End of Year Results

2014

Supported by
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The Isibindi Trust

Numeric 2014 Full Year Results

Cape Town, January 15, 2015

Numeric provides afterschool maths programs and teacher training programs that use technology-based resources to create exciting and high impact learning environments.

Highlights for the 2014 year:

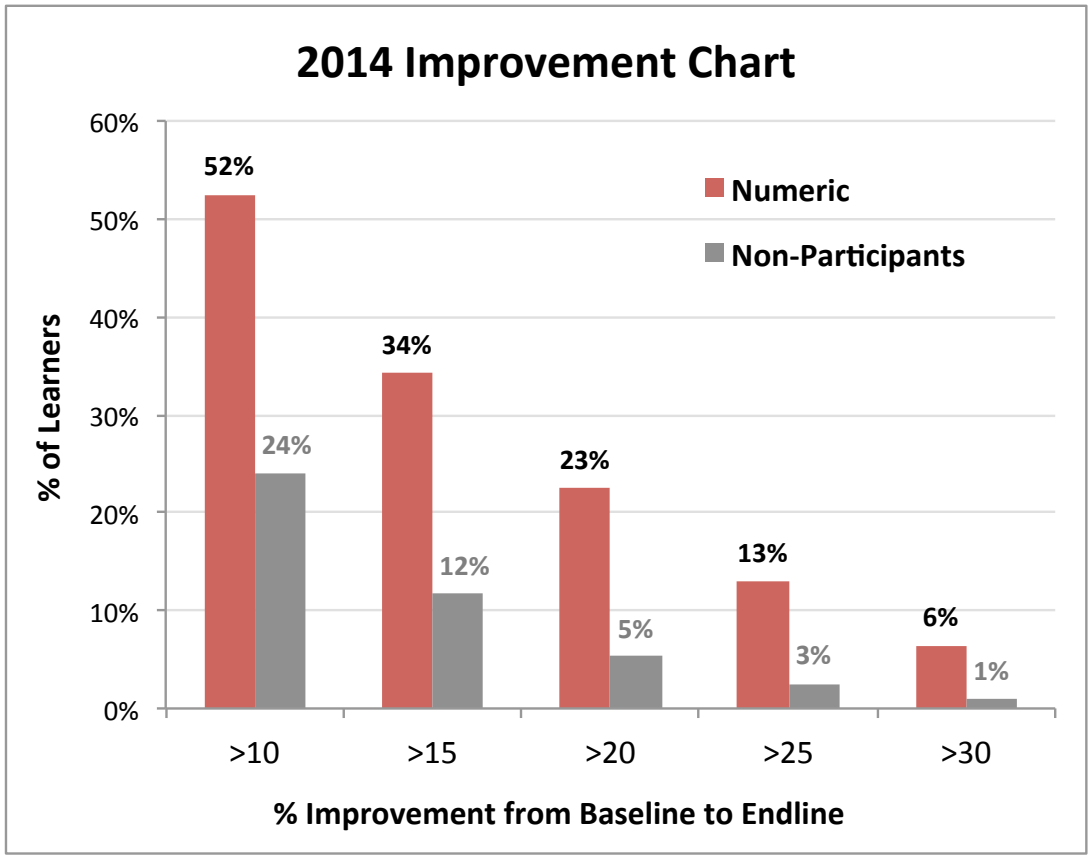
Key Metrics	2013	2014	Change
Partner schools	10	26	160%
Learners tested	2065	4610	123%
Applications received	596	1822	206%
Application rate	29%	40%	11%
Learners accepted	256	1019	298%
Acceptance rate	43%	56%	13%
Afterschool classrooms	21	46	119%
Persistence rate	66%	74%	8%
Gross shift in test scores	7.5%	12.4%	4.9%
Net shift in test scores	5.1%	7.8%	2.7%
Delta	0.34	0.60	0.26

