

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

Annual Report

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Introduction

This longitudinal study follows the progress of students in the Rising Academy Network (RAN) over a period of three years. Each year, computer adaptive tests¹ are used to assess reading and mathematics on three separate occasions (one at the end of each academic term).

At the end of the study, students will have taken 9 assessments. This paper presents the findings at the end of the second year, after 6 assessment points. It is important to note that not all students have taken all the assessments available to them, largely because of adverse environmental conditions in Sierra Leone.

Four key research questions are addressed in the report. These are:

1. How much more on average are students learning in mathematics and how much better do they read over the period of the research?
2. How fast on average are students progressing towards given learning targets in reading and mathematics?
3. How fast on average are the weakest students progressing, and are there differences between boys and girls?
4. How many students in the lowest achievement performance bands transition to higher performance bands in reading and mathematics; and are there differences between boys and girls?

How much more students in the Rising Academy Network learn and how fast they learn is compared to the progress made by matched student samples in comparison schools.

How we understand and assess learning in this study

a. Growth targets and rates of progress

There are a number of ways to assess whether students in the Rising Academy Network are learning. We might for example look at whether students are learning more compared to the last time they were assessed. And we might look at whether the gains they make are significant by comparing their test scores to other groups (students in comparison schools) who take the same tests. But, we know all too well that the achievement of better or higher average scores, even if these are significantly better than those achieved by comparison groups, is not necessarily an indication that students are learning as much or as fast as they might be expected to.

¹ The computer adaptive test 'wraps' itself around each individual student taking the assessment; and that it starts from the students' individual level of learning difficulty levels ensures that floor and ceiling effects are eliminated. The CAT has an item bank in Mathematics that contains over 5,000 items sequenced across the grade range that measure a number of cognitive domains in mathematics; and similar number of sequenced items of varying difficulty levels that measure a wide range of reading skills. CATs continually adjust the difficulty of each student's test by choosing each test question based on the student's previous response; and when the student is tested repeatedly, as for example in the intervals we use in this study, the test picks up from the information it has stored on the previous test taken by the student. So tracking progression is seamless and the CAT follows the developmental trajectory of the student, including picking up on any regressions in learning. CATs save testing time and spare students the frustration of items that are too difficult and the boredom of items that are too easy. Research has also shown that CATs can be considerably more efficient than conventional tests, which present all students with the same test questions.

In this study we attempt to build as comprehensive a picture as we can of (i) *how much more students are learning* – for this we calculate an increase in scaled scores in reading and mathematics from one test occasion to the next; and (ii) *whether they are learning at a rate fast enough to achieve what we might expect from them at a particular age and grade*. We know from our baseline assessments that learning achievement in Sierra Leone is lower than what might be expected of students of the same age and grade levels in other African countries (based on estimates taken from a selection of regional assessments). The point of this study however is to follow the learning progress of students in the Rising Academy Network in comparison to matched samples drawn from other schools in Sierra Leone against learning targets that are realistic; and depending on the rates of growth achieved, we may be able to make predictions about the time it might take for students in Sierra Leone to reach similar learning levels to students elsewhere.

We use two targets to measure rates of progress: a ‘moderate’ growth target based on an estimated gain of 2-scaled scores per week (8-scaled scores per month roughly calculated), where each scaled score represents 2 or 3 raw scores, and a ‘modest’ growth target based on an estimated gain of 1-scaled score per week.

It is this, how much more students are learning and whether the progress they make puts them on course to achieve a growth target², that guides our understanding of learning.

b. Profiles of achievement and patterns of transition

Another critical question for us in this study is whether all students are making progress. This is very important because we know that when results are presented as average scores, gains in learning may simply reflect the continued success of higher performing students while average or low performing students show little progress. If that were to be the case, then not everyone benefits from teaching or other educational interventions on offer.

We profile the learning achievements of students by performance bands. Four bands are identified: very poor performance (level 1), poor performance (level 2), moderately good performance (level 3), above average performance (level 4).

The key observation for our evaluation here is the patterns of transition between performance bands - particularly the number of students who move out of the lowest performance bands into higher performance bands in reading and mathematics. We compare the patterns of transition of

² Growth targets are theoretically determined by an understanding of the quantity and the difficulty of skills through which students are expected to progress. The sequencing of skills in mathematics - numbers and operations, algebra, geometry and measurement, and data analysis, probability and statistics; and in reading, vocabulary and reading comprehension, responding (bringing knowledge and experience 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) form ‘learning progressions’ against which targets are set and growth monitored.

Rates of progression are statistically calculated, normally against national norms. In this study the setting of a moderate growth rate of 2-scaled scores per week is in line with expected growth standards elsewhere. But they do not match actual growth rates elsewhere as each target is calculated from the baseline score achieved by an individual student or a specific cohort of students. For example, for a student in Sierra Leone who achieves a baseline score of 100-scaled scores, an estimated growth rate of 2-scaled scores per week over 12 weeks would produce a target of 124-scaled scores. A student of the same age in another country might achieve a baseline score of 150-scaled scores; she would be working towards a target of 174-scaled scores over a 12-week period if the same estimated rate of growth (2-scaled scores per week) were used.

Raising Academy Network students to those of students in comparison schools. Our findings are disaggregated by gender.

c. Equity in outcomes

The final question that we probe in this study is the rate of progress achieved by the weakest performing students disaggregated by gender. As above, we use a moderate and modest target to measure rates of progress. It is important to remember that targets are calculated separately for each of the four performance bands. In this way we are able to identify whether weaker performing students are learning as fast as, faster than, or slower than, higher performing students. And in so doing, we are able to comment on the achievements of the Rising Academy Network in respect of equity and inclusivity.

Illustrating our approach to assessing learning

It is useful to illustrate how we assess learning and learning progression in this study. We do so through the example of 'Agnes' below. This will help us to understand the findings presented thereafter.

Agnes

Agnes, a student in the Rising Academy Network, was first assessed in October 2016. She achieved a reading scaled score of 232. On the basis of this score, a learning target of 368-scaled scores was set over 4 months. The target was determined by the evaluation team who use a learning progression model (related to the demands of the curriculum) and is seen to be achievable if Agnes gains an increase of 34-scaled scores in her reading test every month. This learning target is specific to Agnes. A student with a higher baseline score for example would have been set a higher estimated learning target based on the same estimated growth rate of 34-scaled scores per month.

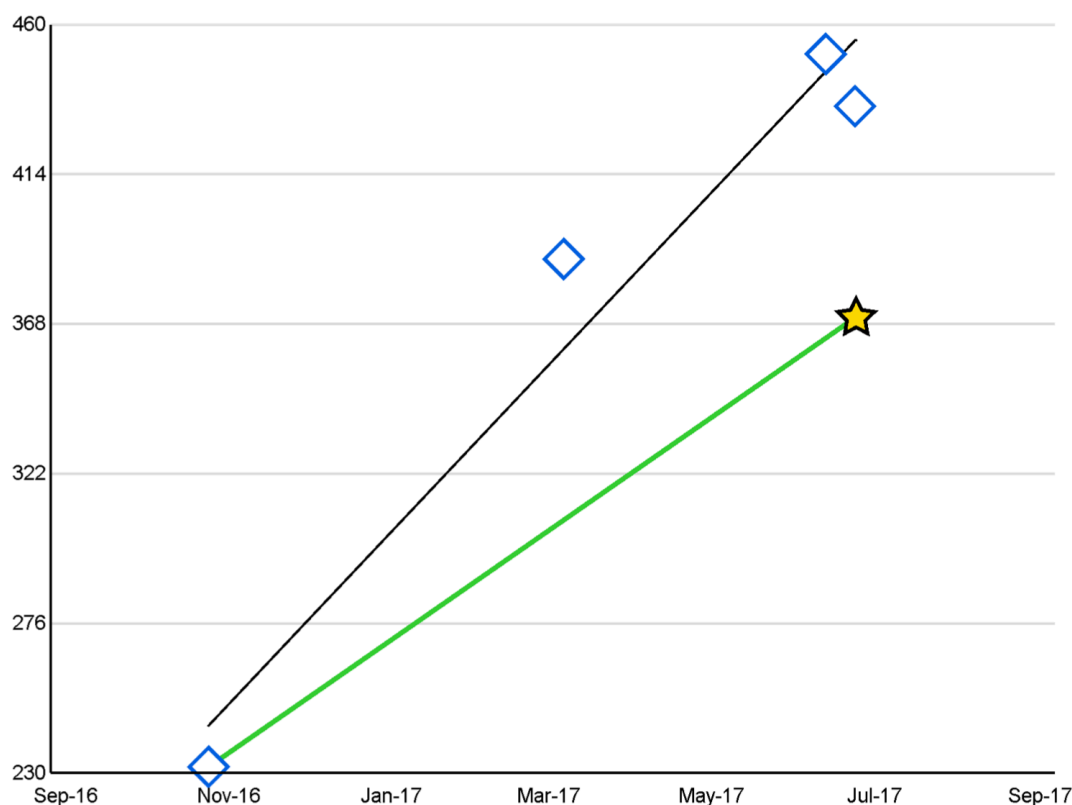
So, for Agnes, her baseline score being 232-scaled scores and an estimated gain of 136-scaled scores (34-scaled scores per month x 4 months), she would have to achieve a scaled score of 368 by the end of the test period in July 2017.

The figure below shows Agnes' actual learning progression (see line 1 in blue) against her projected growth target (see line 2 in green).

By March 2017 Agnes was exceeding her target by 84-scaled scores and she made a transition from performance band 1 to performance band 2. Her reading age improved by 7 months in this period.

By June 2017 Agnes' scaled-score for reading rose to 435 and her reading age rose by a further 5 months to 9 years and 3 months. At the last assessment point in July 2017 her reading scaled scores stood at 451. Her reading age was 9 years and 5 months.

Her rate of growth from time 1 to time 4 was 55.25-scaled scores per month. This exceeded considerably her target of 34-scale scores per month.



Test Date	Performance Band	Reading Age	Scaled Score	Growth Target	Estimated Growth Rate
24/10/2016	1	7.07	232	368-scaled scores	34-scaled scores/month
6/3/2017	2	8.10	388		
12/6/2017	3	9.03	435		
23/7/2017	4	9.05	451	Achieved growth rate: 55.25-scaled scores/month	

The brief case study of Agnes' progress above shows that she is learning at a good rate of progress to cope with the demands of the reading curriculum and has made significant transitions from the lowest achievement bands to the highest achievement levels in reading.

This analysis of learning progression forms the basis of our evaluation. In simple terms then, this evaluation report examines whether:

- Students in the Rising Academy Network are learning more when their average scores are compared to students in comparison schools
- Students in the Rising Academy Network are learning fast enough when their rate of progression towards a learning target is calculated; and at least as fast as their peers in comparison schools
- Students in the lower performing bands of achievement in the Rising Academy Network are making transitions into higher performing bands, and this these patterns compare well to those of their peers in comparison schools
- Students in the lowest performing bands of achievement in the Rising Academy Network are learning fast enough when their rate of progression is compared to those of students in higher performance bands; and at least as fast as their peers in the lowest performance bands in comparison schools

Our procedures

A cohort of students in the Rising Academy Network of schools is assessed in Mathematics and Reading on 9 occasions – 3 times a year over a period of three years. Similar time series data are collected for two matched cohorts selected randomly from several government-funded and other low cost private schools, although for comparison groups, they are assessed 6 times: twice a year, at the beginning and end of every academic year, over the duration of the study.

