their modest and moderate target

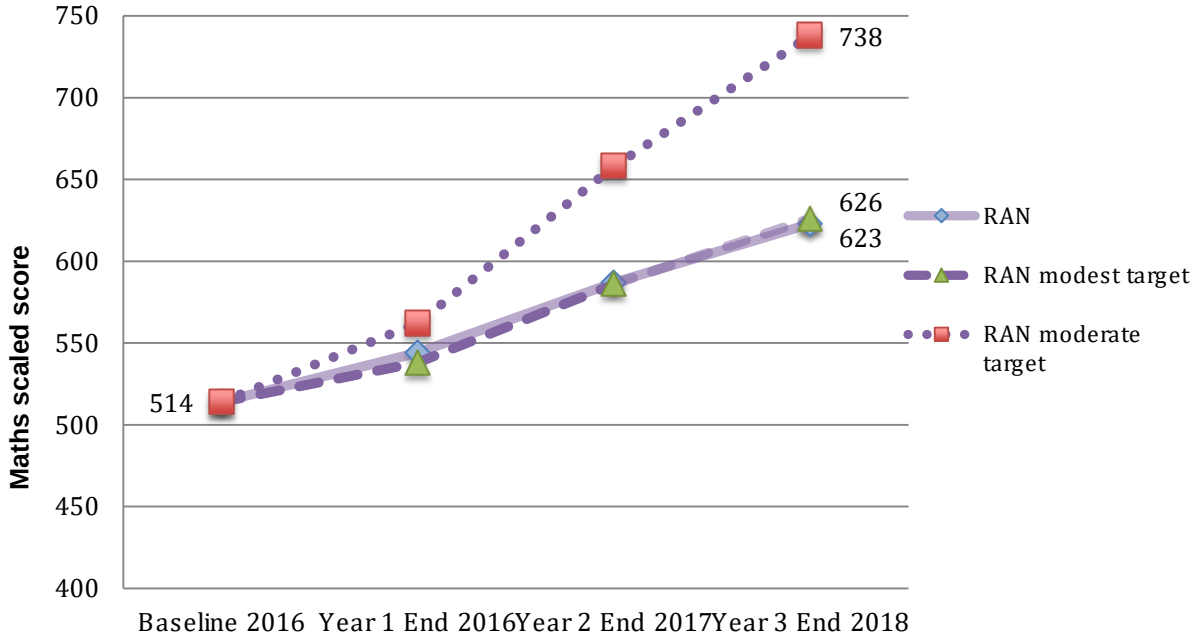


Figure 4.4 - Private comparison schools Maths progress against their modest and moderate target

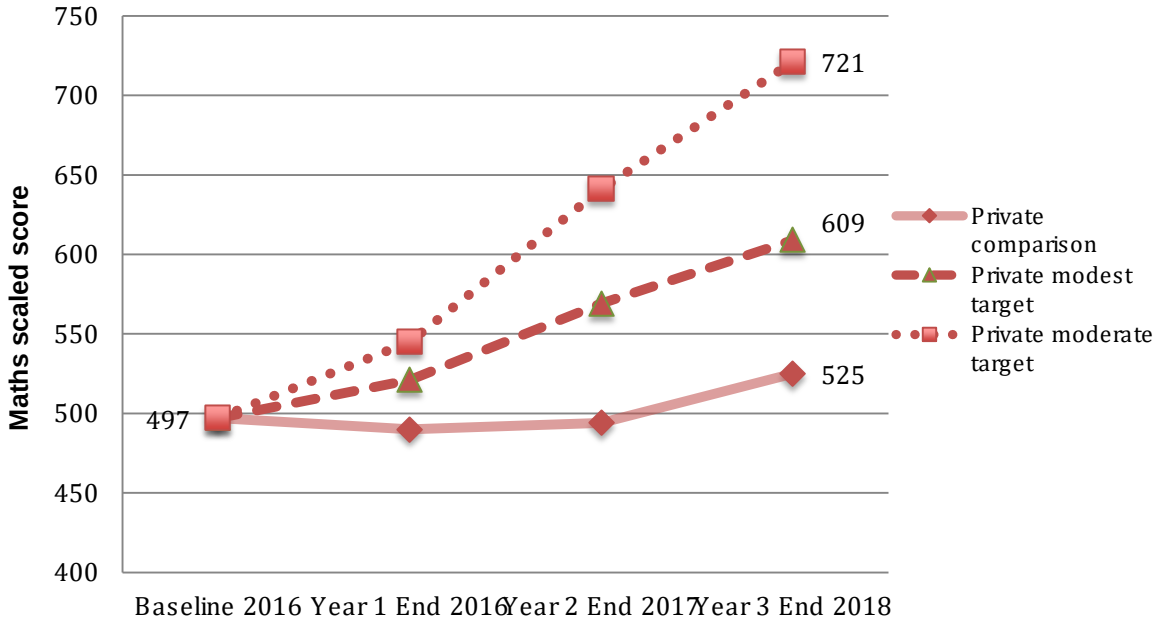
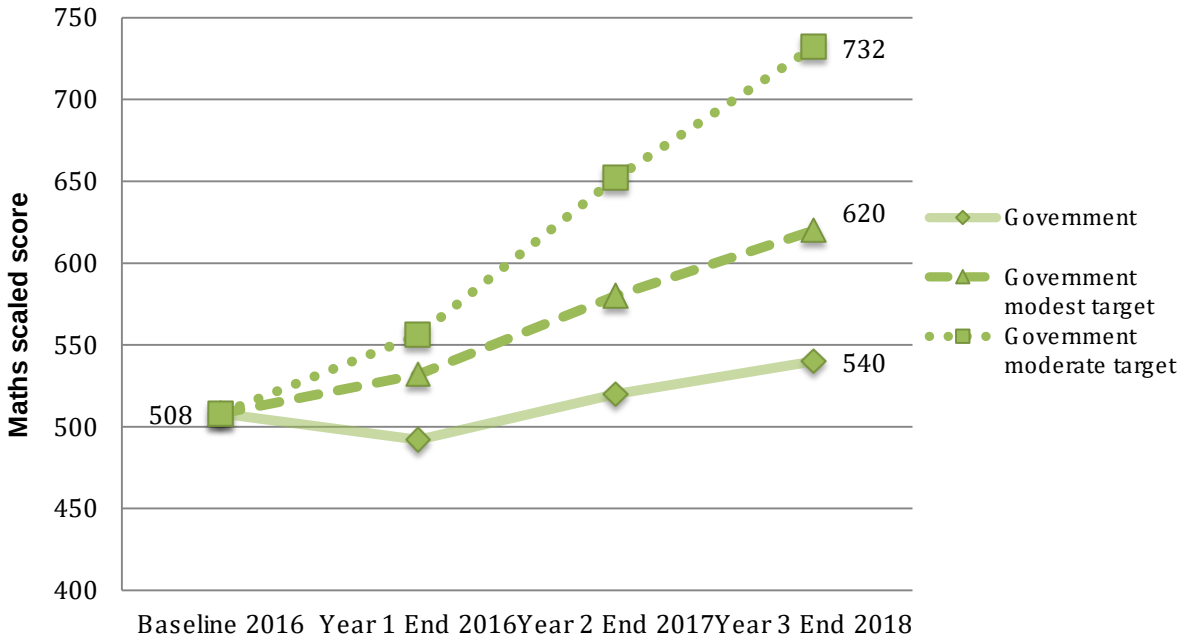


Figure 4.5 - Government-funded schools maths progress against their modest and moderate target



4.3 A comparative analysis of the average gains in mathematics made by students in all cohorts who have taken the baseline test (January 2016) and the final test of the project in June 2018.

When we consider only those students who have taken both the baseline and endline tests, the results confirm that students in RAN schools have made faster gains than those in comparison schools. The size of the effect achieved by RAN schools is practically and statistically significant (see Table 4.3 below).