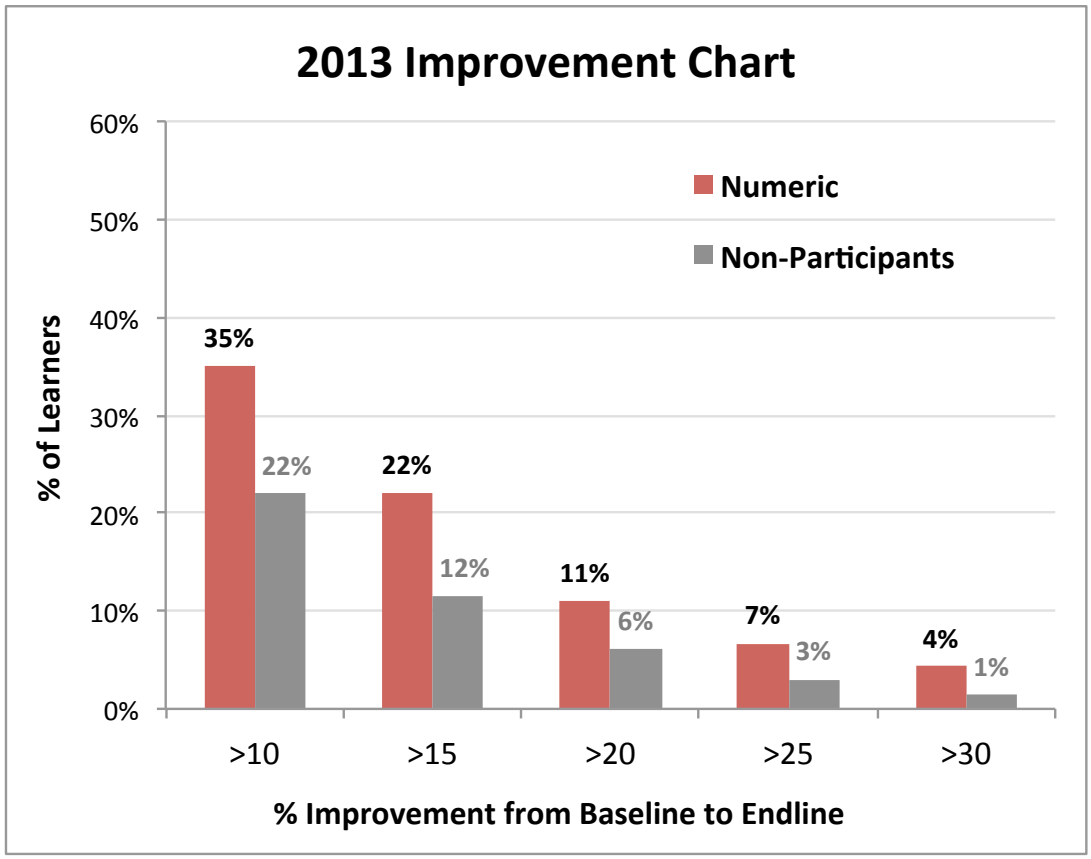
Performance Metrics

- The overall persistence rate was 74% compared with 66% in 2013. Persistence is the percentage of learners who remain on-program for the full year.
- The average Numeric learner scored 46.1% at endline compared with 33.7% at baseline, a gross shift of 12.4% (2013: 7.5%)
- The average non-Numeric learner scored 32.1% at endline compared with 27.5% at baseline, a gross shift of 4.6% (2013: 2.4%)
- The net shift attributable to Numeric was 7.8% compared with 5.1% in 2013
- The delta attributable to Numeric was 0.60 compared with 0.34 in 2013. The delta is a statistical measure of impact and Numeric targets a range of 0.5 – 1.0.
- Between baseline and endline tests:
    - 73% of Numeric learners improved by more than 5% (non-participants 46%)
    - 52% of Numeric learners improved by more than 10% (non-participants 24%)
    - 34% of Numeric learners improved by more than 15% (non-participants 12%)
    - 23% of Numeric learners improved by more than 20% (non-participants 5%)
    - 13% of Numeric learners improved by more than 25% (non-participants 3%)
    - 6% of Numeric learners improved by more than 30% (non-participants 1%)
- Numeric learners accounted for 67 of the 100 most improved learners out of a total 4610 learners tested. Numeric learners account for 23% of all learners tested.

Commentary

The increased focus on coach training, the implementation of regular testing, the investment of time upfront in finding the right partner schools, and improved learner management systems all contributed to the strong set of results in 2014. The two new clusters in Johannesburg made a positive contribution to these results, generating above average delta and persistence rates. We are similarly pleased with the improved operating performance in Cape Town, with particularly good results achieved in the Mfuleni and Mitchells Plain clusters. The opening of an office in Johannesburg (10 new schools) and the expansion of the Cape Town programs (6 new schools) brought the total number of Numeric partner schools to 26 for the year. It is pleasing to see that in spite of the rapid growth, the program managers and coaches succeeded in improving the quality and impact of our programs.


2014 Improvement Chart
60%
50%
40%
30%
20%
10%
0%
% of Learners
52%
24%
34%
12%
23%
5%
13%
3%
6%
1%
Numeric
Non-Participants
>10
>15
>20
>25
>30
% Improvement from Baseline to Endline


2013 Improvement Chart
60%
50%
40%
30%
20%
10%
0%
% of Learners
35%
22%
22%
12%
11%
6%
7%
3%
4%
1%
Numeric
Non-Participants
>10
>15
>20
>25
>30
% Improvement from Baseline to Endline

Explanation of Results Tables

In reading the results tables in this report, the following terminology should be noted:

1. F: Full year students. These are students who appear on Numeric registers in Term 1 and Term 4, in other words, they attend throughout the year.
2. D: Dropped students. These are students who appear on Numeric registers in Term 1 but do not appear in Term 4, in other words they drop out during the year.
3. F&D: Both full year and dropped students, i.e. all students who appear on Numeric registers in Term 1.
4. NP: Non-participating students. These are learners who never enrolled in Numeric's program to begin with.
5. Persistence Rate: Percentage of students who attend throughout the year and do not drop out. This is computed as F/(F+D).
6. SD: Standard deviation. The standard deviation is a measure of the dispersion of test scores. On a normal curve, 68% of learners fall within 1 s.d. of the mean. That is to say, if the mean test score is 40% and the standard deviation is 10%, then 68% of learners are scoring between 30-50%.
7. Gross shift (%): Average endline score minus average baseline score for a given cohort of learners.
8. Net shift (%): The net shift in test scores attributable to Numeric. This is computed as: (Gross shift for Numeric learners) - (Gross shift for non-participating learners)
9. Delta: The delta measures the improvement in test scores attributable to Numeric in terms of standard deviations from the mean. It is computed as (Net shift) / (Standard deviation). For example, if the net shift for Numeric learners was 5% and the standard deviation on the test was 10%, the delta is 0.5.

All results in this report are identical to those in the endline evaluation report provided by Numeric's independent assessment committee (IAC), with the exception of the delta computations. The IAC report used baseline standard deviations to compute delta. The baseline standard deviation was smaller than the endline standard deviation across the board, and as such, the IAC report overstates the delta. In this report, all deltas have been restated using the average of the baseline and endline standard deviation.

Explanation of the Delta

The delta is the most important performance metric used to assess Numeric's operations in any given year. In statistics, the delta (or effect size) is a quantitative measure of the strength of a phenomenon. It is defined as the mean difference between the treatment and control group divided by the standard deviation.

$$Delta = \frac{\mu 1 - \mu 2}{\sigma}$$

In the case of Numeric, $\mu 1$ is the difference between baseline and endline scores for Numeric learners, while $\mu 2$ is the difference between baseline and endline scores for non-Numeric learners. The standard deviation (or σ) is the average standard deviation for both groups at baseline and endline. Jacob Cohen - an American statistician and psychologist best known for his work on statistical power and effect size - defined effect sizes as "small, d = .2," "medium, d = .5," and "large, d =.8".

For a more detailed discussion on the delta and its interpretation, please refer to Appendix D.