The sample

How stable in size are the cohorts over the period of the assessment?

Tables 1 and 2 below show the number of students absent at each test interval. It is not unusual in longitudinal panel studies to lose a number of participants (attrition). In the case of this study, 'loss' is due to absenteeism on the occasion of the test and in many instances such absenteeism was due to adverse environmental conditions. Table 1 below shows that over 40% of students in both RAN and comparison schools that took the Reading Assessment in January 2016 were absent in June 2017. The absenteeism rate for students in comparison schools who were due to take the Mathematics assessment in June 2017 was significantly higher than that in RAN schools (see table 2).

Table 1 – The number of students in the sample who present themselves for reading assessments at different test intervals

Number of students							Percentage of 'no shows'
RAN	181	156	166	163	68	105	41.9
Other private	103		84	90		56	45.6
Government	145		90	134		80	44.8
Total	429		340	387		241	
	Test 1 Jan 2016	Test 2 April 2016	Test 3 June 2016	Test 4 Nov 2016	Test 5 March 2017	Test 6 June 2017	
	Year 1			Year 2			

Table 2 – The number of students in the sample who present themselves for mathematics tests assessments at different test intervals

Number of students							Percentage of 'no shows'
RAN	183	171	167	128	97	125	31.69
Other private	111		88	67		54	51.35
Government	150		93	108		60	60
Total	444		348	303		239	
	Test 1 Jan 2016	Test 2 April 2016	Test 3 June 2016	Test 4 Nov 2016	Test 5 March 2017	Test 6 June 2017	
	Year 1			Year 2			

Findings

1. Tracking cumulative gains in reading and mathematics at every assessment point over the course of the study (whole sample).

The absenteeism rates reported above confounded our ability to compare between the cohorts the cumulative gains that each were making across the period of the assessment. Because of the variability in the size of the samples assessed on each test occasion, it is not possible to be certain that the cumulative gains achieved from one assessment point to the other reflect the true average score of the cohort. The data reported below, in their weak form, therefore permits us to look only generally at the progress of each cohort without drawing firm conclusions about the progress of students in each. For that we have to turn to the comparative analysis reported later.

Based on the weak form of the data, there is at very least a suggestion that the average gains of RAN schools increase over time:

Table 3 shows that RAN schools have maintained a steady gain in reading skills.

Table 3: Gains in Reading Skills over the period of the evaluation

	Test 1 Jan 2016		Test 2 April 2016		Test 3 June 2016		Test 4 Nov 2016		Test 5 March 2017		Test 6 June 2017	
	N	SS	N	SS	N	SS	N	SS	N	SS	N	SS
RAN	181	195	156	205	166	231	163	269	68	298	105	304
Other private	103	190	Not Tested		84	204	90	204	Not Tested		56	226
Government	145	186			90	185	134	199			80	250

N = Number of Students

SS = Average Scaled Score

Table 4 shows that the average reading age of students in RAN schools increase over time.

Table 4 – Increases in the average reading age

	Test 1 Jan 2016		Test 2 April 2016		Test 3 June 2016		Test 4 Nov 2016		Test 5 March 2017		Test 6 June 2017	
	N	Reading age	N	Reading age	N	Reading age	N	Reading age	N	Reading age	N	Reading age
RAN	181	7:03	156	7:04	166	7:07	163	7:10	68	8:01	105	8:02
Other private	103	7:02	Not Tested		84	7:04	90	7:04	Not Tested		56	7:06
Government	145	7:02			90	7:02	134	7:03			80	7:08

Table 5 shows that RAN schools have made a steady improvement in Mathematics.

Table 5 – Gains in Mathematics Skills over the period of the evaluation

	Test 1 Jan 2016		Test 2 April 2016		Test 3 June 2016		Test 4 Nov 2016		Test 5 March 2017		Test 6 June 2017	
	N	SS	N	SS	N	SS	N	SS	N	SS	N	SS
RAN	183	477	171	489	167	507	128	526	97	559	125	559
Other private	111	461	Not Tested		88	476	67	483	Not Tested		54	494
Government	150	456			93	461	108	459			60	502

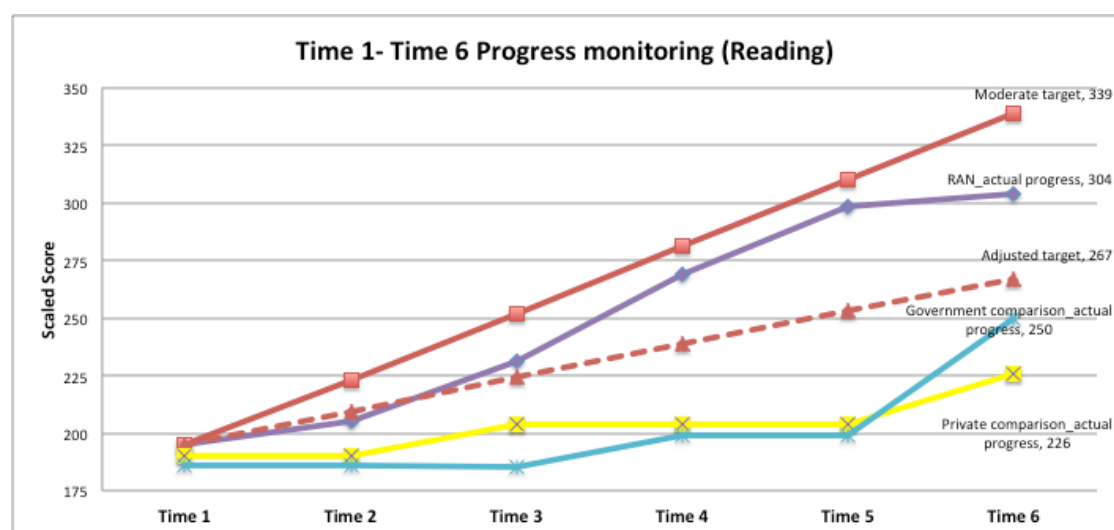
2. Tracking the rates of progress in reading and mathematics (whole sample).

As above, due to the variability in the samples presenting for assessment across the time scale of the study, this is a weak form of data and no firm conclusions can be drawn at this stage.

Figures 1 and 2 below show the average growth rate (rate of progress towards a learning target) achieved by the three cohorts. No comparisons can be made between the three cohorts.

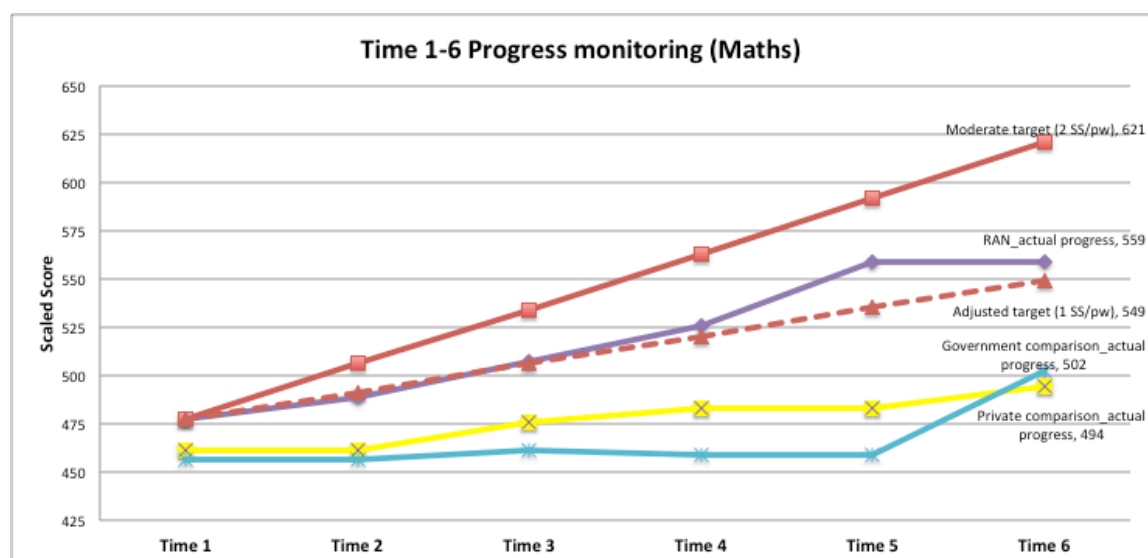
The growth rate for RAN schools is 6.05 scaled-scores per month over 18 months. In mathematics, RAN schools recorded an average growth rate of 4.55-scaled scores per month over an 18-month period. The rate of growth follows closely the modest (adjusted line) and falls some way below the moderate rate of growth.

Figure 1 – Rates of progress between Jan 2016 and June 2017 (Reading)



	Jan 2016		April 2016		June 2016		Nov 2016		March 2017		June 2017	
	N	SS	N	SS	N	SS	N	SS	N	SS	N	SS
RAN	181	195	156	205	166	231	163	269	68	298	105	304
Other private	103	190	Not Tested		84	204	90	204	Not Tested		56	226
Government	145	186			90	185	134	199			80	250

Figure 2 - Rates of progress between Jan 2016 and June 2017 (Mathematics)



	N	SS	N	SS	N	SS	N	SS	N	SS	N	SS
RAN	183	477	171	489	167	507	128	526	97	559	125	559
Other private	111	461	Not Tested		88	476	67	483	Not Tested		54	494
Government	150	456			93	461	108	459			60	502

3. Comparing gains in reading and mathematics attainment

In order to compare the progress of RAN students against those in matched comparison schools, we select only those students that had presented themselves for assessment on both the first test occasion in January 2016 and again in June 2017.

Table 6 below shows that the gains in Reading achieved by RAN schools are significantly higher than those achieved by comparison schools.

Table 6 – Gains in reading (students assessed in both test 1 and test 6 only)

	N		Scaled score	Estimated Reading Age
RAN schools	102	January 2016	218	7:05
		June 2017	316	8:03
		Change	+98	+ 10 months
Other private schools	48	January 2016	186	7:02
		June 2017	234	7:07
		Change	+48	+ 5 months
Government schools	74	January 2016	207	7:04
		June 2017	251	7:09
		Change	+44	+ 5 months

RAN students achieve a gain of 98-scaled scores over a period of 18 months compared to 48-scaled scores for private comparison schools and a gain of 44-scaled scores for government schools.

The overall gain for RAN schools in the improvement of student reading ages is over 10 months. This is twice the gain in reading age recorded for comparison cohorts and in itself a significant

achievement. It is clear that RAN students are reading more and understanding more of what they read. As we might expect the gains reflect an increase in vocabulary and comprehension but less so in skills such as author intention.

In mathematics, when compared to other cohorts, the cumulative gains made by RAN students significantly exceed those achieved by comparison schools. RAN schools achieve a gain of 56-scaled scores over a period of 18 months compared to 23-scaled scores for private comparison schools and a gain of 17-scaled scores for government schools.