Figure 4.6 - Change in Maths scaled score baseline to endline, traceable students

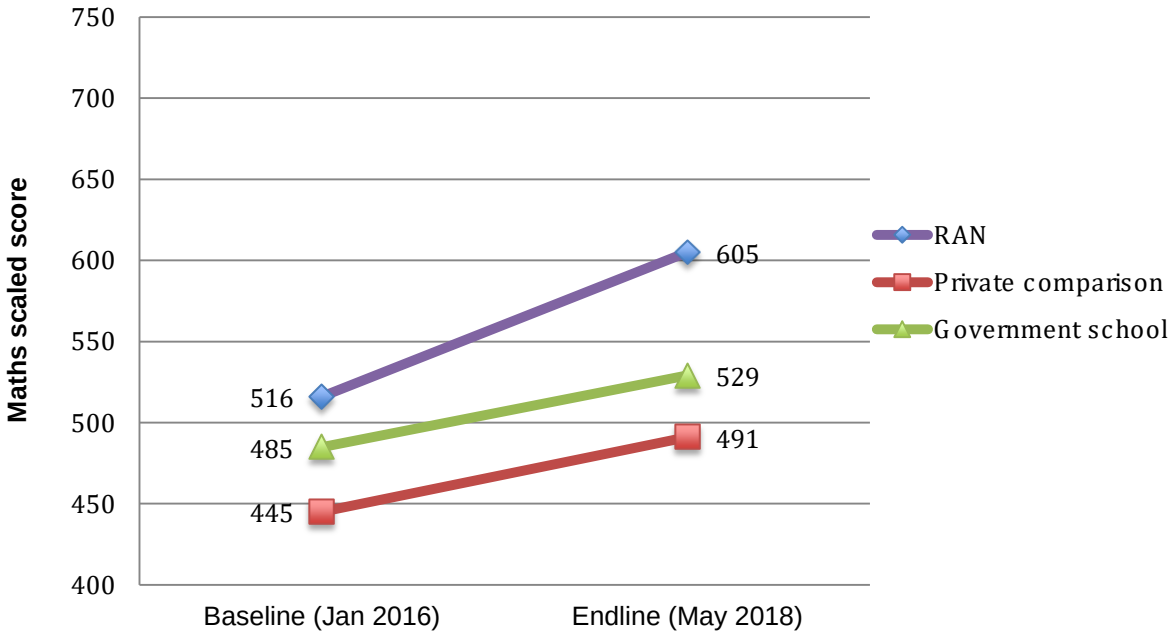


Table 4.3 – Maths increase Effect size, students tested at baseline and endline only

	RAN (N=68)		Other private (N=35)		Government (N=61)	
	Jan 2016	May 2018	Jan 2016	May 2018	Jan 2016	May 2018
Mean Scaled score	516.5	605.2	448.2	491.0	484.6	529.3
Standard Deviation	107.5	116.8	97.9	114.5	100.4	106.2
Standard Errors	13.0	14.2	16.5	19.4	12.9	13.6
Mean SS change	+88.7		+42.8		+44.7	
Paired samples T-test	t(67)=7.2 p<.001***		t(34)=2.1 p<.001***		t(60)=4.0 p<.001***	
Effect size (r)	0.367		0.197		0.211	
Effect size d* within school type	0.790 (medium*)		0.402 (small*)		0.433 (small*)	
Effect size g RAN vs. Private comparison**	SS Difference Test 1 and Test 9: RAN= 88.7 Other private school =42.8 g=0.42 p< .05*					
Effect size g RAN vs. Government **	SS Difference Test 1 and Test 9: RAN= 88.7 Government school =44.7 g=0.46 p< .05*					

*Cohen's standard
**Hedges' g for different sample sizes

b. How well do girls perform within and between cohorts relative to boys?

Table 4.4 below shows that when baseline scores are compared to end-line scores for the same students, girls in RAN schools make better progress than boys despite achieving a lower scaled score at endline test. Girls gained 102 scaled scores between test 1 and test 9 compared to 70 for boys who started on a scaled score of 548 in test 1 and finish on a scaled score of 618 in test 9.

Table 4.4 - Maths Scaled Score by gender, students assessed at both Time 1 and Time 9 only

		Number of students	Test 1 Scaled Score	Test 9 Scaled Score	Change
RAN	Female	39	493	595	+102
	Male	29	548	618	+70
Private Comparison	Female	21	426	453	+27
	Male	14	482	547	+65
Government Comparison	Female	35	483	516	+33
	Male	26	486	546	+60

Figure 4.7 and 4.8 below further illustrate the change in scaled scores by gender.

Figure 4.7 - Change in Maths scaled score baseline to endline - Female students

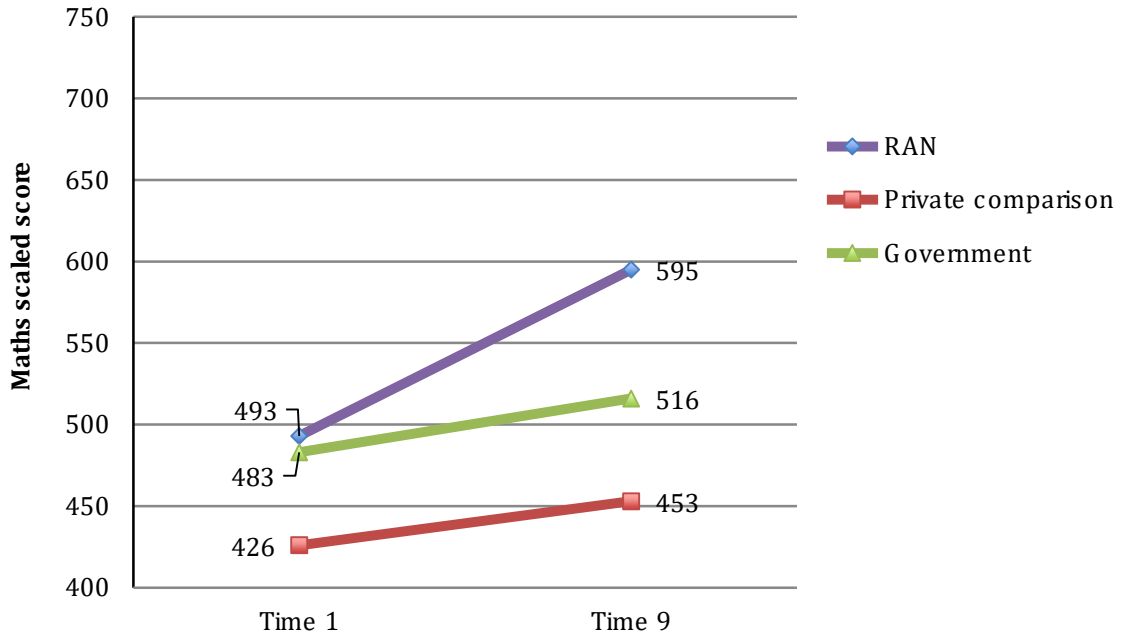
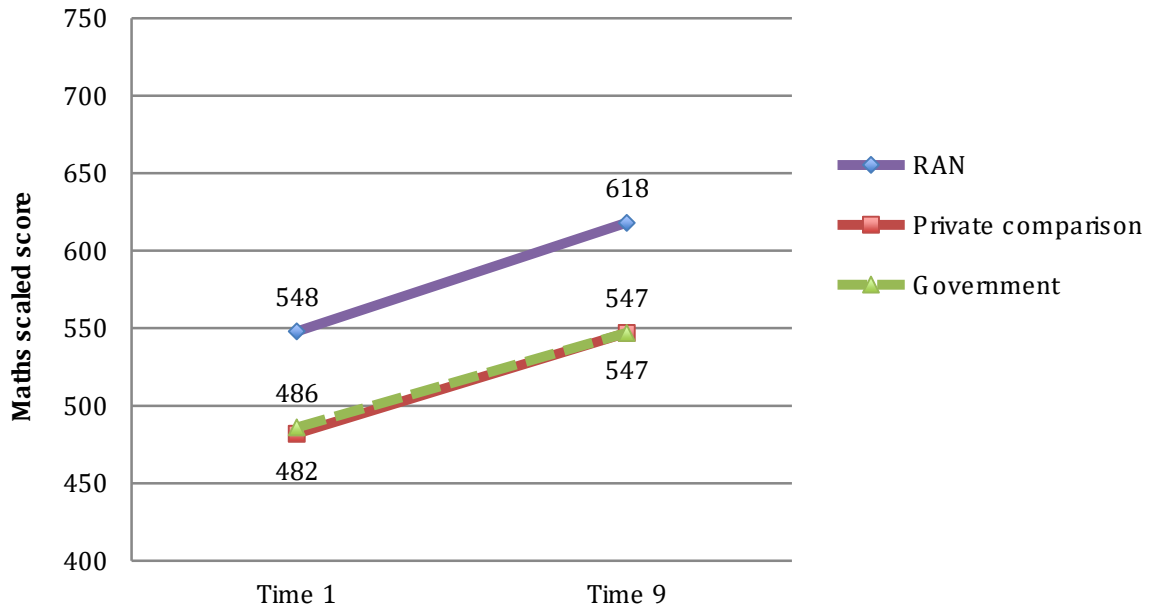


Figure 4.8 - Change in Maths scaled score baseline to endline - Male students



Perhaps one of the most noteworthy results is that girls in RAN schools make significantly better gains than girls in Private Comparison schools (a difference of 75 scaled-scores over 28 months) and Government schools (79 scaled-scores over 28 months), as well as boys in Private Comparison schools (37 scaled-scores) and Government schools (42 scaled-scores). The gains made by boys in RAN schools also exceed that of boys and girls in comparison schools.