Table 1. Results by Cluster

	F&D Baseline Mark (%)	F&D Endline Mark (%)	F&D Mark Change	NP Baseline Mark (%)	NP Endline Mark (%)	NP Mark Change	Net Shift (%)	SD (Average)	Delta
Bardale Primary	30.8	43.3	12.5	24.6	27.5	2.9	9.6	13.2	0.7
Bardale Secondary	26.9	39.8	12.9	23.4	26.4	3.0	9.9	11.3	0.9
Manzomthombo Senior Secondary	25.1	38.5	13.4	20.8	23.4	2.6	10.8	10.3	1.1
Mfuleni High	28.0	45.1	17.1	22.5	29.5	7.0	10.1	11.1	0.9
Mfuleni Schools	**27.7**	**41.7**	**14.0**	**22.8**	**26.7**	**3.9**	**10.1**	**11.5**	**0.89**
Eisleben Primary	49.8	58.5	8.7	41.1	45.4	4.3	4.4	17.2	0.3
Imperial Primary	52.4	65.1	12.7	44.0	50.1	6.2	6.5	18.2	0.4
Lentegeur High	30.0	41.4	11.4	26.2	30.8	4.6	6.8	11.8	0.6
Oval North High	39.0	48.4	9.5	32.6	36.8	4.1	5.3	14.7	0.4
Spine Road High	55.1	70.9	15.7	53.6	67.6	14.1	1.7	13.6	0.1
Mitchells Plain Schools	**45.3**	**56.9**	**11.6**	**39.5**	**46.1**	**6.7**	**4.9**	**15.1**	**0.34**
Belgravia High	41.7	49.3	7.7	39.4	41.9	2.5	5.1	15.5	0.3
Bridgetown High	31.4	32.3	0.9	28.0	29.2	1.2	-0.4	13.4	0.0
Garlandale High	38.6	44.9	6.3	32.3	35.4	3.1	3.2	12.9	0.2
Ned Doman High	27.9	31.9	4.0	25.9	21.4	-4.5	8.5	11.8	0.7
Spes Bona High	31.6	42.1	10.5	28.3	34.6	6.3	4.2	14.6	0.3
Sunnyside Primary	43.8	56.9	13.2	38.5	46.2	7.6	5.5	16.9	0.3
Athlone Schools	**37.4**	**45.1**	**7.7**	**33.3**	**37.5**	**4.2**	**3.5**	**14.7**	**0.23**
Cape Town Average	**37.4**	**48.3**	**10.9**	**32.5**	**37.5**	**5.0**	**5.9**	**13.9**	**0.46**
Ikaneng Primary	28.0	35.4	7.4	21.5	24.0	2.5	4.9	10.3	0.5
Job Rathebe Secondary	26.8	38.6	11.9	20.4	23.1	2.7	9.2	11.0	0.8
Lulama Primary	38.3	55.5	17.1	22.9	27.3	4.4	12.7	16.5	0.8
Thaba Jabula Secondary	31.8	44.8	13.0	22.0	26.1	4.1	8.9	12.2	0.7
Vulamazibuko Combined (Gr 7)	31.4	46.2	14.8	27.2	33.8	6.6	8.1	13.2	0.6
Vulamazibuko Combined (Gr 8)	30.8	60.1	29.3	22.6	36.9	14.3	15.0	13.4	1.1
Soweto (Diepkloof) Schools	**31.2**	**46.8**	**15.6**	**22.8**	**28.5**	**5.8**	**9.8**	**12.8**	**0.76**
Bhukulani High	27.7	39.0	11.3	23.4	30.2	6.8	4.5	11.3	0.4
Daliwonga High	27.3	46.5	19.2	23.0	27.4	4.4	14.8	12.3	1.2
Emshukantambo High	33.2	45.2	12.0	23.8	27.4	3.5	8.4	11.7	0.7
Tiakeni Primary (Grade 6)	23.4	38.7	15.4	15.4	20.2	4.8	10.6	12.0	0.9
Tiakeni Primary (Grade 7)	29.4	42.7	13.4	17.7	21.9	4.2	9.1	15.1	0.6
Vukazenzele Primary	29.1	41.8	12.7	20.4	20.6	0.3	12.4	14.1	0.9
Soweto (Mofolo North) Schools	**28.3**	**42.3**	**14.0**	**20.6**	**24.6**	**4.0**	**10.0**	**12.8**	**0.78**
Johannesburg Average	**29.8**	**44.5**	**14.8**	**21.7**	**26.6**	**4.9**	**9.9**	**12.8**	**0.77**
Global Average	**33.9**	**46.6**	**12.7**	**27.5**	**32.5**	**4.9**	**7.7**	**13.4**	**0.60**

Results Commentary

Refer to the table on the prior page for the full set of results by cluster.

During the 2014 school year, Numeric operated in five distinct geographical clusters. In Cape Town these were Mfuleni, Mitchells Plain and Athlone. In Johannesburg they were Soweto (Mofolo North) and Soweto (Diepkloof). The Mfuleni, Mofolo North and Diepkloof clusters tend to be in poorer, less developed areas, and have correspondingly low baseline scores (27.7%, 31.2%, 28.3% respectively). The Mitchells Plain and Athlone clusters are in slightly more affluent, developed areas, and have correspondingly higher baseline scores (45.3% and 37.4% respectively).

The deltas generated in the poorer areas tend to be higher than those in the more developed areas. Mfuleni, Mofolo North and Diepkloof experienced deltas of 0.89, 0.76 and 0.78 respectively, while the Mitchells Plain and Athlone schools generated deltas of 0.34 and 0.23 respectively. In the case of Mitchells Plain, one might attribute the lower delta to the relatively higher baseline scores (45.3% versus the Numeric average of 33.9%). While this might be partly true, Numeric generated a very reasonable absolute shift of 11.6% in Mitchells Plain compared with a Numeric average of 12.7%. The main reason for the reduced delta in Mitchells Plain is that in the case of Eisleben Primary, Imperial Primary and Spineroad High School, the schools themselves are generating fairly large, positive shifts. This is reflected in the non-Numeric learners increasing by 6.7% between baseline and endline, higher than any other area we operate in. In a certain sense, Numeric experiences a greater level of "competition" from the school itself, where high-performing teachers are generating a positive background shift, which when subtracted from the Numeric shift of 11.6% has a dampening effect on the delta. In the case of Mitchells Plain, we are thus pleased with the results in spite of a lower delta.

In the case of Mfuleni, Diepkloof and Mofolo North, Numeric generated absolute shifts of 14.0%, 15.6% and 14.0% respectively. These large, positive shifts are attributable to strong coach performance in these areas, with most coaches conducting four or more in-class hours per week compared with the prescribed minimum of three. The background shifts for non-Numeric learners in these areas was 3.9%, 5.8% and 4.0% respectively. The resulting net shift attributable to Numeric ranged between 10-11%, resulting in deltas of 0.89, 0.76 and 0.78 respectively. These contributed positively to Numeric's overall delta for the year which increased to 0.60 from 0.34 in 2013.

The poorest performing cluster was in Athlone, with a delta of 0.23. The delta in Athlone was low for an entirely different set of reasons to Mitchells Plain. The gross shift for Numeric learners in Athlone was 7.7% compared with the Numeric average of 12.7%. The net-shift in Athlone was 3.5% compared with the Numeric average of 7.7%. The resulting delta of 0.23 was significantly below our company-wide average of 0.60.

When we first started working in schools in 2012, Athlone looked promising for several reasons. Firstly, it was in close proximity to our office, which made managing the programs easier. Secondly, it was relatively closer to UCT and CPUT where we sourced coaches. Finally, we liked the school management teams we met there and were confident of good support from the schools. In spite of these factors, the delta generated in Athlone was low.

The major reason for this poor performance was low persistence rates. The average persistence in Athlone schools was 59%, compared with 70-80% in the other areas in which we operate. The major reason for this is the relatively large size of Athlone's commuter population. The average commute time in Athlone is higher than in any of our other areas, with children taking some combination of buses, trains, and taxis to get to school, followed by a walk of up to 1-2 km. This makes it relatively harder for them to attend afterschool programs (or rather, maintain attendance), as leaving school later means walking alone to transport

hubs and taking public transport alone, as opposed to in groups or with friends. In a commuter area such as Athlone, persistence rates are particularly negatively affected during winter, when shorter days and rainy weather make it harder for children to attend an afterschool program.

Summary

Numeric performed best in the lower-income areas where our focus on arithmetic and pre-algebra increased average test scores from ±29% to ±44%. Numeric's overall delta increased from 0.34 in 2013 to 0.60 in 2014. This was due largely to the inclusion of the high delta clusters in Soweto as well as the improved operating performance in Mfuleni and a sound performance in Mitchells Plain.

Primary versus High School

Refer to the table on the following page for results by grade.

During 2014, Numeric entered primary schools for the first time. In keeping with our strategy of maintaining the core and experimenting on the periphery, we increased the number of high schools from 10 to 17, and introduced several new primary school programs. As a result, our mix of primary school to high school has changed from 0:100 to 35:65. This has proved an extremely worthwhile experiment, with primary schools showing higher application rates, acceptance rates, and persistence rates across the board. (Note: South African Grade 7s are in their final year of primary school and Grade 8s are in their first year of high school).