Table 7 – Gains in Mathematics (students assessed in both test 1 and test 6 only)

	N		Scaled score
Ran Schools	115	January 2016	506
		June 2017	562
		Change	+56
Private Comparison Schools	51	January 2016	475
		June 2017	498
		Change	+23
Government Schools	57	January 2016	485
		June 2017	502
		Change	+17

4. Comparing the rates of progress students make towards the attainment of overall learning targets (competences) in reading and mathematics

We look at whether RAN schools are making fast enough progress in the attainment of reading targets.

The score for the RAN cohort at baseline (test 1) was 218-scaled scores. The moderate growth target set over 18 months was calculated to be 361-scaled scores. The modest target was calculated at 289-scaled scores.

The actual achievement of the RAN schools cohort was 316-scaled scores. This marks an average growth rate of 5.4-scaled scores per month that exceeds the adjusted target (4-scaled scores per month) but falls just short of achieving the moderate target of 8-scaled scores per month.

The score for the private comparison schools cohort at baseline (test 1) was 186-scaled scores. The moderate growth target set over 18 months was calculated to be an achievement of 330-scaled scores. The modest target was calculated at 258-scaled scores. The actual achievement of the private comparison schools cohort was 234-scaled scores; that marks a growth rate of 2.66-scaled scores per month. This fell below the adjusted target of 4-scaled scores per month and well below the moderate growth target of 8-scaled scores per month.

The score for the government schools cohort at baseline (test 1) was 207-scaled scores. The moderate growth target set over 18 months was calculated as 351-scaled scores. The modest target was calculated at 279-scaled scores.

The actual achievement of the private comparison schools cohort was 251-scaled scores; that reflects a growth rate of 2.44-scaled scores per month and misses both the adjusted target and the moderate target. The growth rate in government schools (2.44 scaled scores per month) is

slower than both other private schools (2.66 scaled scores per month) and RAN schools (5.4 scaled scores per month).

Table 8 – Comparing rates of progress in Reading (see appendix 1 for graphs)

	Test 1 Jan 2016	Moderate Target (8 SS per month)	Modest Target (4 SS per month)	Test 6 June 2017	Actual Rate of Progress (SS per month)
RAN	218	361	289	316	5.4
Other private	186	330	258	234	2.66
Government	207	351	279	251	2.44

And In mathematics, the score for the RAN cohort at baseline (test 1) was 506-scaled scores. The moderate growth target set over 18 months was calculated to be 650-scaled scores. The modest target was calculated at 578-scaled scores.

The actual achievement of the RAN schools cohort was 562-scaled scores. This marks an average growth rate of 3.11-scaled scores per month that falls short of the modest target (4-scaled scores per month) and far short of achieving the moderate target of 8-scaled scores per month.

The score for the private schools comparison cohort at baseline (test 1) was 475-scaled scores. The moderate growth target set over 18 months was calculated to be and achievement of 619-scaled scores. The adjusted target was calculated at 547-scaled scores. The actual achievement of the private comparison schools cohort was 498-scaled scores; that marks a growth rate of 1.27-scaled scores per month. This fell well below the adjusted target of 4-scaled scores per month and well below the moderate growth target of 8-scaled scores per month.

The score for government schools cohort at baseline (test 1) was 485-scaled scores. The moderate growth target set over 18 months was calculated as 629-scaled scores. The adjusted target was calculated at 557-scaled scores.

The actual achievement of the government-funded comparison schools cohort was 502-scaled scores; that reflects a growth rate of 0.9-scaled scores per month and misses both the adjusted target and the moderate target by a long chalk.

The growth rate in government schools (0.9-scaled scores per month) is slower than both the private comparison schools (1.27 scaled scores per month) and RAN schools (3.11-scaled scores per month).

Table 9 – Rates of progress in Mathematics (see appendix 2 for graphs)

	Test 1 Jan 2016	Moderate Target (8)	Modest Target (4)	Test 6 June 2017	Rate of Progress
RAN	506	650	578	562	3.11
Private Comparison	475	619	547	498	1.27
Government	485	629	557	502	0.9

5. Gender equity in reading and mathematics

When the question is asked whether there is equity in achievement between girls and boys, the answer is that boys in RAN schools make better gains in reading than girls but not significantly

so. Boys in comparison schools also achieve bigger gains than girls. But, it is interesting that girls in RAN schools make significantly better gains than both girls in private comparison schools and government schools as well as boys in those same schools. The gains made by boys in RAN schools far exceed that of boys and girls in comparison schools.

Table 10 – Comparing gains in reading by gender (students assessed at both Time 1 and Time 6)

		Number of students	Test 1 Scaled Score	Test 6 Scaled Score	Change
RAN	Female	56	213	304	+91
	Male	46	223	330	+107
Other private	Female	31	173	216	+43
	Male	17	210	267	+57
Government	Female	37	227	257	+30
	Male	37	187	244	+57

But when we look at the gains by reading age, 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 other private schools and 5 months higher than girls in government schools. Boys in private comparison schools have on average a higher reading age to that of girls in private comparison schools 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 11 – Comparing reading age by gender (students assessed at both Time 1 and Time 6)

		Number of students	Time 1 Reading Age	Time 6 Reading Age	Change
RAN	Female	56	7.04	8.02	+10 months
	Male	46	7.06	8.04	+ 10 months
Other private	Female	31	7.00	7.05	+ 5 months
	Male	17	7.04	7.10	+ 6 months
Government	Female	37	7.06	7.09	+ 3 months
	Male	37	7.02	7.08	+ 4 months

In mathematics girls in RAN schools make better progress than boys despite achieving a lower scaled score in the final test. Girls in RAN schools make significantly better gains than girls in private comparison schools (a difference of 42-scaled scores over 18 months and government schools (41-scaled scores over 18 months), as well as boys in other private schools (29-scaled-scores) and government schools (47-scaled scores). The gains made by boys in RAN schools far exceed that of boys and girls in comparison schools.

Table 12 – Comparing gains in Mathematics by gender (students assessed at both Time 1 and Time 6)

		Number of students	Time 1 Scaled Score	Time 6 Scaled Score	Change
RAN	Female	61	492	552	+60
	Male	54	522	574	+52
Other private	Female	32	455	473	+18
	Male	19	510	541	+31
Government	Female	32	481	500	+19
	Male	25	491	504	+13

Boys in government funded schools make fewer gains over time than girls in the same schools even though they achieve higher scaled scores than girls in both test 1 and test 6.

6. Inclusivity in learning (students assessed in both test 1 and test 6 only)

When the question about inclusivity in learning outcomes is asked, it is interesting to look at the patterns of transition between performance bands.

The findings show that In RAN schools, the number of girls making a transition into better performance bands (working at or above benchmark) increases from 1 to 4 in reading.

At the other end of the spectrum, the number of female students in the worst performing band reduced from 44 (80% of the total) at test 1 to 25 (45.5% of the total) in test 6. Male students too responded well. There were no male students (in the traceable sub sample) in the highest performing group at the beginning of the study. Their share increased to 3 by the 6th test. And the number of male students in the worst performing band was reduced from 34 (73.9%) to 16 (34.8%) between the first and sixth test intervals.

Table 13 - Within cohort transitions and changes in the profiles of reading by performance band and gender

		Level 4		Level 3		Level 2		Level 1		Total
		Time 1	Time 6	Time 1	Time 6	Time 1	Time 6	Time 1	Time 6	
RAN schools	Female	1 (1.8%)	4 (7.3%)	2 (3.6%)	4 (7.4%)	8 (14.5%)	22 (40%)	44 (80.0%)	25 (45.5%)	56 (100%)
	Male	0 (0%)	3 (6.5%)	4 (8.7%)	5 (10.9%)	8 (17.4%)	22 (47.8%)	34 (73.9%)	16 (34.8%)	46 (100%)
Other private schools	Female	0 (0%)	0 (0%)	1 (3.2%)	1 (3.2%)	5 (16.1%)	11 (35.5%)	25 (80.6%)	19 (61.3%)	31 (100%)
	Male	0 (0%)	0 (0%)	0 (0%)	0 (0%)	5 (29.4%)	9 (52.9%)	12 (70.6%)	8 (47.1%)	17 (100%)
Government schools	Female	0 (0%)	1 (2.7%)	3 (8.1%)	1 (2.7%)	9 (24.3%)	13 (35.1%)	25 (67.6%)	22 (59.5%)	37 (100%)
	Male	1 (2.7%)	2 (5.4%)	0 (0%)	4 (10.8%)	6 (16.2%)	9 (24.3%)	30 (81.1%)	22 (59.5%)	37 (100%)

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

The patterns of transition in reading achievement for each cohort are shown graphically in appendix 3.

In Mathematics it is striking that the share of students working at or above the benchmark in RAN schools increase significantly from 10 students in this sub sample identified in the pre-test (test 1) to 35 students in the same sub sample in test 6. The share of girls who are performing at or above the benchmark is 32.8% (20 girls of a total of 61) compared to just 6.6% (4 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 11.1% (6 out of 54 boys) in the time 1 assessment to 27.8% (15 of 54 boys) in the time 6 assessment in June 2016.

The share of students in the worst performing bands reduced from 60.7% to 34.4% for girls and from 44.4% to 24.1% for boys.

Table 14 - Within cohort transitions and changes in the profiles of mathematics attainment by performance band and gender

		Level 4		Level 3		Level 2		Level 1		Total
		Time 1	Time 6	Time 1	Time 6	Time 1	Time 6	Time 1	Time 6	
RAN schools	Female	4 (6.6%)	20 (32.8%)	10 (16.4%)	6 (9.8%)	10 (16.4%)	14 (23%)	37 (60.7%)	21 (34.4 %)	61 (100%)
	Male	6 (11.1%)	15 (27.8%)	17 (31.5%)	13 (24.1%)	7 (13.0%)	13 (24.1%)	24 (44.4%)	13 (24.1%)	54 (100%)
Other private schools	Female	1 (3.1%)	2 (6.3%)	4 (12.5%)	4 (12.5%)	6 (18.8%)	9 (28.1%)	21 (65.6%)	17 (53.1%)	32 (100%)
	Male	0 (0%)	0 (0%)	7 (36.8%)	6 (31.6%)	5 (26.3%)	5 (26.3%)	7 (36.8%)	6 (31.6%)	17 (100%)
Government schools	Female	0 (0%)	3 (9.4%)	8 (25%)	5 (15.6%)	7 (21.9%)	8 (25%)	17 (53.1%)	16 (50%)	32 (100%)
	Male	2 (8%)	3 (12%)	4 (16%)	3 (12%)	5 (20%)	4 (16%)	14 (56%)	15 (60%)	25 (100%)

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

Rates of transition between performance bands are much slower in private comparison schools. The share of girls working at or above the benchmark has increased from 3.1% (1 girl) to 6.3% (2 girls) in the 18 months between January 2016 and June 2017. No change was recorded for boys in this band of achievement. There were none in January 2016 and this remains the case.

The worst performing girls in private comparison schools have reduced from 65.6% to 53.1 (a reduction of 4 girls from 21 to 17). The share of boys in this performance band has reduced by 1.