Similar to the Reading test results, girls in Private Comparison schools and Government-funded schools made fewer gains over time than boys in the same schools.

c. How do the profiles of learning within cohorts change over time and how do these profiles compare?

The next level of analysis looks at changes in the profiles of learning within cohorts and compares these profiles across cohorts. This level of analysis is an important indicator of the sensitivity of a variety of teaching strategies and other inputs on the cross section of students stratified by performance bands.

Table 4.6 - Within cohort transitions and changes in the profiles of mathematics attainment by performance band

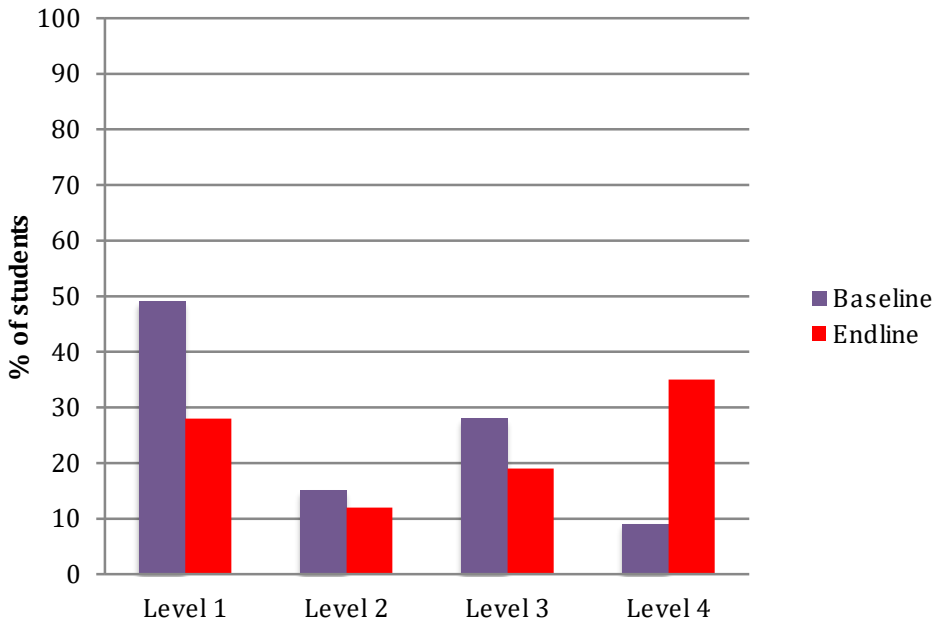
	RAN				Private comparison				Government			
	Level 4	Level 3	Level 2	Level 1	Level 4	Level 3	Level 2	Level 1	Level 4	Level 3	Level 2	Level 1
Baseline	10 (5%)	31 (17%)	29 (16%)	113 (62%)	3 (3%)	17 (15%)	23 (21%)	68 (61%)	2 (1%)	15 (10%)	32 (21%)	101 (67%)
End of year I	16 (10%)	27 (17%)	46 (29%)	71 (44%)	8 (9%)	13 (15%)	16 (19%)	49 (57%)	5 (6%)	7 (8%)	16 (19%)	56 (67%)
End of year II	28 (22%)	15 (12%)	34 (27%)	51 (40%)	6 (9%)	7 (10%)	18 (27%)	36 (54%)	6 (6%)	10 (9%)	25 (23%)	67 (62%)
Endline	27 (40%)	12 (18%)	9 (13%)	20 (29%)	1 (3%)	6 (17%)	5 (14%)	24 (67%)	8 (13%)	9 (14%)	22 (34%)	25 (39%)

Level 4: Good performance. Working at or above the benchmark
Level 3: Moderately good performance. Working just below the benchmark
Level 2: Poor performance. Working well below the benchmark
Level 1: Very poor performance and in need of urgent intervention

Table 4.7 below shows the changes in the learning profiles of students by performance band of the traceable students from the baseline to the end-line assessment.

Student transitions across mathematics performance bands for RAN students are shown graphically in Figure 4.9 below.

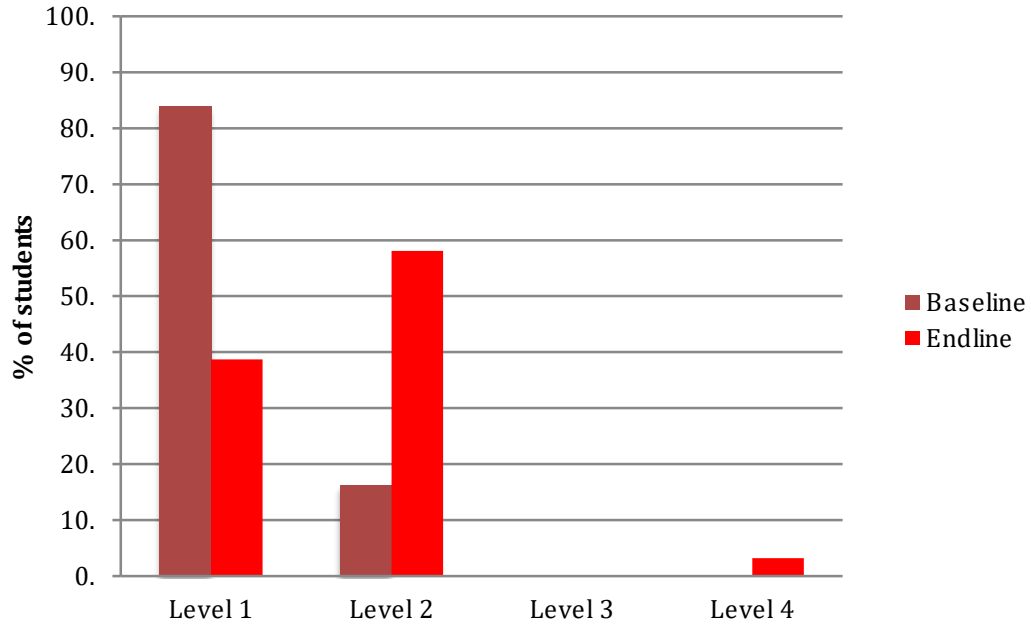
Figure 4.9 - Student transitions across mathematics performance bands: RAN Schools



Rates of transition between performance bands are much slower in Private Comparison schools. No change was recorded for the proportion of Level 4 students between the baseline to the end-line assessment.

Student transitions across mathematics performance bands for Private Comparison School students are shown graphically in Figure 4.10 below.

Figure 4.10 - Student transitions across mathematics performance bands: Private Comparison Schools



In Government-funded schools, too, the rates of transition between performance bands are slower than RAN schools but better than those in Private Comparison schools. Student transitions across mathematics performance bands for Government Funded School students are shown graphically in figure 4.19 below.

Figure 4.11 - Student transitions across mathematics performance bands: Government-funded schools

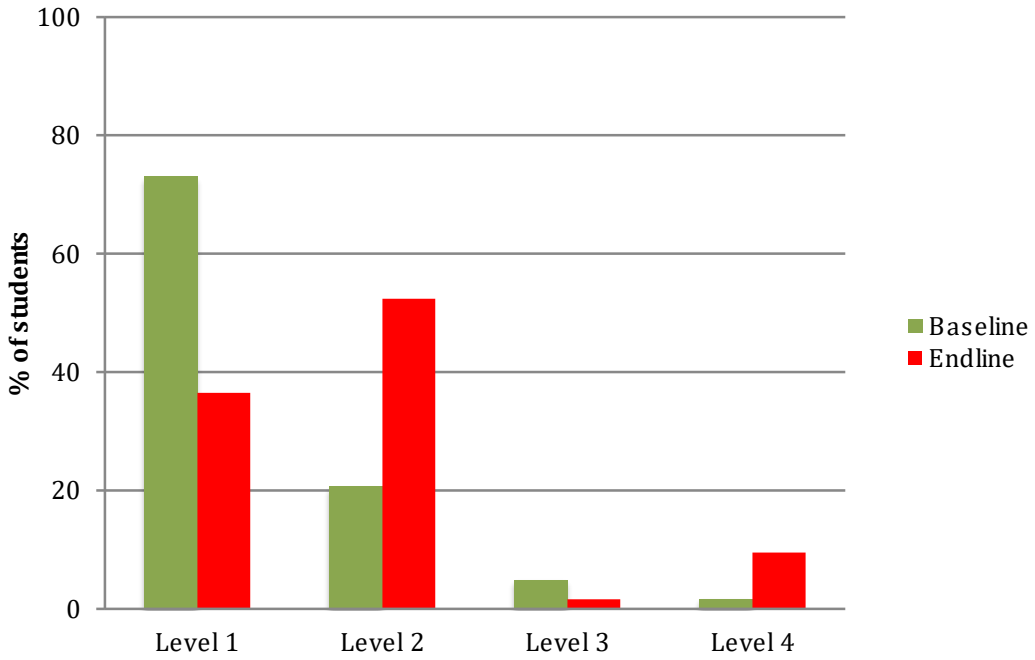


Table 4.7 - Within cohort transitions and changes in the profiles of mathematics attainment by performance band and gender- traceable students baseline to end-line only.