- 54% of Grade 7s applied to join the Numeric program compared with 34% of Grade 8s
- 60% of Grade 7s were accepted into the program compared with 54% of Grade 8s
- 1 in every 3 Grade 7s attended Numeric programs compared with 1 in every 5 Grade 8s
- The persistence rate at primary schools was 85% compared with 68% at high schools

The persistence rate is an important operating metric for Numeric. It measures the percentage of learners from our Term 1 registers who appear on our Term 4 registers (i.e. persist for the full year). The higher the persistence rate, the lower the drop-out rate. Drop-outs are administratively "expensive" for Numeric as replacing a learner takes time, not to mention the time and effort expended in seeking to retain the learner (motivational talks, discussion with parents etc.). Drop-outs also present a problem for the coaches as bringing new learners into the program midway through the year requires added work in order to bring them up to speed.

The persistence rate at our primary schools was materially higher (17 percentage points) higher than in high schools. There are many possible reasons for this.

- Primary schools are much smaller than high schools, with an average grade size of 100 learners compared with 210 learners in high schools. This makes primary schools more intimate and controlled environments and makes it easier to hold learners accountable.
- Our Grade 7s are in their final year at primary school and tend to be more settled and confident in their environment. Our Grade 8s are typically new at their school and tend to experience higher levels of peer pressure.
- The Numeric curriculum (primarily arithmetic and pre-algebra) has a greater level of overlap with the Grade 7 curriculum than with the Grade 8 curriculum. While it is clear that the Grade 8s need this work (average baseline score: 32.8%), they are less likely to observe improvement in their school grades as we do not deal directly with their curriculum.

Table 2. Results by Grade

	F&D Baseline Mark (%)	F&D Endline Mark (%)	F&D Mark Change	NP Baseline Mark (%)	NP Endline Mark (%)	NP Mark Change	Net Shift (%)	SD (Average)	Delta
Bardale Primary	30.8	43.3	12.5	24.6	27.5	2.9	9.6	13.2	0.7
Eisleben Primary	49.8	58.5	8.7	41.1	45.4	4.3	4.4	17.2	0.3
Imperial Primary	52.4	65.1	12.7	44.0	50.1	6.2	6.5	18.2	0.4
Sunnyside Primary	43.8	56.9	13.2	38.5	46.2	7.6	5.5	16.9	0.3
Cape Town Primary Schools	**44.2**	**56.0**	**11.8**	**37.1**	**42.3**	**5.3**	**6.5**	**16.4**	**0.42**
Ikaneng Primary	28.0	35.4	7.4	21.5	24.0	2.5	4.9	10.3	0.5
Lulama Primary	38.3	55.5	17.1	22.9	27.3	4.4	12.7	16.5	0.8
Tiakeni Primary (Grade 6)	23.4	38.7	15.4	15.4	20.2	4.8	10.6	12.0	0.9
Tiakeni Primary (Grade 7)	29.4	42.7	13.4	17.7	21.9	4.2	9.1	15.1	0.6
Vukazenzele Primary	29.1	41.8	12.7	20.4	20.6	0.3	12.4	14.1	0.9
Vulamazibuko Combined (Gr 7)	31.4	46.2	14.8	27.2	33.8	6.6	8.1	13.2	0.6
Johannesburg Primary Schools	**29.9**	**43.4**	**13.4**	**20.8**	**24.6**	**3.8**	**9.6**	**13.5**	**0.70**
Primary School Average	**35.6**	**48.4**	**12.8**	**27.3**	**31.7**	**4.4**	**8.4**	**14.7**	**0.59**
Bardale Secondary	26.9	39.8	12.9	23.4	26.4	3.0	9.9	11.3	0.9
Belgravia High	41.7	49.3	7.7	39.4	41.9	2.5	5.1	15.5	0.3
Bridgetown High	31.4	32.3	0.9	28.0	29.2	1.2	-0.4	13.4	0.0
Garlandale High	38.6	44.9	6.3	32.3	35.4	3.1	3.2	12.9	0.2
Lentegeur High	30.0	41.4	11.4	26.2	30.8	4.6	6.8	11.8	0.6
Manzomthombo Senior Secondary	25.1	38.5	13.4	20.8	23.4	2.6	10.8	10.3	1.1
Mfuleni High	28.0	45.1	17.1	22.5	29.5	7.0	10.1	11.1	0.9
Ned Doman High	27.9	31.9	4.0	25.9	21.4	-4.5	8.5	11.8	0.7
Oval North High	39.0	48.4	9.5	32.6	36.8	4.1	5.3	14.7	0.4
Spes Bona High	31.6	42.1	10.5	28.3	34.6	6.3	4.2	14.6	0.3
Spine Road High	55.1	70.9	15.7	53.6	67.6	14.1	1.7	13.6	0.1
Cape Town High Schools	**34.7**	**45.3**	**10.5**	**30.7**	**35.6**	**4.9**	**5.7**	**12.9**	**0.47**
Bhukulani High	27.7	39.0	11.3	23.4	30.2	6.8	4.5	11.3	0.4
Daliwonga High	27.3	46.5	19.2	23.0	27.4	4.4	14.8	12.3	1.2
Emshukantambo High	33.2	45.2	12.0	23.8	27.4	3.5	8.4	11.7	0.7
Job Rathebe Secondary	26.8	38.6	11.9	20.4	23.1	2.7	9.2	11.0	0.8
Thaba Jabula Secondary	31.8	44.8	13.0	22.0	26.1	4.1	8.9	12.2	0.7
Vulamazibuko Combined (Gr 8)	30.8	60.1	29.3	22.6	36.9	14.3	15.0	13.4	1.1
Johannesburg High Schools	**29.6**	**45.7**	**16.1**	**22.6**	**28.5**	**6.0**	**10.1**	**12.0**	**0.83**
High School Average	**32.8**	**45.4**	**12.6**	**27.6**	**32.9**	**5.3**	**7.4**	**12.6**	**0.61**
Global Average	**33.9**	**46.6**	**12.7**	**27.5**	**32.5**	**4.9**	**7.7**	**13.4**	**0.60**

Whatever the reason, the shift to primary schools has been beneficial for Numeric and has informed our decision to increase our primary: high school mix. In some respects, it is preferable to have learners attend the year-long Numeric program in Grade 7 than in Grade 8. If they attend in Grade 7, they benefit from the strengthened foundations for 5 full school years compared with Grade 8s who will only benefit for 4 full school years.

This is not to say we will cease operating in high schools completely. We run some excellent high school programs, many of which have high persistence rates and deltas. As such, we will selectively continue in high schools where we believe that the management support and culture at the school will sustain a vibrant Numeric program.

Khan Academy versus No Khan Academy

Due to the lack of adequate infrastructure and connectivity in Soweto, Numeric ran its Johannesburg programs in the absence of Khan Academy during 2014. The result is that we ran an unintended experiment whereby Cape Town learners had access to Khan Academy and Johannesburg learners did not. While the experiment was not planned, the results are nonetheless both interesting and informative.