In government-funded schools too the rates of transition between performance bands are much slower than RAN schools and marginally better than those in private comparison schools. The share of girls working at or above the benchmark has increased from 0% to 9.4% (3 girls) in the 18 months between January 2016 and June 2017. The share of boys in this band of achievement increased from 8% to 12% (2 boys at time 1 up to 3 boys at the time 6 assessment).

The worst performing girls in government-funded schools have reduced from 53.1% to 50% (a reduction of 1 girls from 17 to 16). The share of boys in this performance band has increased by 1.

The patterns of transition in mathematics for each cohort are shown graphically in appendix 4.

7. Equivalence in outcomes (students assessed in both test 1 and test 6 only)

The next level of analysis examines the hypothesis that the better students in a school are likely to show the strongest growth. To put this in a different way, increases in average growth scores are likely to reflect the gains made by those who are on a reasonable pathway to learning and hide the scores of those who learn poorly. The hypothesis is often extended to gender differences also. We explore this proposition here by looking at the results (comparatively) of male and female students across all three cohorts in the lowest performance bands.

Tables 15, 16, and 17 below compares the rates of progress in reading between students in the weakest performance groups and the average performance of the cohort, disaggregated by gender. The findings are shown graphically in Appendix 5.

We can see from table 15 that on average the poorest performing students in RAN schools show a strong rate of progress (5.5 scaled scores per month). That is a faster growth rate than the modest target (4) but slower than the moderate target (8). The growth rate for girls is 5.1; that is lower than the mean for this sub group and lower than that of boys (5.8) who also exceed the average rate of growth. The mean rate of progress for the weakest performing students is equivalent to the rate of progress achieved by the cohort as a whole. It is fair to say that there is equivalence in outcomes but we are aware too of the skewed nature of the results, where the majority of students in the overall cohort are in fact weaker performing students.

Table 15 – Rates of progress for poorest performing students compared to whole cohort by sex: Reading, RAN schools

		Test 1	Adjusted Target	Rate	Moderate Target	Rate	Test 6	Rate of Progress
RAN	Female	167	239	4	311	8	260	5.1
	Male	174	246	4	318	8	279	5.8
	Mean	170	242	4	314	8	269	5.5
	Cohort	218	289	4	361	8	316	5.4

Table 16 below shows that on average the poorest performing students in Private Comparison schools show a slow rate of progress (3.11 scaled scores per month). That is a slower growth rate than the modest target (4) and far slower than the moderate target (8). The growth rate for girls is 2.66 and that is lower than the mean for this sub group (3.11) and lower than that of boys (3.88) who also exceed the average rate of growth. Weaker performing students make slower progress on average and learning is less equivalent.

Table 16 – Rates of progress for poorest performing students compared to whole cohort by sex: Reading, Private Comparison Schools

		Test 1	Adjusted Target	Rate	Moderate Target		Test 6	Rate of Progress
Other private schools	Female	147	219	4	291	8	195	2.7
	Male	182	254	4	326	8	252	3.9
	Mean	158	230	4	302	8	214	3.1
	Cohort	186	258	4	330	8	234	2.7

Table 17 below shows that on average the poorest performing students in Government Funded schools show a much slower rate of progress (2.77 scaled scores per month) than either RAN schools and Private Comparison schools.

The growth rate is slower than the modest target and far slower than the moderate target (8). The growth rate for girls is 2.66 and that is lower than the mean for this sub group (2.77) and lower than that of boys (2.88) who also exceed the average rate of growth. These results are interesting because they show that even where girls have achieved bigger gains in scaled scores (212) than boys (202), boys in this performance quartile start from a lower pre-test score (150) than girls (164), and learn more quickly. With the same caveat as above, that the profile of achievement is skewed towards the poorest performing achievement band, it is interesting that the weaker performing students are making faster progress than the cohort at large.

Table 17 – Rates of progress for poorest performing students compared to whole cohort by sex: Reading, Government Comparison Schools

		Test 1	Adjusted Target	Rate	Moderate Target	Test 6	Rate of Progress
Government schools	Female	164	236	4	308	8 212	2.66
	Male	150	222	4	294	8 202	2.88
	Mean	156	228	4	300	8 206	2.77
	Cohort	207	279	4	351	8 251	2.44

As with the reading analysis above, for mathematics too we explore whether all students, not just those potentially more disposed to learning, are learning. We compare the results of male and female students across all three cohorts in the lowest performance bands. The findings are shown graphically in Appendix 6.

Tables 18, 19, and 20 below compares the rates of progress in mathematics between students in the weakest performance groups and the average performance of the cohort, disaggregated by sex.

We can see from table 18 that on average the poorest performing students in RAN schools show a strong rate of progress (5.11 scaled scores per month). That is a faster growth rate than the modest target (4) but slower than the moderate target (8). The growth rate for girls is 4.38; that is lower than the mean for this sub group and lower than that of boys (6.22) who also exceed the average rate of growth. Interestingly, students in the weakest performing group make a faster rate progress on average than the entire cohort.

Table 18 – Rates of progress for poorest performing students compared to whole cohort by sex: Mathematics, RAN Schools

		Test 1	Adjusted Target	Rate	Moderate Target	Rate	Test 6	Rate of Progress
RAN	Female	431	503	4	575	8	510	4.38
	Male	418	490	4	562	8	530	6.22
	Mean	426	498	4	570	8	518	5.11
	Cohort	506	578	4	650	8	562	3.11

Table 19 below shows that on average the poorest performing students in Private Comparison schools show a slow rate of progress (2.61 scaled scores per month). That is a slower growth rate than the adjusted target (4) and far slower than the moderate target (8). The growth rate for girls is 1.44 and that is lower than the mean for this sub group and lower than that of boys (5.88) who also exceed the adjusted growth target. Again, the weakest performing students appear to grow at a faster rate on average than the cohort at large.

Table 19 – Rates of progress for poorest performing students by sex: Mathematics, private comparison schools

		Test 1	Adjusted Target	Rate	Moderate Target	Rate	Test 6	Rate of Progress
Private Comparison	Female	409	481	4	553	8	435	1.44
	Male	422	494	4	566	8	528	5.88
	Mean	412	484	4	556	8	459	2.61
	Cohort	475	547	4	619	8	498	1.27

Table 20 below shows that on average the poorest performing students in Government schools show a much slower rate of progress (2.38 scaled scores per month) than either RAN schools or Private comparison schools. The growth rate is slower than the adjusted target (4 ss/pm) and far slower than the moderate target (8ss/pm). The growth rate for girls is 2.27 and that is lower than the mean for this sub group (2.38) and lower than that of boys (2.66).

These results are interesting because they show that even where girls have achieved bigger gains in scaled scores (212) than boys (202), boys in this performance quartile start from a lower pre-test score (150) than girls (164), and learn more quickly. The average rate of progress for the weakest students is slower than that of the entire cohort.

Table 20 – Rates of progress for poorest performing students by sex: Mathematics, Government schools

		Test 1	Adjusted Target	Rate	Moderate Target	Rate	Test 6	Rate of Progress
Government schools	Female	412	484	4	556	8	453	2.27
	Male	417	489	4	561	8	465	2.66
	Mean	415	487	4	559	8	458	2.38
	Cohort	207	279	4	351	8	251	2.44

Conclusions

A number of questions are posed in this evaluation study and the data reveal compelling answers. We summarise the findings here.

Cumulative gains in reading and mathematics (whole sample)

When the question ‘what cumulative gains in learning are made over two years of the study’ is asked the indications are that RAN schools increased significantly their average cumulative gain in reading and mathematics. The average reading age stands at 8 years and 1 month, 11 months higher than at the start of the study; and significantly better than private comparison schools that raised their average reading age by 4 months between test 1 to test 6 and government funded schools that raised their average reading age by 6 months, from 7 years and 2 months at the start of the study to 7 years and 8 months.

The variability in the size of the cohorts on each test occasion means that we have to treat with caution the data and accept that they prevent us from making reliable comparisons between RAN schools and comparison schools.

Rates of progress towards reading and mathematics attainment targets (whole sample)

And when asked whether schools are making rapid enough progress towards their given attainment targets, the answer is that the overall growth rate of 6.05 scaled scores per month for RAN schools is significant. As above, we are not confident that the data are robust given the variability of cohort size on each test occasion. But it is interesting to compare the growth rate of 6.05-scaled scores achieved by the whole sample at test 6, with the rate of 5.4 achieved by a more stable cohort of students who can be traced as having taken both tests 1 and 6 (see table 8 above). The growth rate of 5.4 achieved by the ‘stable’ cohort offers at once a more robust statistic of the progress made, and a less optimistic indication of the actual progress made. Both figures are above the projected ‘modest’ target for reading but well below the projected ‘moderate’ target (8) that indicates more strongly that students are developing as readers.

In mathematics, RAN schools recorded an average growth rate of 4.55-scaled scores per month over an 18-month period. This figure is unreliable because of the reasons given above – that of unstable cohort sizes. Indeed, when compared to a rate of progress achieved by a stable cohort who had taken both test 1 and test 6, who record a rate of progress of 3.11, it is clear that the progress of RAN students is slower than expected. The more reliable statistic (3.11) is below the modest projected target of 4.

Cumulative gains in reading and mathematics (sub sample)

The study identifies a sub sample of students from all cohorts who have taken two or more tests, including the first and last test. This allows us to compare more confidently the achievements of RAN students against matched samples from comparison schools.

The findings show that students in RAN schools are making more substantial cognitive gains and are making faster progress than their counterparts in comparison schools. In reading, RAN students significantly exceed the scaled scores achieved by students in comparison schools. RAN schools achieve a gain of 98-scaled scores over a period of 18 months compared to 48-scaled scores for ‘other’ private schools and a gain of 44-scaled scores for government schools.

The overall gain for RAN schools in the improvement of student reading ages is over 10 months. This is twice the gain in reading age recorded for comparison cohorts and in itself a significant

achievement. It is clear that RAN students are reading more and understanding more of what they read. As we might expect the gains reflect an increase in vocabulary and comprehension but less so in skills such as author intention.

In mathematics, when compared to other cohorts, the cumulative gains made by RAN students significantly exceed those achieved by comparison schools. RAN schools achieve a gain of 56-scaled scores over a period of 18 months compared to 23-scaled scores for private comparison schools and a gain of 17-scaled scores for government schools.

Rates of progress towards reading and mathematics attainment targets (sub sample)

RAN schools make more gains in reading and mathematics compared to comparison schools, and they make faster progress towards given targets, even if this progress is in itself modest in mathematics and moderate in reading.

RAN schools achieve an average growth rate of 5.4-scaled scores per month (just above the moderate target) compared to a growth rate of 2.66-scaled scores per month for private comparison schools and 2.44-scaled scores per month for government funded schools.

And In mathematics RAN schools achieve an average growth rate of 3.11-scaled scores per month (this is below both the modest and moderate targets) compared to a growth rate of 1.27-scaled scores per month for private comparison schools and 0.9-scaled scores per month for government-funded schools.

Equity in outcomes (sub sample)

When the question is asked whether there is equity in outcomes between girls and boys, the answer is that boys in RAN schools make better gains in reading than girls but not significantly so. It is interesting that girls in RAN schools make significantly better gains than both girls in private comparison schools and government schools as well as boys in those same schools. The gains made by boys in RAN schools far exceed that of boys and girls in comparison schools.