		RAN				Private comparison				Government			
		Level 4	Level 3	Level 2	Level 1	Level 4	Level 3	Level 2	Level 1	Level 4	Level 3	Level 2	Level 1
Baseline	Female	2 (5%)	8 (21%)	5 (13%)	24 (62%)	0 (0%)	1 (5%)	2 (10%)	18 (86%)	0 (0%)	9 (26%)	9 (26%)	17 (49%)
	Male	4 (14%)	11 (38%)	5 (17%)	9 (31%)	0 (0%)	6 (43%)	4 (29%)	4 (29%)	2 (8%)	3 (12%)	7 (27%)	14 (54%)
Endline	Female	15 (40%)	7 (18%)	4 (11%)	12 (32%)	0	3 (14%)	3 (14%)	15 (71%)	5 (15%)	5 (15%)	12 (35%)	12 (35%)
	Male	7 (27%)	4 (15%)	6 (23%)	9 (35%)	1 (7%)	4 (29%)	2 (14%)	7 (50%)	3 (13%)	4 (17%)	7 (29%)	10 (42%)

It is striking that the share of 'good performing' students working at or above the benchmark in RAN schools increase significantly from 5% at baseline to 40% at end-line.

The share of girls who are performing at or above average is 40% (15 girls of a total of 36) compared to just 5% (2 girls) when the cohort was tested for the first time in January 2016. The share of boys performing at or above average have increased from 14% (4 out of 29 boys) in the time 1 assessment to 27% (7 of 29 boys) in the time 9 assessment in May 2018.

Remarkable too is the reduction in RAN schools in the share of 'very poor performing students' between time-1 where 62% of girls (24) and 31% of boys (9) were working in this band of achievement and end-line where of only 21 students of 64 who remain in the band of achievement.

f. What are the patterns of transition for individual students over time and how do their learning pathways compare?

The transition analysis below shows us advances or regressions in the learning pathways of students from the beginning of the study to the final test and the end of the study.

Figure 4.12 below represents an analysis of the transitions of students in RAN schools between different levels of achievement from the baseline reading assessment in 2016 to the end line assessment in 2018. The sample comprised of 72 students who were tracked over three years. At the first assessment point, 33 of the 72 students were working well below the benchmark and located in the 'poorest' achievement level (Level 1). 6 students were working below the benchmark and located in the 'poor' level of achievement band (Level 2). 9 students were working just below or at the benchmark and located in the 'moderately good' level of achievement band (Level 3). 4 students were working above the benchmark and located in the 'highest' level of achievement band (Level 4).

At the end of the study, the 72 students were found to have made the following transitions:

- Of the 33 students at Level 1 at baseline, only 14 remained in that band at endline. 6 of these students transitioned into Level 2, 9 transitioned two levels up, into Level 3 and 3 students transitioned into level 4, the highest achievement level.

- Of the 16 students at Level 2 at baseline, 3 students remained in this band, 5 students moved up to the next level of achievement (Level 3) and a further 8 students had moved to the highest performance level (Level 4).

- Of the 18 students in Level 3 at the baseline assessment, 4 regressed to Level 1, 2 to Level 2, 1 remained at Level 3 and 11 progressed to Level 4.

- Of the 5 students at Level 4 at the baseline assessment, 1 regressed to Level 1 and 4 remained at Level 4.

Figure 4.12 below shows that there was a sharp increase of students in the highest performance level from Test 1 to Test 9. At the beginning of the study there were 5 students at this level of learning. They were made up of 2 girls and 4 boys. At the end of the study, the number of girls performing at this level rose to 15 while the number of boys transitioning was 7. At the other end of the scale, students in Level 1 in Test 1 decreased from 33 to 19. The number of students remaining in Level 1 is made up of 10 girls and 9 boys.

Figure 4.12 - Learning Pathways: Individual Reading Progress Patterns over Time. RAN Schools

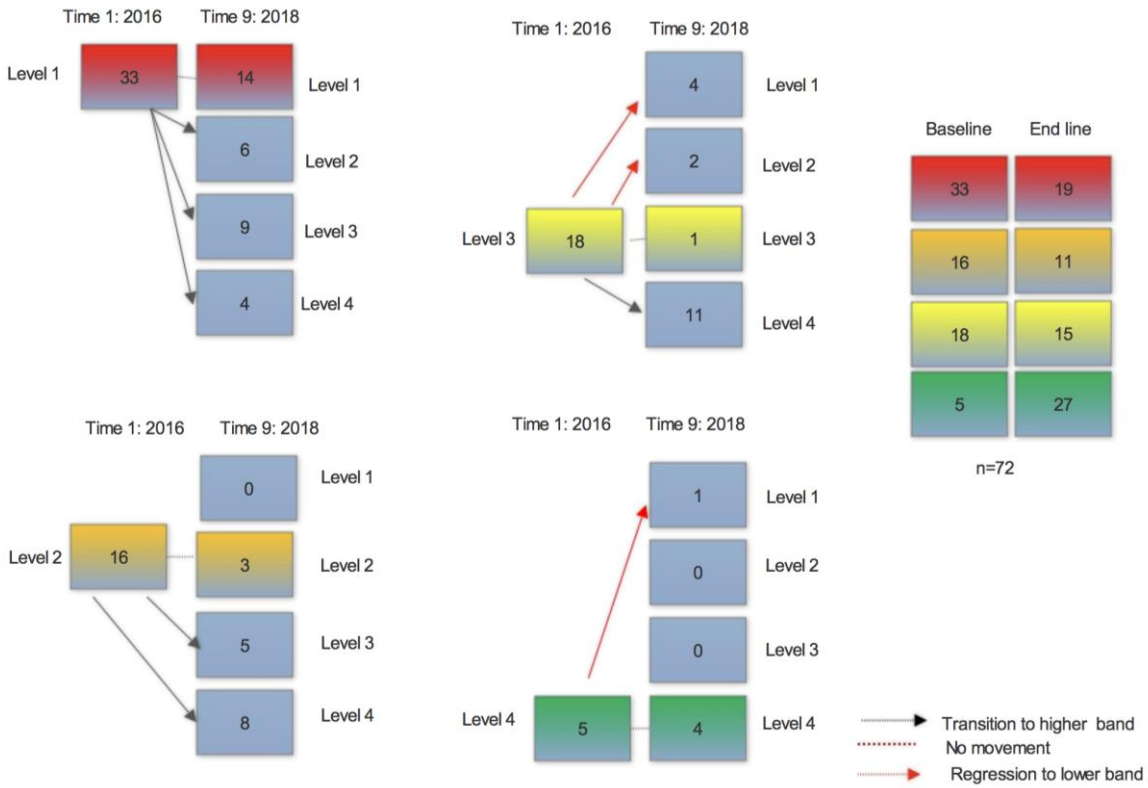


Figure 4.13 below represents an analysis of the transitions of the students in Private Comparison schools between different levels of achievement from the baseline reading assessment in 2016 to the end line assessment in 2018.

The sample comprises 40 (traceable) students tracked over three years. At the first assessment point, 24 of the 40 students were working well below the benchmark and located in the 'poorest' achievement level (Level 1). 11 students were working below the benchmark and located in the

'poor' level of achievement band (Level 2). 5 students were working just below or at the benchmark and located in the 'moderately good' level of achievement band (Level 3).

At the end of the study, the 40 students were found to have made the following transitions:

- Of the 24 students in Level 1 at the baseline assessment, 20 remained in that level of achievement band. 1 of these students transitioned into Level 2, and 3 transitioned into Level 3.

- Of the 11 students that were in Level 2 at the baseline assessment, 1 student regressed to Level 1, 4 students remained in this level of achievement, 3 students moved up to the next level of achievement (level 3) and a further 3 students had moved to the highest performance level (level 4).

- Of the 3 students in level 3 at the baseline assessment, 1 regressed to Level 1, 2 regressed to level 2, and 2 remained at Level 3.