During the year, the average Numeric learner in Cape Town increased from 37.4% to 48.3%, a gross shift of 10.9%. Non-Numeric learners increased from 33.3% to 37.5%, a gross shift of 5.0%. The net shift attributable to Numeric was thus 5.9%, or 0.46 standard deviations from the mean.

Over the same period, the average Numeric learner in Johannesburg increased from 29.8% to 44.5%, a gross shift of 14.8%. Non-Numeric learners increased from 21.7% to 26.6%, a gross shift of 4.9%. The net shift attributable to Numeric was thus 9.9%, or 0.77 standard deviations from the mean.

One might conclude from these results that the traditional teaching model is more effective than the newer Khan Academy environment. Analysis of the results in Table 2 suggests that this is not strictly the case. The results in Cape Town are skewed downwards as a result of the difficulties faced in Athlone (discussed elsewhere in this report), and are also dampened by the high level of "background" in Mitchells Plain. If we exclude Athlone schools, the Cape Town delta increases to 0.58. Furthermore, the Mfuleni cluster did in fact outperform both clusters in Johannesburg, with a delta of 0.89 compared with Mofolo North and Diepkloof whose deltas were 0.76 and 0.78 respectively.

What is clear from the results is that both systems performed well during the year. What is not clear is whether one system is better than, or preferable to, the other. Perhaps the more important take-away from these results is that it is not so much the resources available to the coach (computers, internet, Khan Academy or otherwise) that determine the delta, but the quality of the coaches themselves and the level of support around them. This observation is corroborated by the 2014 results, which show that large and meaningful deltas can be generated by training and appropriately equipping young teachers to do the job properly, regardless of the resources at their disposal.

This is a major departure from the founding premise of Numeric. At the outset of the project four years ago, we were interested to see whether an average facilitator paired with Khan Academy could produce above-average outcomes. We pursued this line of inquiry because the number of skilled maths teachers in South Africa is so low and we wondered whether a technology-based intervention could get around this problem.

We are increasingly of the view that skilled and talented educators are a necessary and indispensable part of the in-classroom process, particularly at the primary and secondary school level. While platforms like Coursera, Udacity and Edx allow independently motivated

adults to self-educate, for children – particularly in the classroom and school environment – a quality coach or teacher is necessary to drive the learning process. This is not to say that Khan Academy is not a powerful classroom tool (it is, and we remain big fans), but it is our observation that running and effectively managing a Khan Academy classroom requires both skill and content knowledge on the part of the coach.

Numeric has thus moved away from a teacher-substitution model and has turned to a teacher-training model. We continue to run after-school maths programs and we continue to use Khan Academy. We do, however, place a much greater focus on our coach development. To illustrate this, total coach training hours pre-placement in our programs was 18 hours in 2012, 40 hours (one week) in 2013, and 80 hours (two weeks) in 2014. Over 90% of Numeric's coaches are bachelor of education students training to become maths teachers. In 2014 we placed 37 pre-service teachers into our programs. In 2015 this number will increase to 60. By training and placing these pre-service teachers into our programs, we not only generate delta amongst our learners, but we can dramatically and positively impact the development of that teacher. With the average public school teacher teaching over 5,000 children during their career, we are confident that the improvement our coaches experience during training and placement with Numeric will have a substantial and positive knock-on effect over time.

To paraphrase a comment by one of our program managers with respect to how we now think about Khan Academy: We do not so much view Khan Academy as the core of our program, but rather as one of the tools available to our coaches in achieving educational outcomes. Like textbooks, workbooks or games, it constitutes one of the resources available to our coaches.

When the internet and lab infrastructure in Johannesburg becomes available, we will introduce Khan Academy to our learners there. Furthermore, Khan Academy will continue to be a key resource for Johannesburg and Cape Town coaches, both in training and in lesson preparation. We remain big fans of the platform and will make use of it whenever possible in order to further our mission of helping young South Africans to excel in Maths.

Outlook

During the final quarter of 2014, Numeric prepared to expand its number of programs from 5 operating units (25 schools) to 7 operating units (35 schools). To this end we hired three new program managers, two of them formerly Teach South Africa ambassadors and one of them a former high school maths teacher. Kristen Thompson will move out of her role as program manager and into a full-time chief program manager role in Cape Town. Out of our full-time operating team of nine people, four are former Teach South Africa ambassadors, five are qualified teachers, and eight have at least two years work experience in Maths education.

With the increase from 25 to 35 schools, the number of Numeric classrooms will grow from 50 to 70 in 2015. In anticipation of the increased coaching requirement, we advertised coaching positions both in Cape Town and Johannesburg. We received 220 applications for coaching positions, interviewed just over 100 candidates, and made offers to 50. During the December holiday, Numeric trained 25 new coaches in Cape Town and 25 new coaches in Johannesburg. The vast majority of these new coaches are second or third year bachelor of education students who in time will become maths teachers.

<u>Cape Town Clusters</u>

Given the difficult operating environment in Athlone, and opportunities to generate delta elsewhere in the Cape Town Metro, Numeric elected to cease operations in Athlone and to shift these resources into a new cluster in Khayelitsha. With one additional cluster in Mitchells Plain, the four Cape Town clusters are:

Mitchells Plain 1
Mitchells Plain 2
Mfuleni
Khayelitsha

The Cape Town team visited and interviewed 27 school management teams across Mfuleni, Khayelitsha and Mitchells Plain and signed MOUs with 11 of these. This is consistent with Numeric's policy of recruiting schools who, although they exist in low-income areas, nonetheless have strong and dedicated management teams. With the establishment of a new cluster in Khayelitsha, the ratio of black to coloured learners in Numeric's programs will shift from 30:70 in 2014 to 50:50 in 2015.

Johannesburg Clusters

With the addition of one operating unit in Johannesburg, Numeric elected to establish a cluster of schools in Pimville (Soweto). The three Johannesburg clusters are thus:

Soweto - Mofolo North
Soweto - Diepkloof
Soweto - Pimville

Given the higher persistence, attendance and buy-in rates at primary schools, Numeric elected to cease running programs in high schools and focus exclusively on primary schools. The Johannesburg team visited and interviewed 29 school management teams in Soweto and recruited 10 new primary schools bringing the total number of partner primary schools in Johannesburg to 15.

In an effort to create continuity for our graduating Grade 7s, Numeric is in negotiations with the University of Johannesburg to run Saturday schools for Grade 8s on UJ premises. This will allow Numeric to introduce the learners to Khan Academy using the Universities computer labs and internet capacity.

Independent Assessment

The independent administration of baseline and endline tests at Numeric's partner schools continues to be a cornerstone of our operating model. Without a financial bottom line, our performance on these baseline and endline tests provides Numeric with a proxy for its performance in any given year.

For the past two years, these evaluations have been conducted by post-graduate students from the UCT economics department. Given the increased scale of the project, this process has been outsourced to a specialist monitoring and evaluation firm Ukufunda Education Consulting who will be responsible for the creation, administration and grading of baseline and endline tests.