But when we look at the gains by reading age, 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 other private schools and 5 months higher than girls in government schools. Boys in private comparison schools have on average a higher reading age to that of girls in private comparison schools 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).

In mathematics girls in RAN schools make better progress than boys despite achieving a lower scaled score in the final test. Girls in RAN schools make significantly better gains than girls in private comparison schools (a difference of 42-scaled scores over 18 months and government schools (41-scaled scores over 18 months), as well as boys in other private schools (29-scaled-scores) and government schools (47-scaled scores). The gains made by boys in RAN schools far exceed that of boys and girls in comparison schools.

Boys in government funded schools make fewer gains over time than girls in the same schools even though they achieve higher scaled scores than girls in both test 1 and test 6.

Comparisons of within cohort transitions (sub sample)

When the question about patterns of transition between performance bands is asked, the findings show that In RAN schools, the number of girls making a transition into better performance bands (working at or above benchmark) increases from 1 to 4 in reading and from 10 to 35 in mathematics. The reduction of girls in the worst performance banding reduced significantly as did boys.

Comparisons of gains in reading and mathematics for the worst performing students

Finally, when the question 'are all students learning?' asked, the findings show that the rate of learning for the poorest performing students in RAN is on par with the rate of achievement of the 'stable' (identifiable sub sample) cohort.

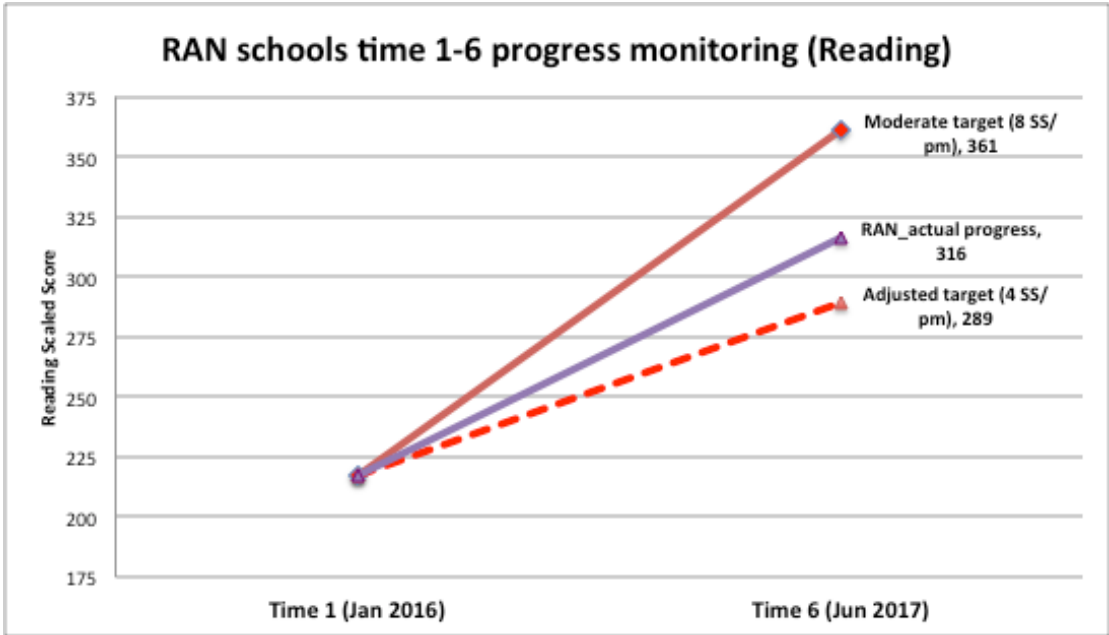
Reflections

In conclusion, RAN schools seem to make better cumulative gains, learn at a faster rate, and weaker students make stronger transitions from poor performance to good performance bands when compared to matched student samples in private and government schools. It is also the case that learning outcomes are more equitable in RAN schools. Girls perform as well in improving their reading scores and bettering their average reading age as boys. Girls also make strong transitions from the poorest to the better performance bands.

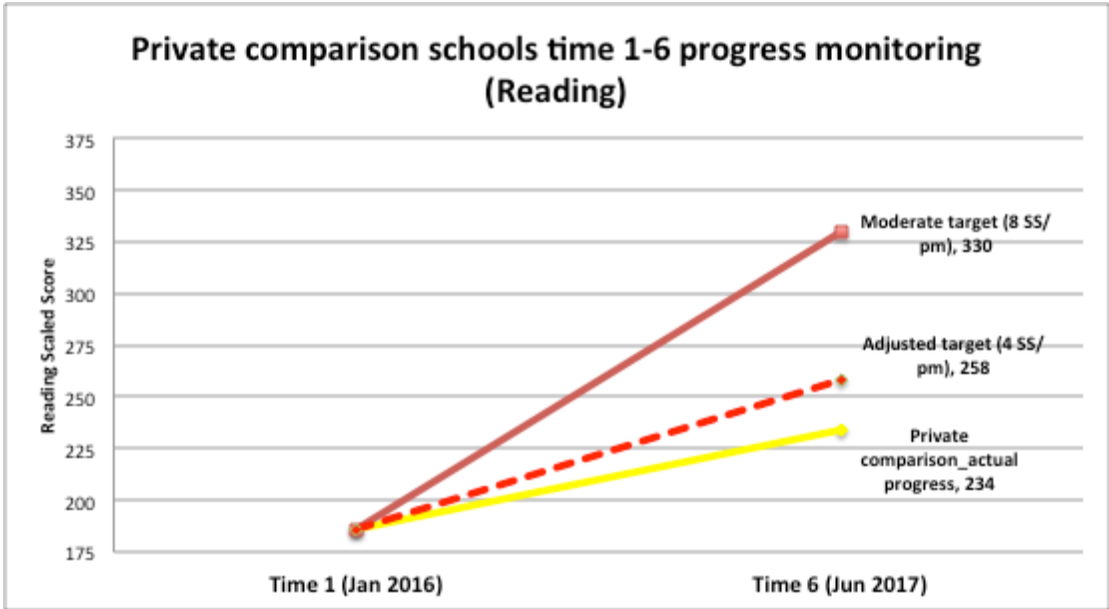
But it is the rate of progress, especially in mathematics, that is slow (below both the modest and moderate suggested growth rates) and that needs to be monitored closely over the next cycle.

Appendix 1

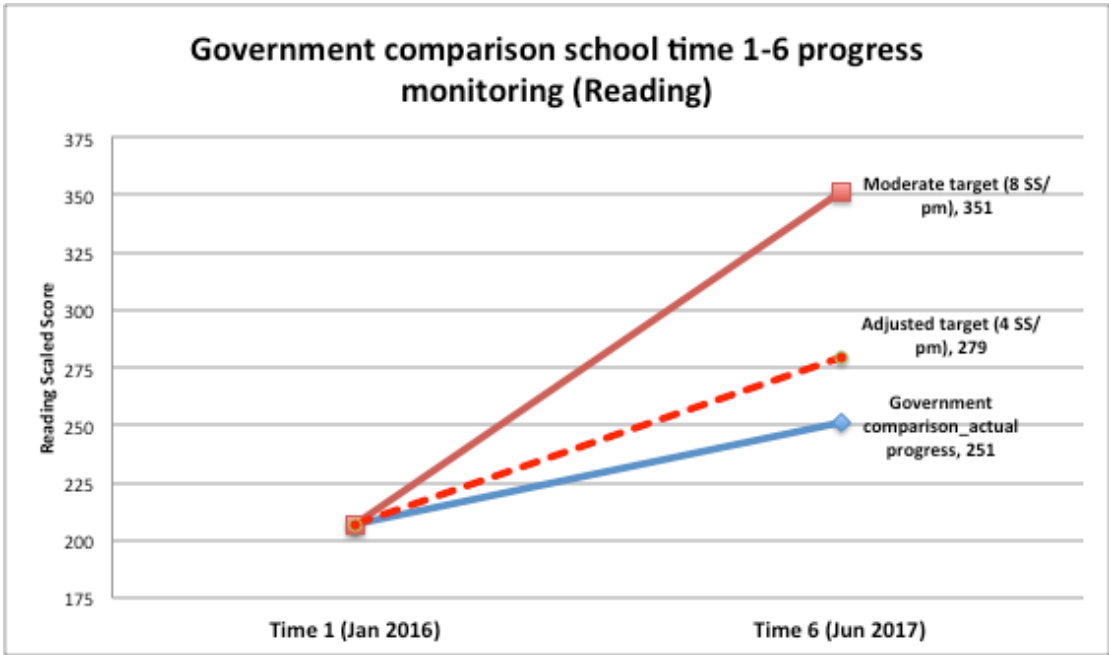
Rates of Progress: RAN schools (based on 18 months of which 14 months consisted of exposure to teaching - traceable students only).



Rates of Progress: Private Comparison Schools (based on 18 months of which 14 months consisted of exposure to teaching - traceable students only).

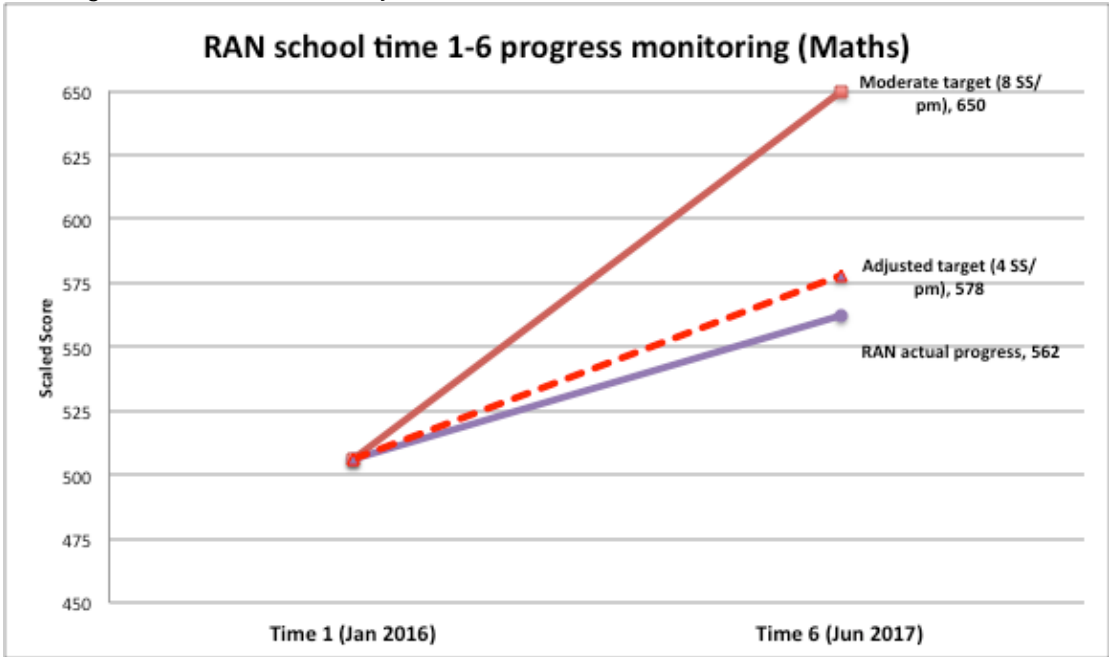


Rates of Progress: Government Funded schools (based on 18 months of which 14 months consisted of exposure to teaching - traceable students only).