Figure 4.13 - Learning Pathways: Individual Reading Progress Patterns over Time. Private Comparison Schools

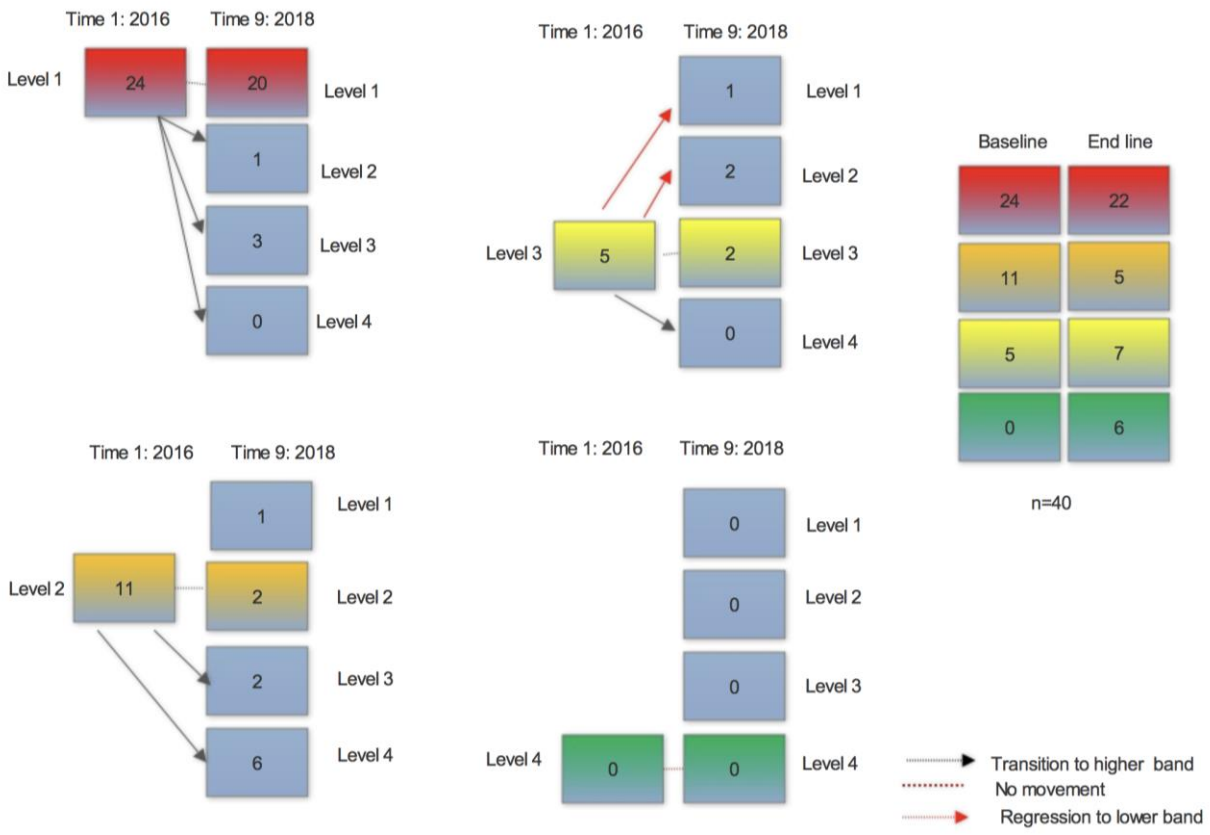


Figure 4.14 below represents an analysis of the transitions of the students in Government schools between different levels of achievement from the baseline reading assessment in 2016 to the end line assessment in 2018.

The sample comprises of 58 (traceable) students who were tracked over three years. At the first assessment point, 29 of the 58 students were working well below the benchmark and located in the

'poorest' achievement level (Level 1).15 students were working below the benchmark and located in the 'poor' level of achievement band (Level 2). 12 students were working just below or at the benchmark and located in the 'moderately good' level of achievement band (Level 3). 2 students were in Level 4.

At the end of the study, the 58 students were found to have made the following transitions:

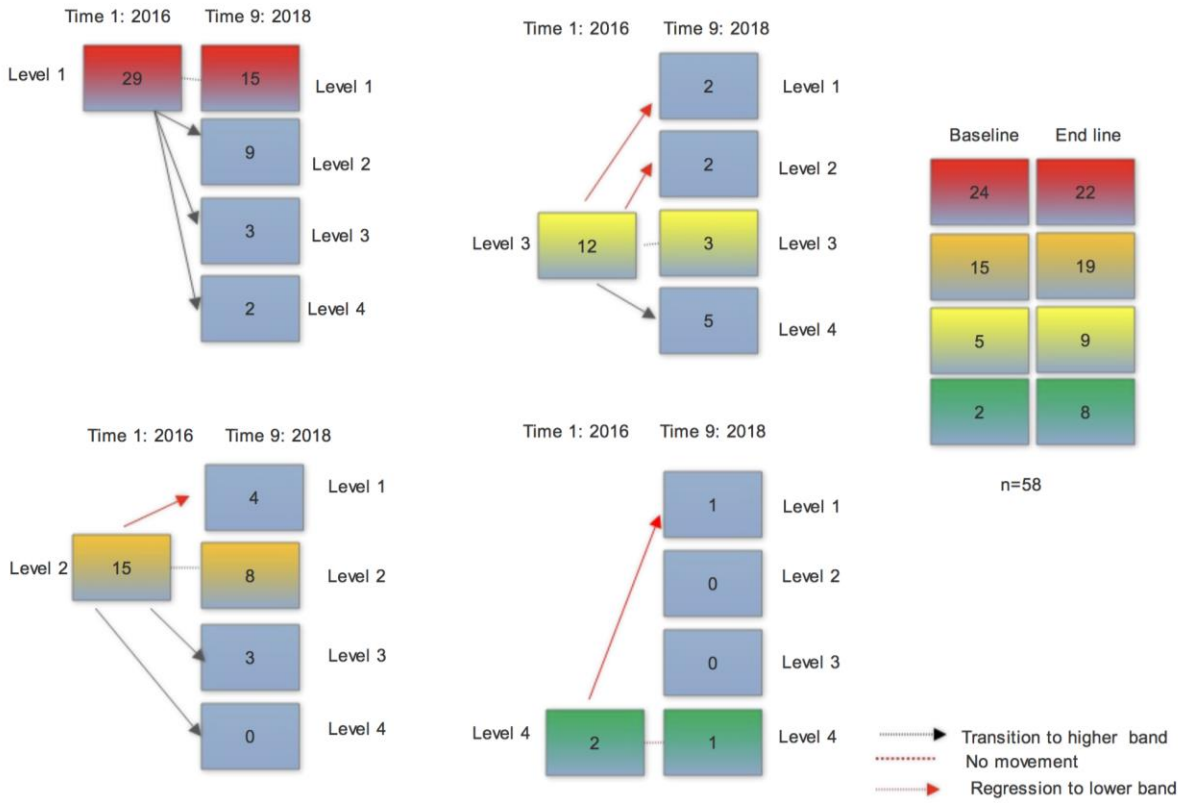
- Of the 29 students in Level 1 at the baseline assessment, 15 remained in that level of achievement band. 9 of these students transitioned into Level 2, 3 transitioned into Level 3 and 2 progressed to Level 4.

- Of the 15 students that were in Level 2 at the baseline assessment, 4 students regressed to Level 1, 8 students remained in this level of achievement, 3 students moved up to the next level of achievement (Level 3).

- Of the 3 students in Level 3 at the baseline assessment, 1 regressed to Level 1, 2 regressed to level 2, and 2 remained at Level 3. 5 students progressed to Level 4.

- Of the 2 students in Level 4 at the baseline assessment, 1 remained at Level 4 and 1 regressed to Level 1

Figure 4.14 - Learning Pathways: Individual Reading Progress Patterns over Time. Government schools.



Chapter 5

Personal, Social, and Emotional Growth

The study was keen to understand how students experienced school during the 3 years of the study. A questionnaire-based survey was conducted at the beginning and the end of the study.