While the delta measurements are a core component of our performance analysis, it should be noted that they do not encapsulate the full impact of Numeric operations. The delta does not measure the impact of Numeric's operations on its coaches, attitudinal shifts in its learners, or the impact of Numeric's teacher training programs. Numeric will continue to seek to generate a delta that justifies its cost per learner per month, with the additional (and sometimes intangible) impact on coaches, learners and teachers constituting an excess "return on investment".

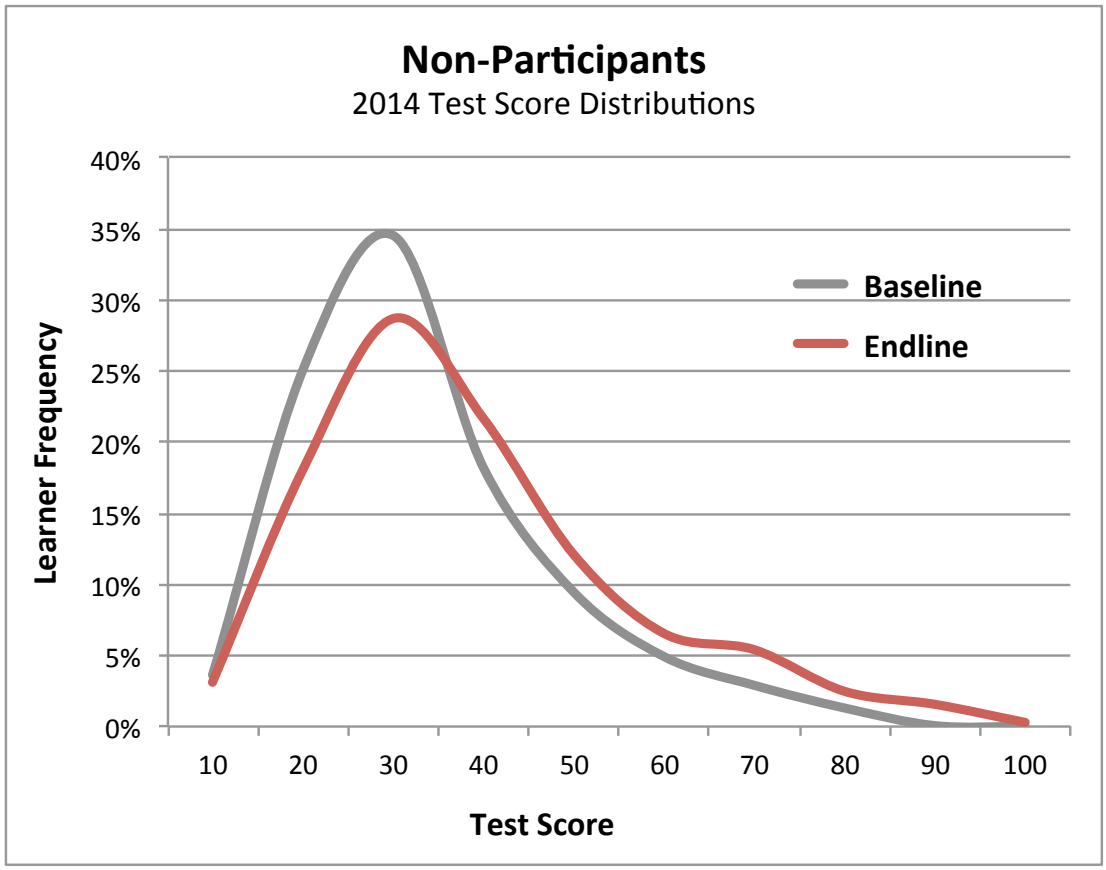
Area	School	Learners Tested	Number Applied	Percentage Applied	Number Accepted	Percentage Accepted	Full Year	Dropped	Full Year / Accepted
AT	Sunnyside Primary	90	44	49%	35	80%	27	8	77%
MP	Eisleben Road Primary	90	43	48%	22	51%	22	0	100%
MP	Imperial Primary	207	88	43%	44	50%	35	9	80%
MF	Bardale Primary	114	82	72%	45	55%	34	11	76%
MN	Tiakeni Gr7	35	24	69%	24	100%	20	4	83%
MN	Tiakeni Gr6	38	37	97%	23	62%	22	1	96%
MN	Vukazenzele	89	79	89%	44	56%	42	2	95%
DP	Ikaneng	173	74	43%	44	59%	30	14	68%
DP	Lulama	73	39	53%	22	56%	21	1	95%
DP	Vulamazibuko Gr7	101	36	36%	22	61%	17	5	77%
	Primary Schools (Grade 7s)	**1010**	**546**	**54%**	**325**	**60%**	**270**	**55**	**85%**
AT	Ned Doman	75	61	81%	42	69%	16	26	38%
AT	Bridgetown	138	39	28%	20	51%	11	9	55%
AT	Spes Bona	155	47	30%	41	87%	26	15	63%
AT	Garlandale	172	39	23%	25	64%	14	11	56%
AT	Belgravia	209	51	24%	40	78%	27	13	68%
MP	Spine Road	269	161	60%	68	42%	54	14	79%
MP	Lentegeur	263	76	29%	44	58%	38	6	86%
MP	Oval North	331	152	46%	66	43%	49	17	74%
MF	Mfuleni	254	102	40%	42	41%	31	11	74%
MF	Manzomthombo	303	104	34%	42	40%	37	5	88%
MF	Bardale Secondary	187	57	30%	40	70%	31	9	78%
MN	Bhukulani	265	78	29%	43	55%	31	12	72%
MN	Daliwonga	155	35	23%	22	63%	16	6	73%
MN	Emshukanthambo	219	82	37%	48	59%	30	18	63%
DP	Vulamazibuko Gr8	100	29	29%	23	79%	22	1	96%
DP	Job Rathebe	286	74	26%	43	58%	11	32	26%
DP	Thaba Jabula	219	89	41%	45	51%	29	16	64%
	High Schools (Grade 8s)	**3600**	**1276**	**35%**	**694**	**54%**	**473**	**221**	**68%**
	Numeric Totals	**4610**	**1822**	**40%**	**1019**	**56%**	**1013**	**331**	**74%**