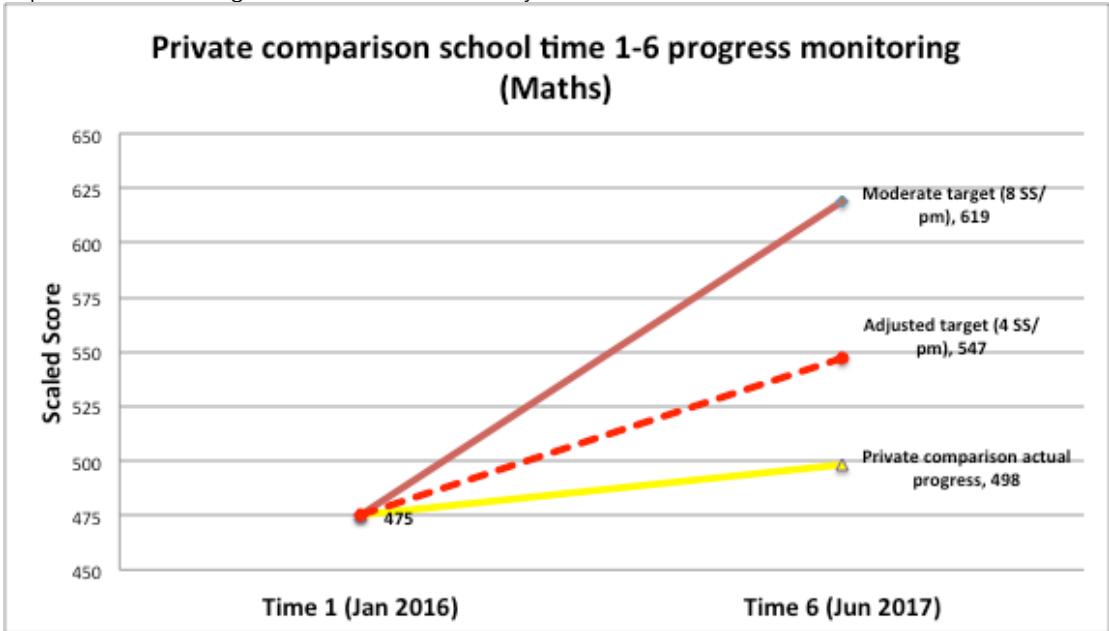


Appendix 2

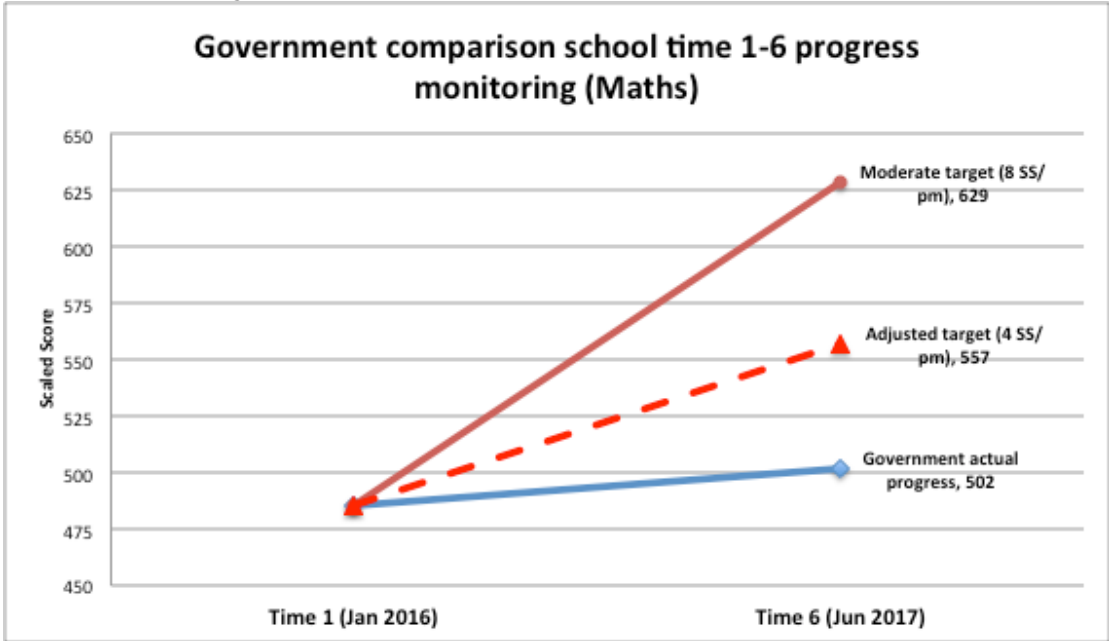
Rates of Progress: RAN schools (based on 18 months of which 14 months consisted of exposure to teaching - traceable students only).



Rates of Progress: Private Comparison Schools (based on 18 months of which 14 months consisted of exposure to teaching - traceable students only).

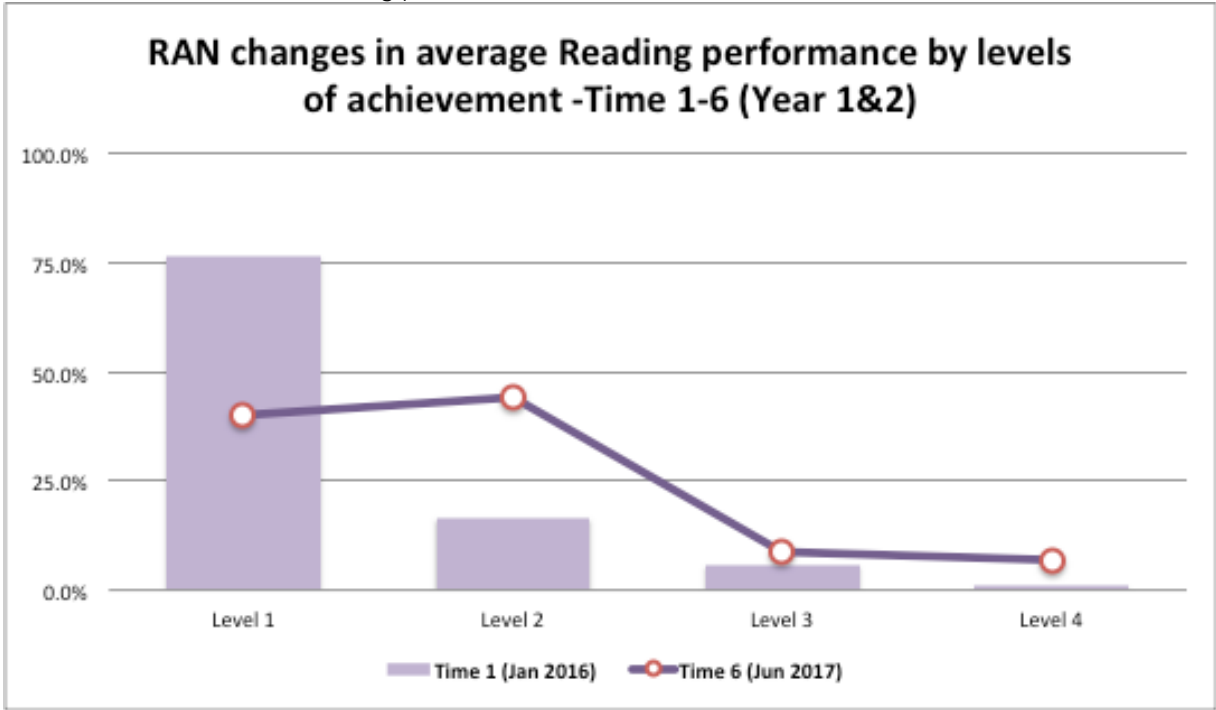


Rates of Progress: Government Funded schools (based on 18 months of which 14 months consisted of exposure to teaching - traceable students only).