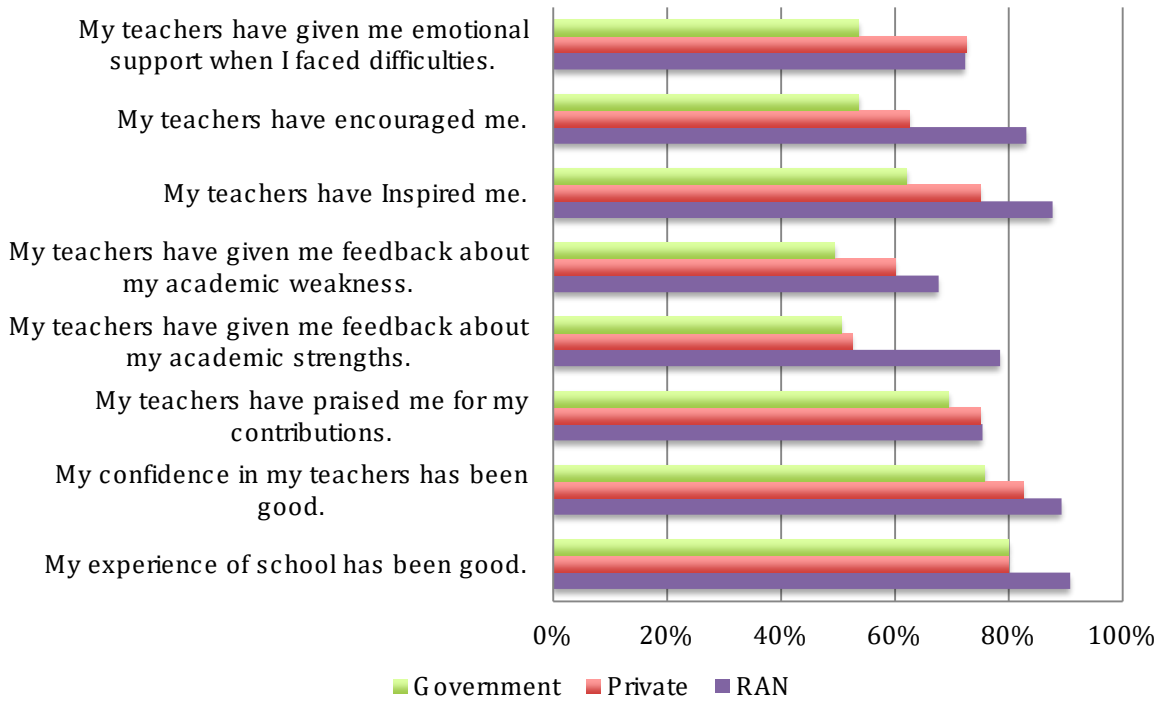
At the beginning of the study, students were asked to think back to their experiences in primary schools before their enrolment in secondary education. They will not otherwise have been able to form a 'life in school' judgement as they were at the start of their secondary school career. The analysis then, is a 'life in schools' analysis spanning 5 years.

Four dimensions of growth were observed: social and emotional experiences of schooling, academic experiences, social relationships, and self-determination and drive.

Dimension 1: Social and emotional climate

RAN students reported on average a moderately positive experience of the social climate (3.7) of schooling. They felt that teachers provided them with emotional support when they faced difficulties, and that teachers encouraged and inspired them. Teachers provided feedback about their academic strengths as well as their academic weaknesses and praised them for their contributions. Their confidence in their teachers was high and their overall experiences of school, positive. At the end o the study, their opinions about the social climate in their schools strengthened (4.1) (see table 5.1)

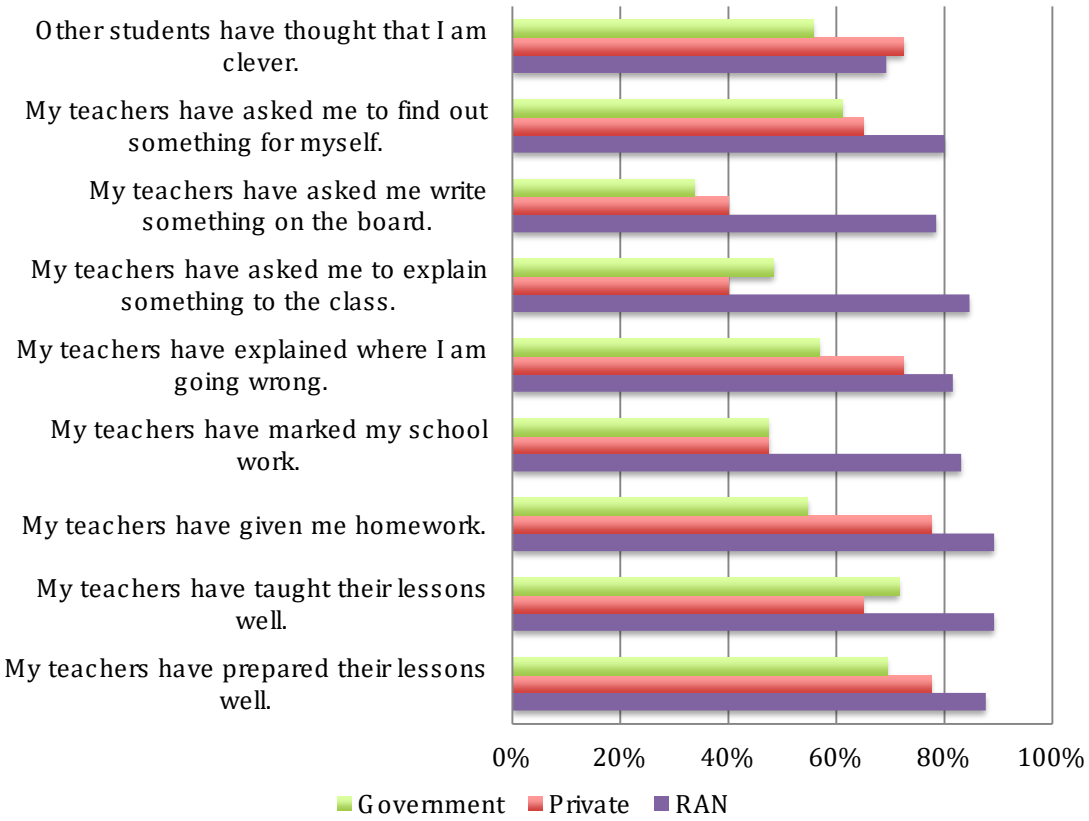
Private comparison schools too reported a moderately positive experience of the social climate (3.4) (see table 5.2) - as did Government schools (3.7) (see table 5.3)- at the beginning of the study. Students in Private Comparison schools report a significant positive change (4.0) but those in Government schools report little change at the end of the study (3.7).



Dimension 2: The academic environment

RAN students reported on average a positive experience of the academic environment (4.0) at the beginning of the study. They felt that teachers provided them with opportunities to find things out for themselves (independent learners), to demonstrate what they have learned or how they are thinking by explain things to other students and writing things on the board, emotional support when they faced difficulties, and that teachers encouraged and inspired them. Teachers provided feedback about their academic strengths as well as their academic weaknesses and praised them for their contributions. Teachers were supportive of their learning. They gave them homework, marked their work, and explained where they were going wrong. Teachers, it was thought prepared and taught their lessons well. At the end of the study student opinion of their academic experiences strengthened (4.4)

Both Private comparison schools (3.3) and Government schools (3.8) reported a moderately positive experience of the academic environment at the beginning of the study. Students in Private Comparison schools report a significant positive change (4.0) while those in Government schools report little change at the end of the study (3.6).

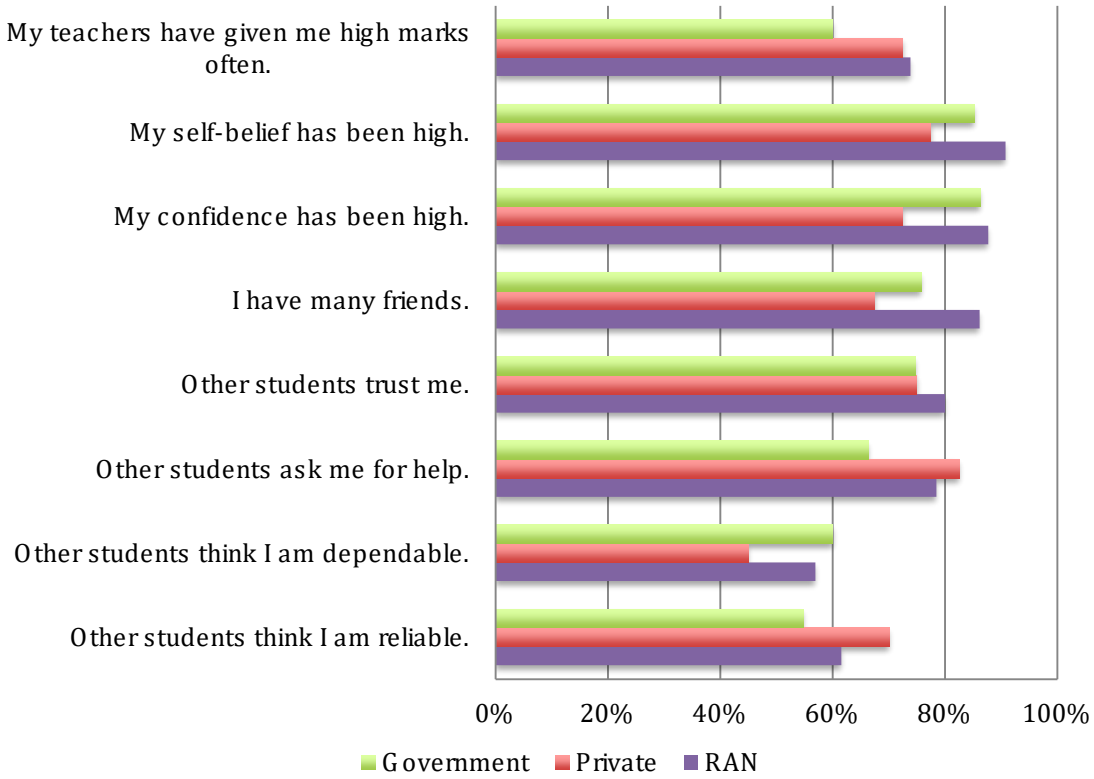


Dimension 3: Social Relationships

RAN students reported on average moderately positive personal and social relationships (3.5) at the beginning of the study. They report that they have many friends and feel that other students ask them for help and trust them. They suggest that other students find them reliable and dependable. They report high levels of self-confidence and self-belief. At the end of the study student opinion of their social relationships strengthened slightly (3.8).