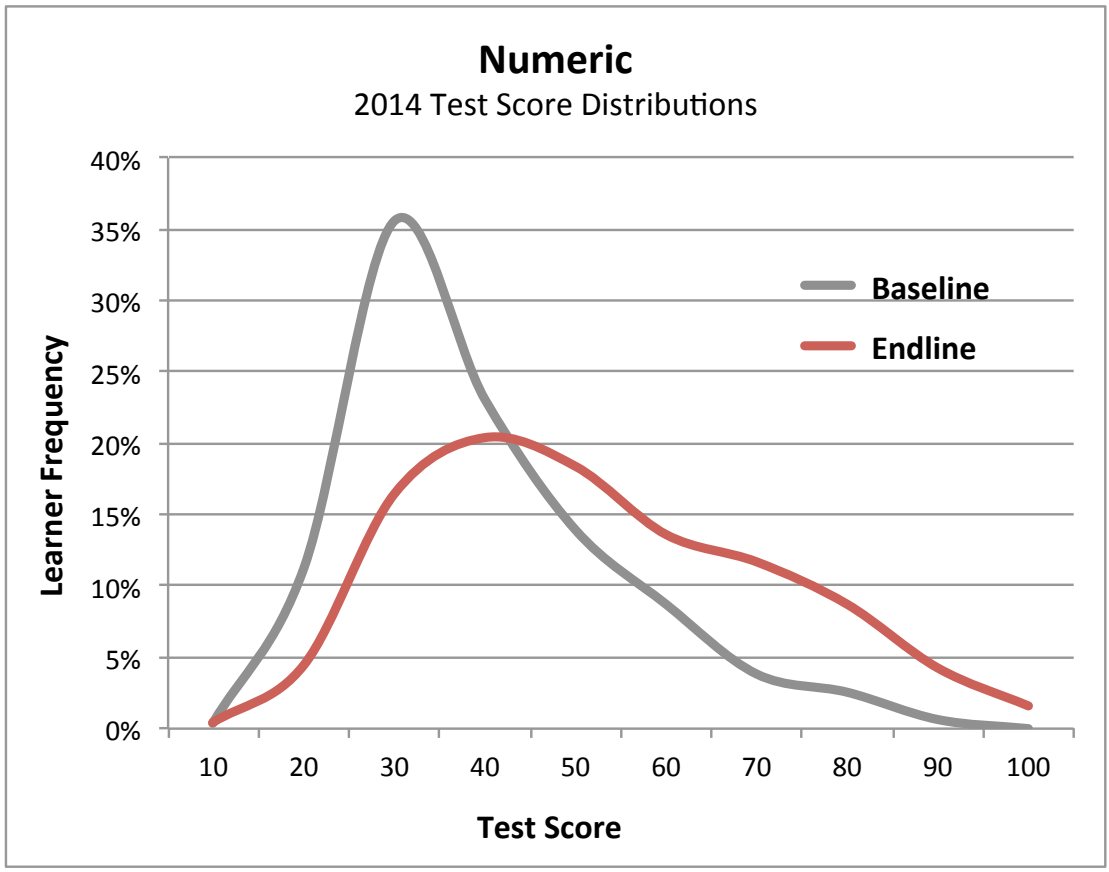
Appendix B

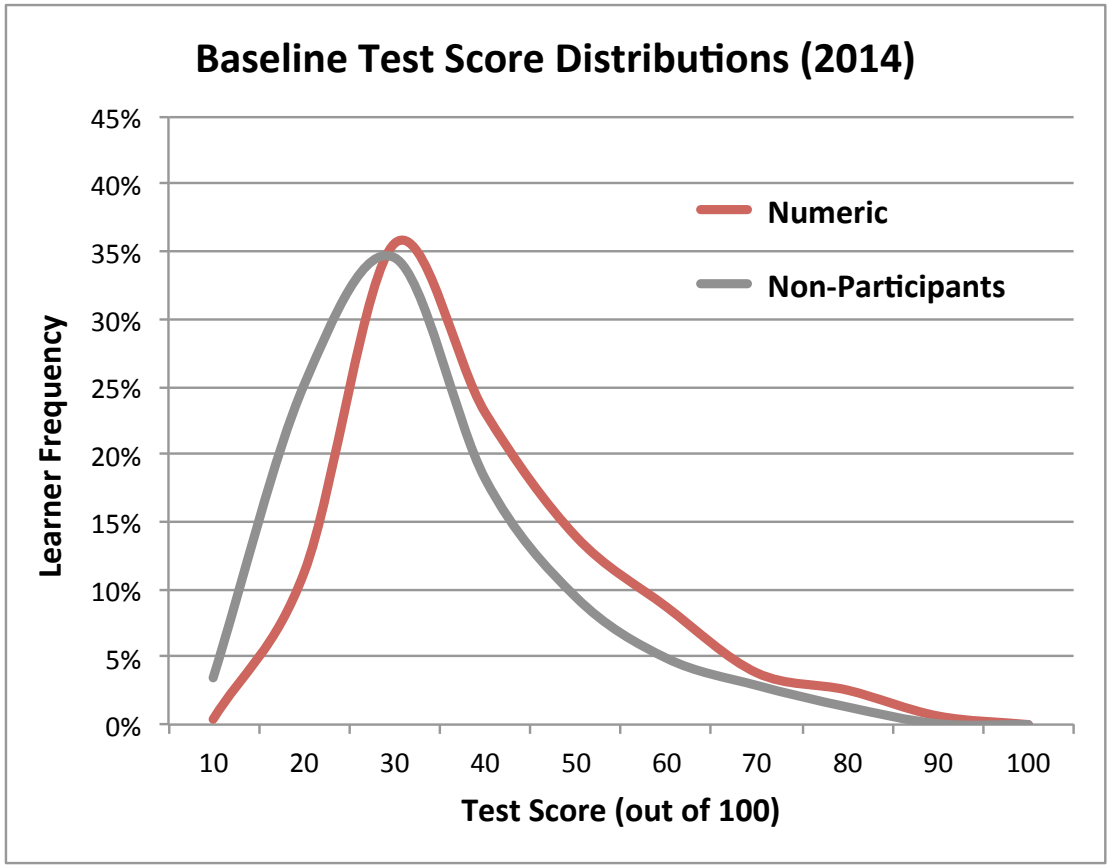
2013 Results

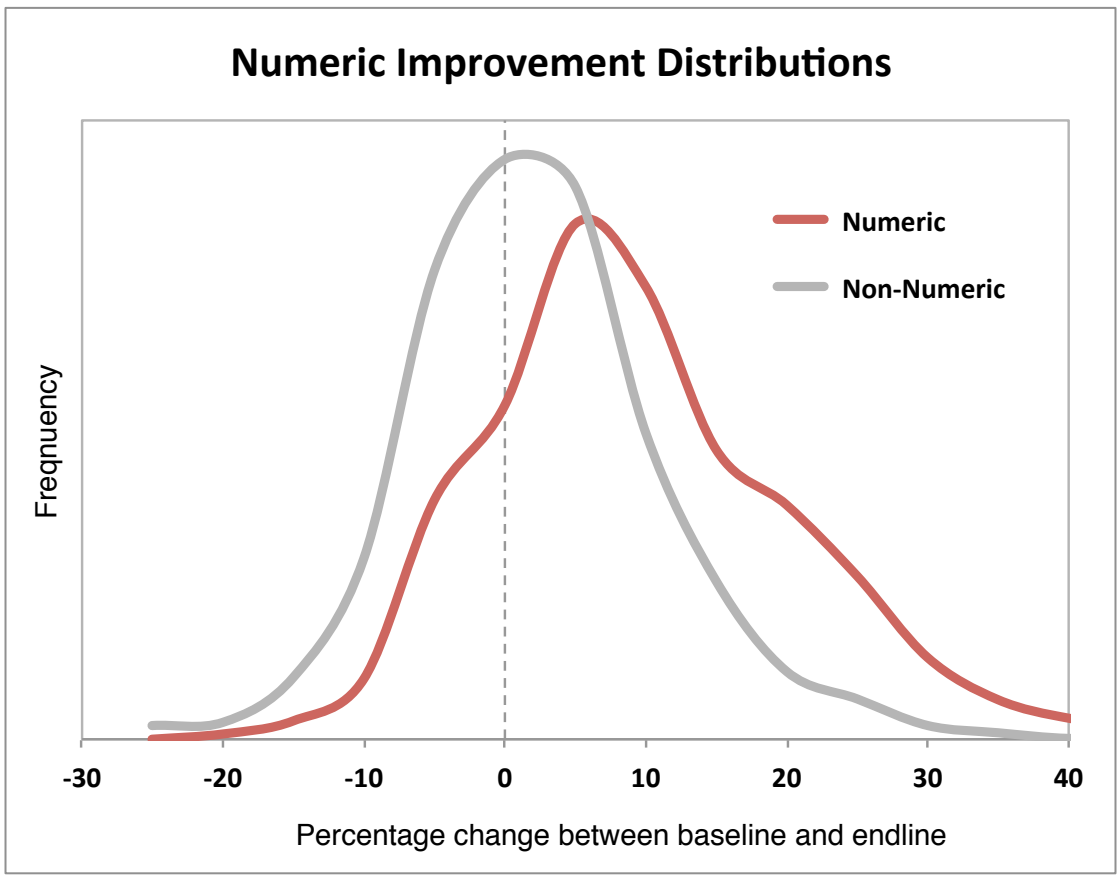
School	1. F&D Baseline Mark	3. F&D Endline Mark	1. Numeric Mark Change	1.NP Baseline Mark	3. NP Endline Mark	2. NP Mark Change	3. F&D - NP	4. Average Standard Deviation	5. F&D - NP Difference/ Standard Dev
Esangweni*	30,5	30,5	-	38,0	38,5	1,6	(1,6)	18,6	(0,1)
Manzomthombo	40,3	47,5	7,2	33,8	35,7	(2,5)	9,7	13,2	0,7
Mfuleni	34,4	50,5	16,1	34,4	42,3	6,5	9,6	14,3	0,7
Mfuleni Schools	**37,3**	**49,0**	**11,7**	**34,1**	**39,0**	**2,0**	**9,6**	**13,8**	**0,70**
Lentegeur	39,7	47,1	7,3	36,6	39,6	0,8	6,5	14,4	0,5
Spine Road	62,8	75,8	13,1	59,0	66,0	6,7	6,4	15,1	0,4
Mitchells Plain Schools	**51,2**	**61,4**	**10,2**	**47,8**	**52,8**	**3,7**	**6,5**	**14,8**	**0,44**
Belgravia	51,9	56,0	4,1	50,6	51,7	(1,9)	6,0	16,5	0,4
Bridgetown	47,1	51,4	4,3	40,1	42,0	(0,1)	4,4	15,4	0,3
Garlandale	49,4	58,3	8,8	44,6	48,7	9,0	(0,2)	15,9	(0,0)
Rylands	56,4	61,7	5,3	57,5	58,7	3,1	2,2	17,2	0,1
Spes Bona	41,4	42,2	0,8	50,3	54,7	0,3	0,6	18,5	0,0
Athlone Schools	**49,3**	**53,9**	**4,7**	**48,6**	**51,2**	**2,1**	**2,6**	**16,7**	**0,16**
Cape Town Summary	**47,1**	**54,5**	**7,5**	**45,2**	**48,8**	**2,4**	**5,0**	**15,6**	**0,34**

Appendix C **Results Charts and Distributions**






Baseline Test Score Distributions (2014)
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
Learner Frequency
Numeric
Non-Participants
10
20
30
40
50
60
70
80
90
100
Test Score (out of 100)


Numeric Improvement Distributions
Freqnuency
Numeric
Non-Numeric
-30
-20
-10
0
10
20
30
40
Percentage change between baseline and endline

Appendix D Explanation of the Delta

The explanations below are borrowed from articles written by Chuck Huber (senior statistician at Statacorp, Texas) and Lee Becker (University of Hamburg, Germany).

What are Effect Sizes (or Deltas)?

The importance of research results is often assessed by statistical significance, usually that the p-value is less than 0.05. P-values and statistical significance, however, don't tell us anything about practical significance.

What if I told you that I had developed a new weight-loss pill and that the difference between the average weight loss for people who took the pill and those who took a placebo was statistically significant? Would you buy my new pill? If you were overweight, you might reply, "Of course! I'll take two bottles and a large order of french fries to go!". Now let me add that the average difference in weight loss was only one pound over the year. Still interested? My results may be statistically significant but they are not practically significant.