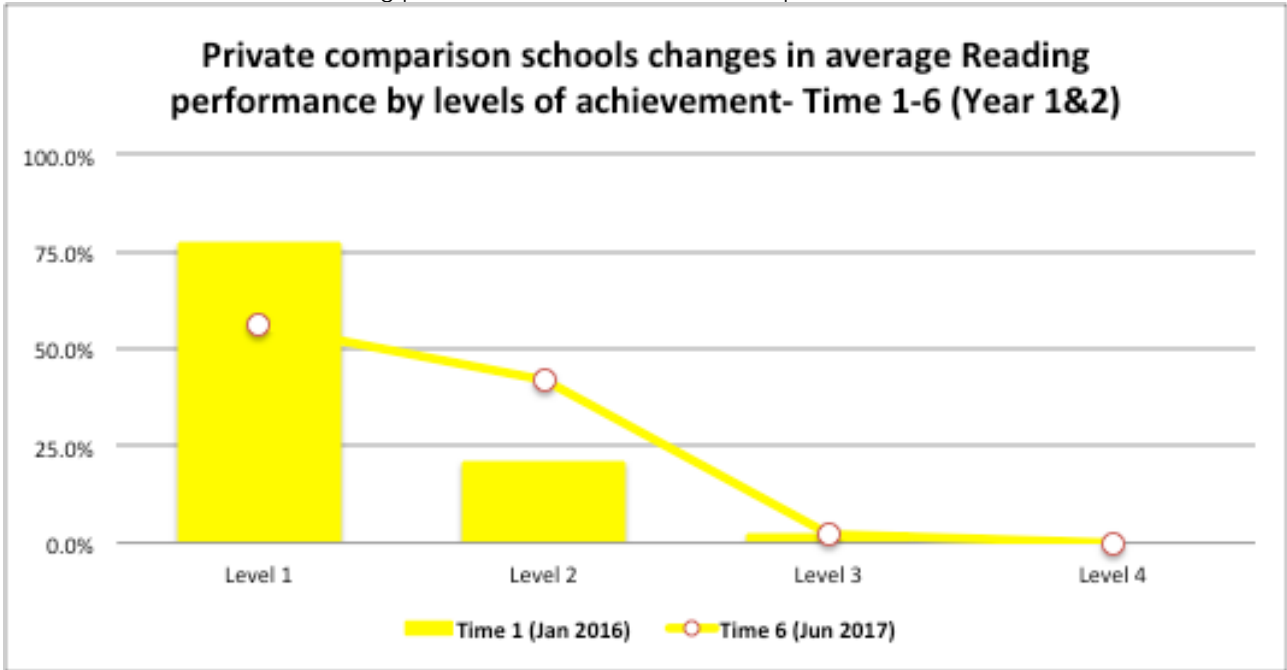


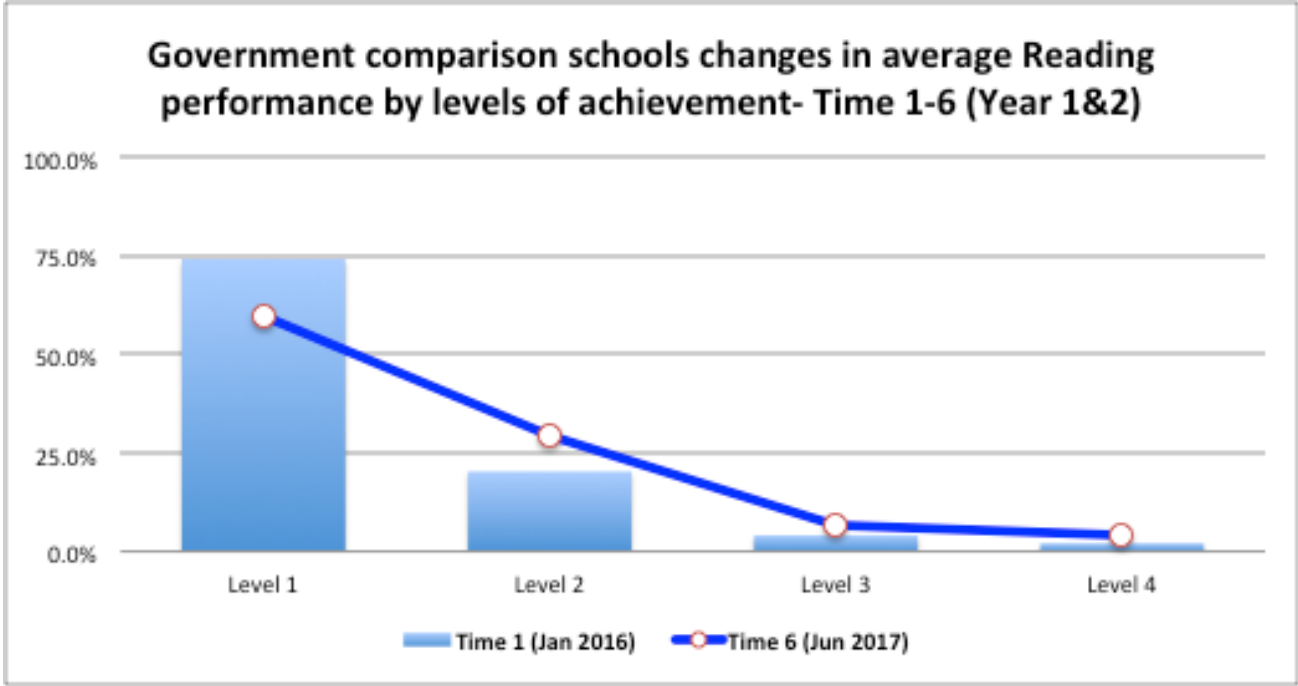
Appendix 3

Student transitions across reading performance bands: RAN Schools



Student transitions across reading performance bands: Private Comparison Schools

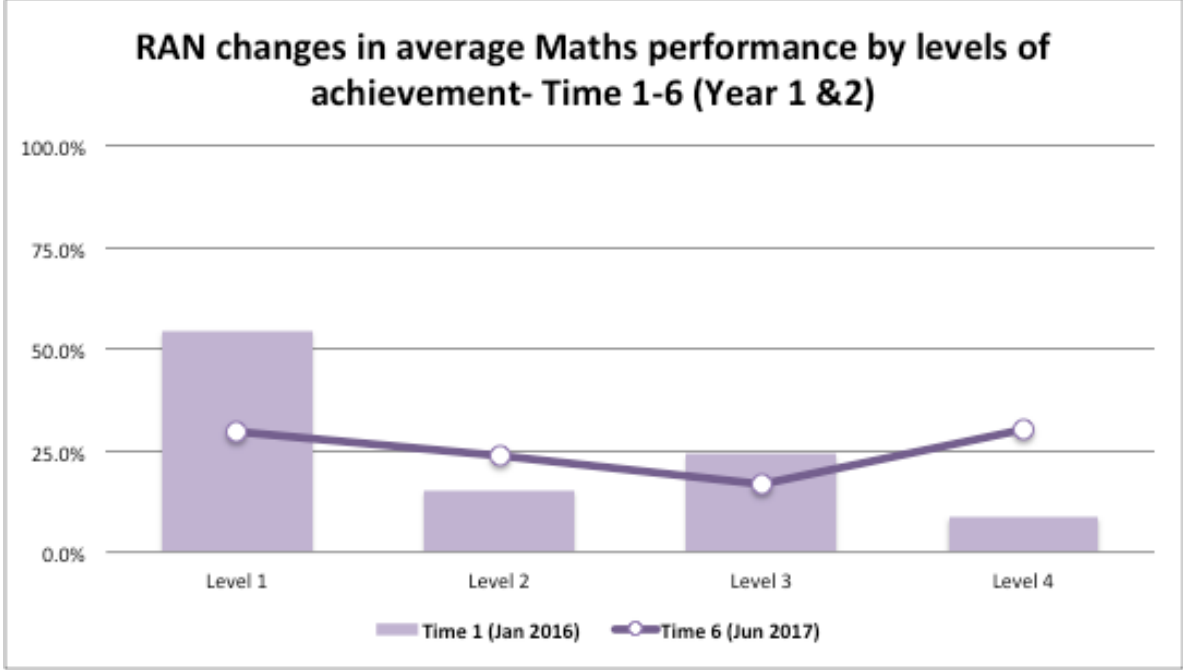




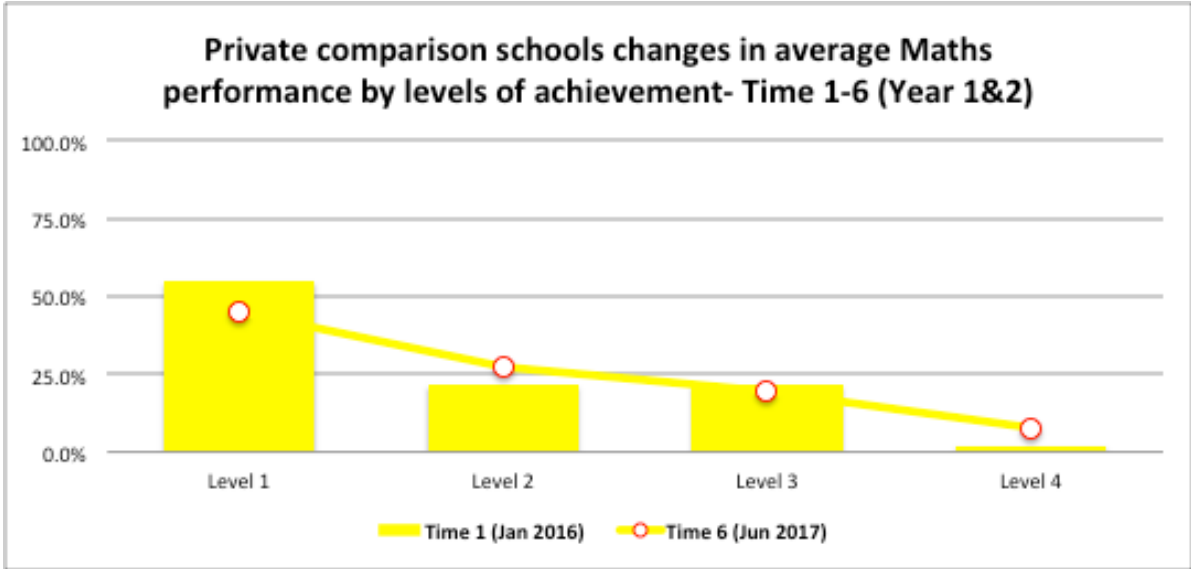
The data show that RAN schools have done more than comparison schools to change the profiles of reading in the worst performing groups. Women students in this band are as sensitive to male students to schooling.

Appendix 4

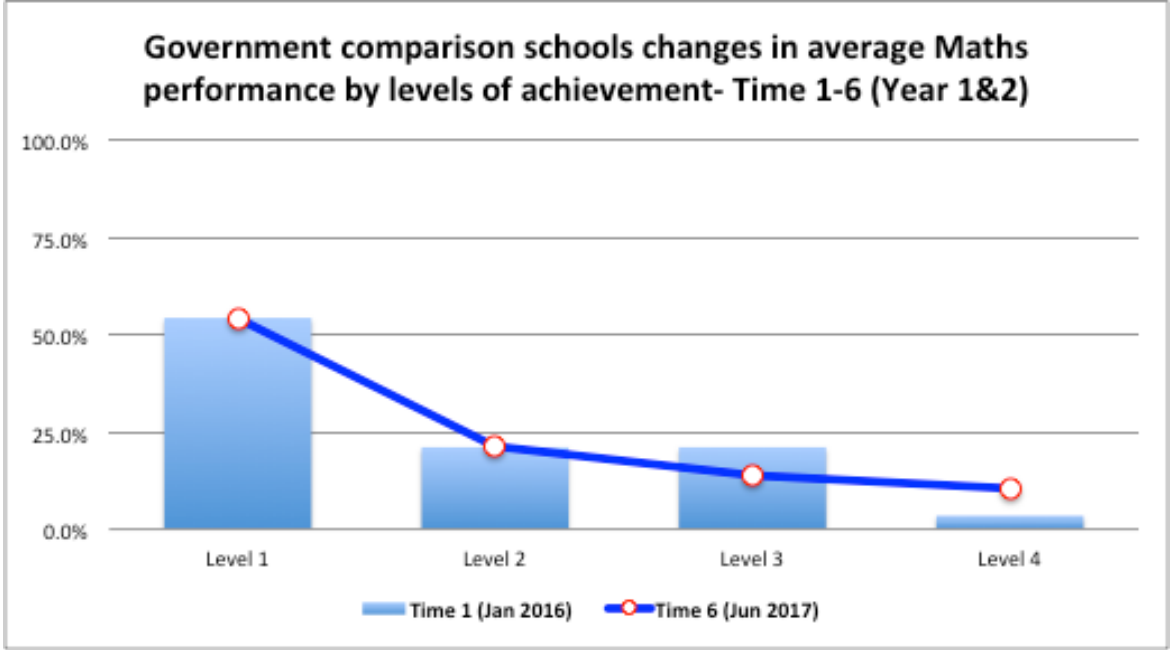
Student transitions across mathematics performance bands: RAN Schools



Student transitions across mathematics performance bands: Private Comparison Schools