Private comparison school students on average report weak social relations at the beginning of the study (2.8). They do however report a significant change in their interpersonal experiences at the end of the study (3.5).

Government schools by contrast reported on average moderately good interpersonal relationships (3.3) at the beginning of the study with a small positive change at the end (3.7).

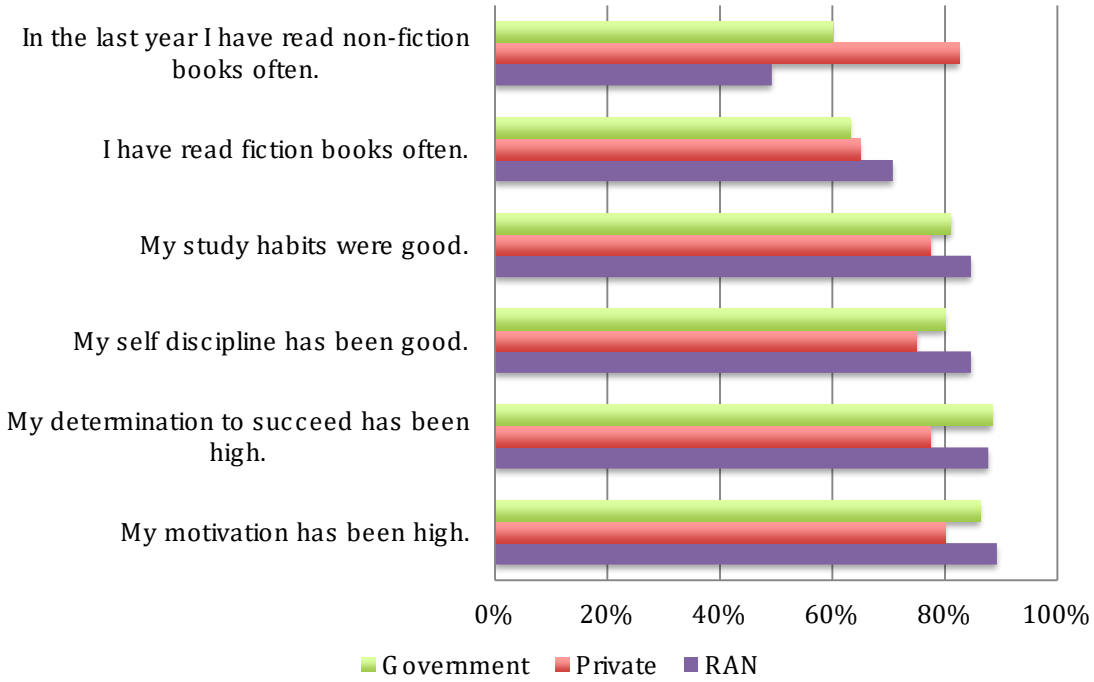


Dimension 4: Self Determination

RAN students reported on average high levels of self-determination (4.4) at the beginning of the study. They report that their determination to succeed and they self-discipline was high and that they were goal driven and had strong aspirations. At the end of the study their levels of self-determination strengthened significantly (4.8).

Private comparison school students on average report lower levels of self-determination at the beginning of the study (3.7). They do however report a significant change at the end of the study (4.2).

Government schools also reported on average high levels of self-determination (3.8 at the beginning of the study) with a strong positive change at the end (4.6).



Dimension 5: Academic Independence

RAN students reported on average moderately high levels of academic independence (3.8) at the beginning of the study. They have helped other students with their work and they have been active participants in student-led group work exercises. At the end of the study their reported levels of academic independence strengthened (4.0).

Private comparison school students on average report moderately high levels of independence at the beginning of the study (3.2) with a positive change at the end of the study (3.6).

Government schools also reported on average moderately high levels of independence (3.5) at the beginning of the study with a slight positive change at the end (3.7).

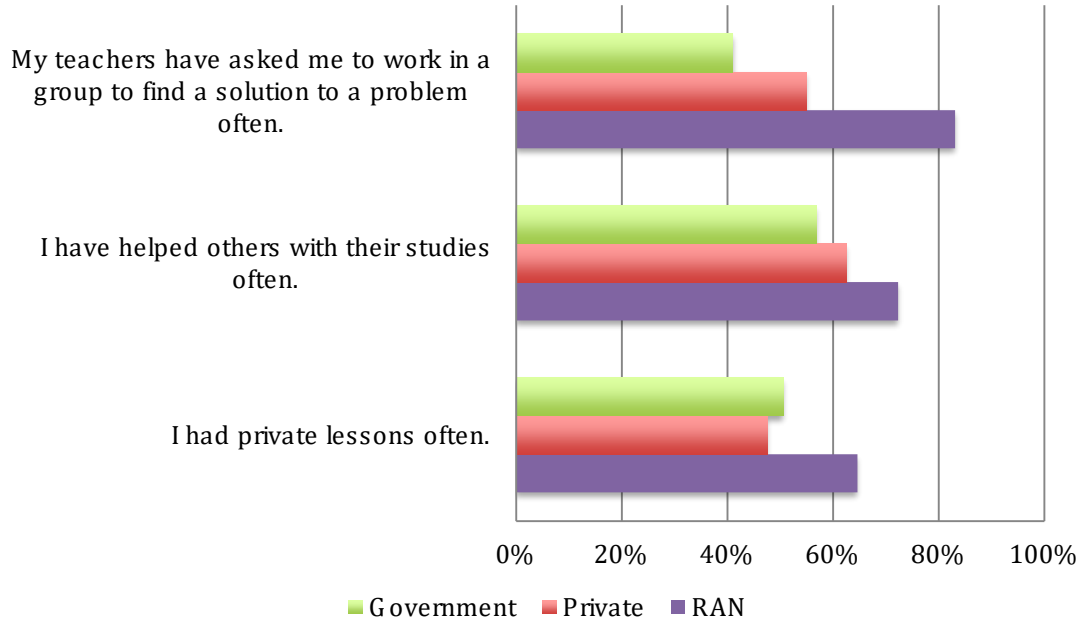


Table 5.1 - RAN -Paired Samples Statistics

		Mean	N
Pair 1	Social experience_2014	3.7491	62
	social_experience_2018	4.0860	62
Pair 2	academic_experience_2014	4.0281	64
	academic_experience_2018	4.3813	64
Pair 3	interpersonal_relationship_2014	3.5439	59
	interpersonal_relationship_2018	3.7596	59
Pair 4	self_motivation_2014	4.3645	62
	self_motivation_2018	4.8000	62
Pair 5	academic_independence_2014	3.8373	63
	academic_independence_2018	3.9643	63

Table 5.2 - Private comparison -Paired Samples Statistics

		Mean	N
Pair 1	social_experience_2014	3.3987	34
	social_experience_2018	4.0131	34
Pair 2	academic_experience_2014	3.2857	35
	academic_experience_2018	3.9543	35
Pair 3	interpersonal_relationship_2014	2.7753	36
	interpersonal_relationship_2018	3.5480	36

Pair 4	self_motivation_2014	3.6649	37
	self_motivation_2018	4.2378	37
Pair 5	academic_independence_2014	3.1824	37
	academic_independence_2018	3.6081	37

Table 5.3 - Government school-Paired Samples Statistics

		Mean	N
Pair 1	social_experience_2014	3.6631	62
	social_experience_2018	3.6667	62
Pair 2	academic_experience_2014	3.7934	61
	academic_experience_2018	3.6311	61
Pair 3	interpersonal_relationship_2014	3.3463	63
	interpersonal_relationship_2018	3.6941	63
Pair 4	self_motivation_2014	3.7877	81
	self_motivation_2018	4.5679	81
Pair 5	academic_independence_2014	3.5422	77
	academic_independence_2018	3.7078	77

Chapter 6

Conclusions

This study was designed to establish how much students in the Rising Academy Network learn, and how fast they learn, compared to the progress made by matched samples in comparison schools - both private and Government-funded.