Or what if I told you that the difference in weight loss was not statistically significant — the p-value was "only" 0.06 — but the average difference over the year was 20 pounds? You might very well be interested in that pill.

The size of the effect tells us about the practical significance. P-values do not assess practical significance. All of which is to say, one should report parameter estimates along with statistical significance.

In my examples above, you knew that 1 pound over the year is small and 20 pounds is large because you are familiar with human weights. In another context, 1 pound might be large, and in yet another, 20 pounds small. Formal measures of effects sizes are thus usually presented in unit-free but easy-to-interpret form, such as standardized differences and proportions of variability explained.

Computing the Delta

Effect sizes that measure the scaled difference between means belong to the "delta" family. The generic formula is for computing the delta is:

$$Delta = \frac{\mu 1 - \mu 2}{\sigma}$$

Where $\mu 1$ is the mean for the treatment group, $\mu 2$ is the mean for the untreated group, and σ is the standard deviation of the data

Interpretations of the Delta

Cohen (1988) hesitantly defined effect sizes as "small, d = .2," "medium, d = .5," and "large, d =.8", stating that "there is a certain risk in inherent in offering conventional operational definitions for those terms for use in power analysis in as diverse a field of inquiry as behavioral science".

Effect sizes can also be thought of as the average percentile standing of the average treated participant relative to the average untreated participant. An ES of 0.0 indicates that the mean of the treated group is at the 50th percentile of the untreated group. An ES of 0.8 indicates that the mean of the treated group is at the 79th percentile of the untreated group. An effect size of 1.7 indicates that the mean of the treated group is at the 95.5 percentile of the untreated group.

Effect sizes can also be interpreted in terms of the percent of non-overlap of the treated group's scores with those of the untreated group. An ES of 0.0 indicates that the distribution of scores for the treated group overlaps completely with the distribution of scores for the untreated group, there is 0% of non-overlap. An ES of 0.8 indicates a non-overlap of 47.4% in the two distributions. An ES of 1.7 indicates a non-overlap of 75.4% in the two distributions.

Sources: Lee A Becker (University of Hamburg); Chuck Huber (Senior Statistician, Statacorp, Texas)