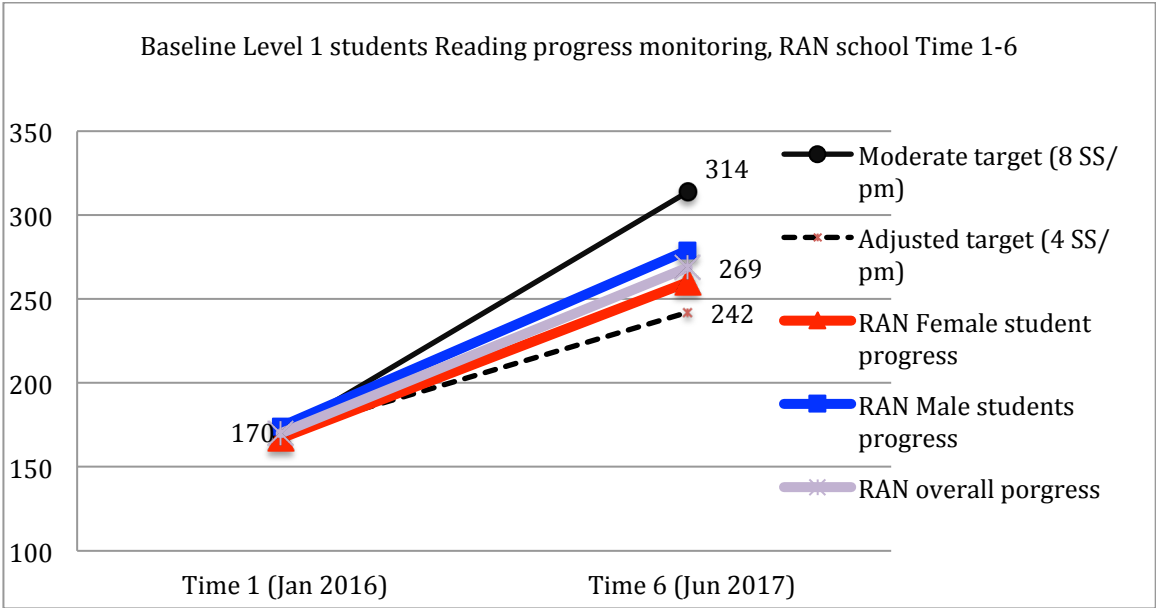


Student transitions across mathematics performance bands: government-funded schools

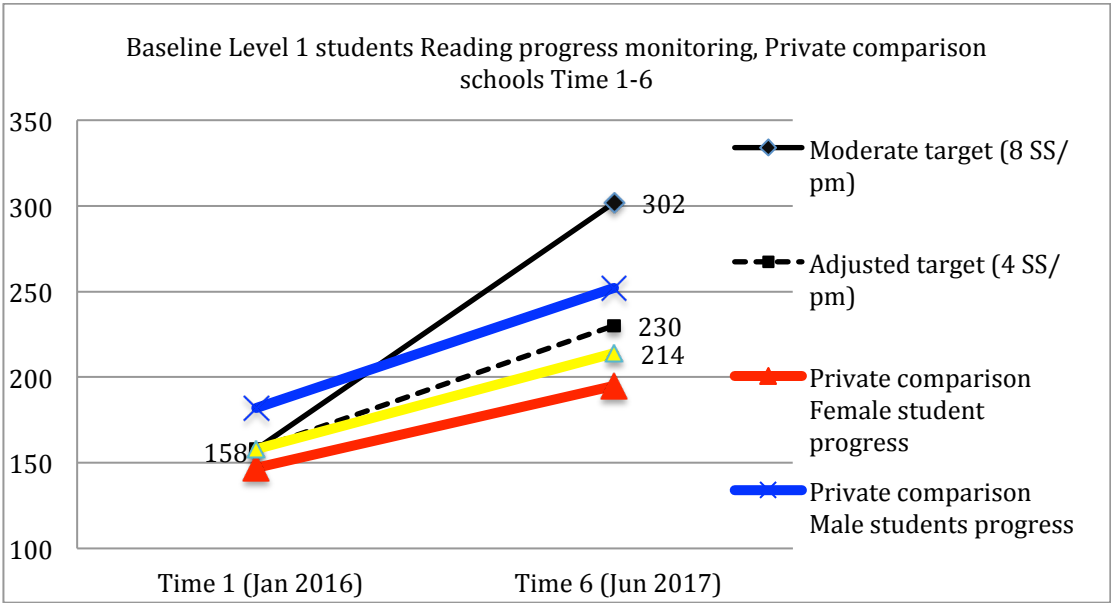


Appendix 5

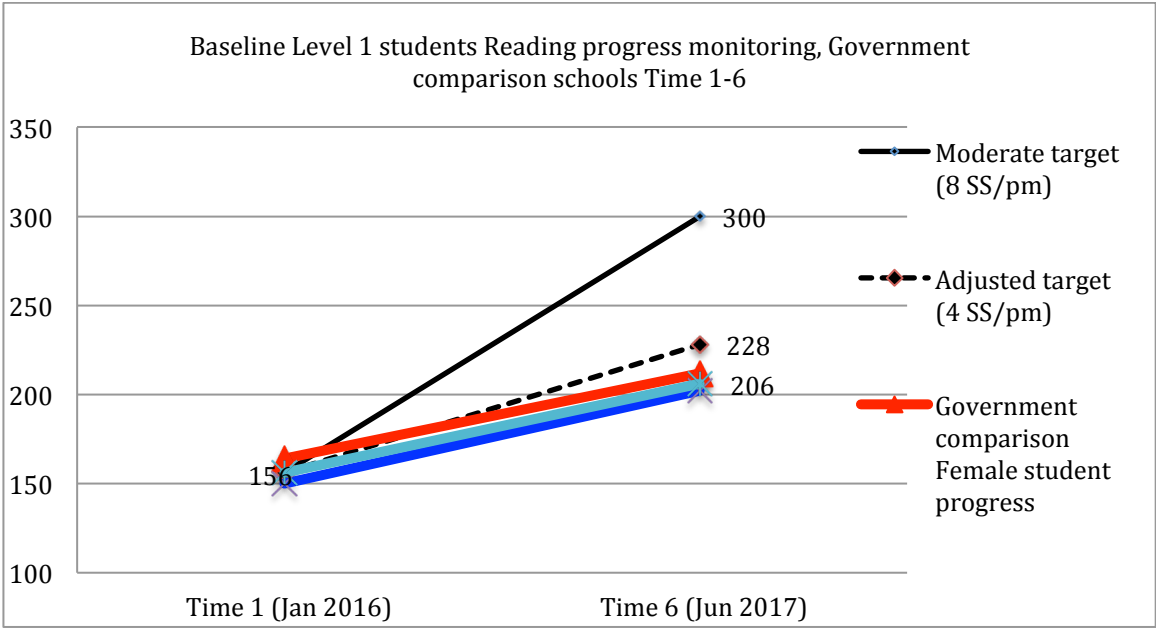
Rates of progress for poorest performing students by sex.



Rates of progress for poorest performing students by sex.

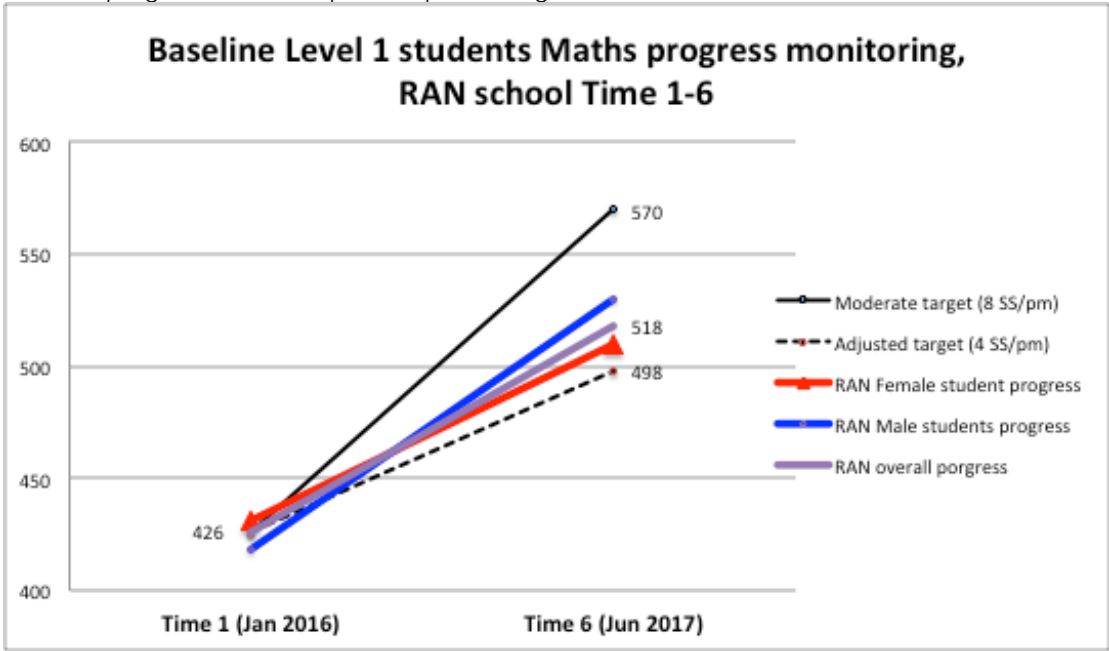


Rates of progress for poorest performing students by sex.

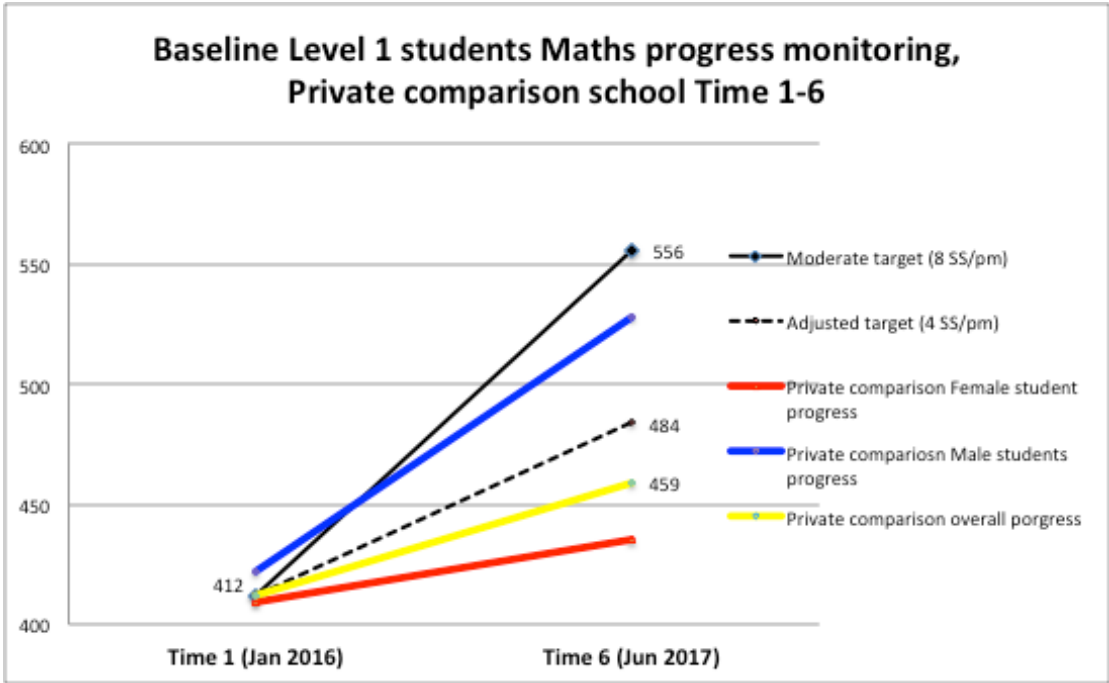


Appendix 6

Rates of progression for the poorest performing students: Ran Schools



Rates of progression for the poorest performing students: Private Comparison Schools



Rates of progression for the poorest performing students: Government Schools