The study found that RAN students make significantly higher reading gains than comparison schools over three years. A number of analyses on different sub-samples were performed and the results consistently confirm that student in the RAN schools make better and faster gains in reading than their counterparts in Private Comparison and Government schools.

The cohort of RAN School students who have taken all the assessments has increased their mean score of 197.3 at baseline to a mean score of 337.8 by the end of the study. This marks a gain of 140.5 scale scores. The Private Comparison Schools panel made fewer gains. They started with a score of 184.2 scale scores at baseline and achieved a gain of 79.5 scale scores by the end of the study. The Government-funded schools panel started with a higher average score (252.7) than both the RAN and Government school cohorts but made slower gains overall. They achieved a gain of 55.9 scale scores by the end of the project.

The study poses an important question. That is whether, *the growth rates in reading for RAN students is fast enough to achieve their learning targets? And how does that compare to the reading rates of other cohorts?*

RAN Schools exceed the modest learning target set for them but fall short of reaching the moderate learning target. Comparison schools do not achieve their modest or moderate learning targets.

An important indicator of a schools' contribution to learning lies in the analysis of the patterns of transition between performance bands.

For RAN schools, the percentage of students in the weakest performance band decreased from 81.5% at the baseline test to 19.7% at the endline. The number of students performing at the next level of achievement (Level 2) increased as a result, from 14.4% at baseline to 52.6% at end of the study.

The number of students performing at level 3 as increased from 2.6% to 17.1% and in the top performance band (level 4) from 1.3% to 10.5% at endline test.

In RAN schools, there were no female students performing above expectation (Level 4) at the beginning of the study (baseline). This increased to 6 students at endline. At the other end of the spectrum, 39 female students (83% of the total) were in the worst performance banding at the beginning of the study. By the end line, the number of female students in the worst performing band reduced to 8 (17% of the total).

Male students too responded well to schooling over time. There was only 1 male student (in the traceable subsample) in the highest performing group at the beginning of the study. The share increased slightly to 2 by the end line test. And the worst performing male student band was reduced from 23 (79%) to 7 (24%) between baseline and end line.

The data show that RAN schools have done more than comparison schools to change the profiles of reading in the worst performing groups. Women students in this band are as sensitive to male students to schooling.

The results for all cohorts are promising in that they show a reduction of the worst performing students and an increase in the share of better performing students over time. What the results do not show us are those students who might leap frog one or more performance bands or indeed regress. It is interesting therefore to ask what the transition patterns of individual students look like over the three years of the study.

In Mathematics, RAN schools achieve significantly higher mathematics gains than comparison schools over three years. However, they fail to meet their Modest and Moderate Learning Targets over the period of the study.

Although boys in RAN schools score higher on mathematics tests than girls at the end of the study, girls in RAN Schools show significantly better gains than boys over three years. The rate of progress for girls is significantly faster than that of boys. The achievements in mathematics for girls in RAN schools are higher than those of boys and girls in comparison schools.

It is striking that the share of 'good performing' students working at or above the benchmark in RAN schools increase significantly from 5% at baseline to 40% at end-line.

The share of girls who are performing at or above average is 40% (15 girls of a total of 36) compared to just 5% (2 girls) when the cohort was tested for the first time in January 2016. The share of boys performing at or above average have increased from 14% (4 out of 29 boys) in the time 1 assessment to 27% (7 of 29 boys) in the time 9 assessment in May 2018.

Remarkable too is the reduction in RAN schools in the share of 'very poor performing students' between time-1 where 62% of girls (24) and 31% of boys (9) were working in this band of achievement and end-line where of only 21 students of 64 who remain in the band of achievement.

The study sought also to understand the personal, social, and emotional growth of students over three years

RAN students reported on average stronger progressions in their experience of the social dimensions of schooling than those in comparison schools. They felt that teachers provided them with emotional support when they faced difficulties, and that teachers encouraged and inspired them. Teachers provided feedback about their academic strengths as well as their academic weaknesses and praised them for their contributions. Their confidence in their teachers was high and their overall experiences of school, positive.

RAN students also reported on average better experiences of the academic dimensions of schooling than their counterparts. They felt that teachers provided them with opportunities to find things out for themselves (independent learners), to demonstrate what they have learned or how they are thinking by explain things to other students and writing things on the board, emotional support when they faced difficulties, and that teachers encouraged and inspired them. Teachers provided feedback about their academic strengths as well as their academic weaknesses and praised them for their contributions. Teachers were supportive of their learning. They gave them homework, marked their work, and explained where they were going wrong.

RAN students reported on average better growth in academic independence than their peers.

The study also found that RAN students developed over time stronger personal and social relationships than their counterparts. They were also more determined to succeed and had stronger aspirations than their counterparts.

Appendix A – List of comparison schools

- Regent

	School fees	Entry requirement	School feature	Note
Private School RA (EMMANS)	Year 1- 70,000 per term all inclusive Year 2- 200k per term all inclusive (would take less if parents are in hardship) Extra cost for after school lessons	NPSE 230+	Enthusiastic head teacher, community school funded mainly by one business woman. Gaining reputation over the years because of good BECE results	
Private School RB (DIVINE Model)	600k per year inclusive. Extra cost for after school lessons. (allow students who cannot pay to attend)	NPSE230	Run by a Pastor, school established after Ebola to school misplaced children, funded by church. A number of children from epidemic background.	Struggle to make ends meet.
Government school R (MRSS)	Year 1-100k per year inclusive, extra cost for afterschool lessons. Year 2- 90k per year excluding uniforms. Extra pay for afterschool classes.	NPSE 230	Organised school, remote but supported by the community. School in secluded area outside of the town hence less disturbance from outside. Good BECE results hence increased intake.	
RAN Regent	350k per term all inclusive (8am-4pm)	NPSE 230 not required	Very remote, difficult to reach. First RAN school. Significant dropouts after Year 1 due to misunderstanding in the community.	

- Tengbeh Town

	School fees	Entry requirement	School feature	Note
Private School TA (MCASS)	2016-350k per term 2017- 750k per year 2018-900 per year plus books and uniforms. Extra cost for afterschool lessons.	NPSE-230	Established by the church, no rent required. Poor infrastructure. Cater for the left-out.	Struggle with survival, headteacher very stressed and worried about teacher salary and free education scheme.

Private School TB (MBAYOH)	510k first term 380k second term plus uniforms and learning materials	NPSE requirement 280-300	One of the most established "second class" private school in Tengbeh, known for good exam results.	Many dropouts after Year 1, school thinks it is because parents don't like their children to repeat grades
Private School TC (Grace school of Science)	650k per term, plus uniform and learning materials.	NPSE 270	"Second class" private school, relatively good infrastructure with library and computer lab (with computer). 100% BECE pass in 2017. Students join from other schools to prepare for exam.	Biggest challenge being cost of rent
Private School TD (Christ the King)	Year 1- 250k per term+ 60k uniform + 50k t-shirts. Year 3- 1200k per year for the first year, 1000k per year if continues. Extra cost for after school lessons.	NPSE230	Focus a lot on exam preparation. Also advocates for moral education.	Cramp school and classrooms, feels like a cramming school
Private School TE ("first-class school)	690ok per year all inclusive,	NPSE 300 and additional Maths and English entrance exam results	One of the most prestigious school in the area. School curriculum aligned with IGSE standard.	
Government school T (SERVICES)	105k per year, plus uniforms and books	NPSE 230	Big school, originally established for military families. Double shifts but Public BECE result okay, above national average. Normally around 60-70% students pass.	
RAN Tengbeh Town	350k per term all inclusive (8am-4pm)	NPSE230 not required	Most populated RAN school. In the centre of town. Parents very much involved. Attrition high partly because of movements of the parents. Surrounded by	

			many other private schools.	

- Calaba Town

	School fees	Entry requirement	School feature	Note
Private School CA (Lincoln)	2016- 500k per year all inclusive 2018- 570k per year	NPSE 230	Enthusiastic headteacher, good parent support, BECE results better than other surrounding schools	Struggle to pay the teachers and keep them
Private School CB (Providence)	390k per term all inclusive	NPSE 250	Focus on technology, computing	School closed after one year.
Government school C (St Helena's)	105k per year	NPSE 230, but normally higher to limit the number of intake	Big school, well known and popular in the area. Oversubscribed almost every year.	
RAN Calaba	350k per term all inclusive (8am-4pm)	NPSE 230 not required.	Remote school. A number of other low cost private schools around.	