Annual Numeracy Program Report 2014

The SiMERR National Research Centre
The University of New England
ARMIDALE NSW

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1 *QuickSmart* Executive Summary in 2014

Students who experience ongoing failure in upper-primary and lower-secondary school face a myriad of difficulties in pursuing post-school options and contributing to society through employment and aware citizenship. Those who exhibit consistent weaknesses in basic skills, such as the recall of number facts, or who experience difficulty with reading and comprehension are particularly vulnerable. These students are usually caught in a cycle of continued failure, as it is particularly difficult to bring about sustainable change within the usual classroom environments for students who by Year 4 are persistently at or below national benchmarks.

Three issues confront schools in Australia with regard to addressing the needs of at-risk students.

1. Too many Australian Indigenous and non-Indigenous students have shown to be resistant to improvements in learning despite large investments of funds to overcome their problems. Longitudinal national data indicate that low-achieving students have not drawn lasting benefits from most current in-class and withdrawal instructional activities.
2. Teaching assistants are an underutilised, poorly supported, and seldom recognised resource in school education. With appropriate training these adults are highly motivated, and offer cost-effective, long-term sustainable ways to close the achievement gap for low-achieving students. In remote and rural areas, trained Indigenous teaching assistants (as *QuickSmart* Instructors) are a resource able to enrich their whole community.
3. Educational support programs need to be sustainable in the short- and long-term without large drains on the public purse. Sustainability means cost-efficient, clear exit criteria, proven longitudinal results, documented ongoing benefits for students and instructors, and replicable (including quality assurance) across all regions of Australia.

The analyses presented in this report provide information about students' performance in the QuickSmart Numeracy program. In particular, the focus here is on the Cognitive Aptitude Assessment System, Australian version (OZCAAS) and on standardised test measures, specifically the Progressive Achievement Tests in Mathematics (ACER, 2005). Some schools provided data for other independent tests, however, there was insufficient use of these tests for inclusion in this report. Further investigation of the data in this report examines the results in terms of gender and for the participating Indigenous students.

In 2014, the *QuickSmart* team at the University of New England received data from 6350 students who participated in *QuickSmart* Numeracy lessons and 1601 average-achieving comparison peers. These students were drawn from schools from 29 regions around Australia. Further data were also submitted for independent analysis to the Northern Territory (NT) Department of Education and Training by NT schools.

In terms of the OZCAAS (a random number computer generated testing approach that measures the time and the accuracy of basic arithmetic computation) the results for the four operations offered at each of two levels indicate a strong to substantial improvement for the *QuickSmart* students in terms of accuracy and speed. The diagrammatic evidence illustrate that the *QuickSmart* students narrowed the achievement gap by improving to such an extent that there was either no substantial difference between them and the comparison students or they had reached a slightly better level of performance than their comparison group peers.

Such growth is a critical requirement for these *QuickSmart* students as number facts are a vital skill underpinning mathematics functioning in general. This improvement provides the necessary foundation for students to improve in other areas of mathematics that are not specifically taught in *QuickSmart*.

Some small differences between male and female students were observed. Females performed slightly better in most operations. However, except in two of the sixteen analyses undertaken these differences (both related to subtraction) were not significant. As a result, these data do not warrant further investigation.

It is acknowledged that Indigenous students had lower starting and finishing points in most operations but their overall improvement in terms of effect size is rated very strong to substantial over all operations.

A mark of the success of *QuickSmart* is the results of those students, who did not succeed in completing the pre-test. In such cases Instructors were advised not to continue collecting data as doing so would have confronted these students dramatically with their weaknesses at the beginning of the program. These students did manage to complete all OZCAAS assessments at the end of the program.

The results for this cohort are impressive given that these students did not have the skills or confidence to complete the OZCAAS pre-tests initially. In addition and subtraction, the average response rates were below 3.4 seconds and above 92.7% accuracy. In multiplication and division the average response speeds were below 4.3 seconds and accuracy over 77.8% at post-test. This improvement is most likely due to:

1. there has been some mutually beneficial development of the common areas of the brain that process the four operations;
2. students have increased their ability to benefit from classroom instruction; and
3. students' overall improved levels of confidence may have led to a 'have a go attitude' that was not present at the beginning of the *QuickSmart* program.

In the case of the ACER PATM tests, Norm Tables (2005) were used to convert raw scores from various forms of the PATM to consistent Scale scores, which were used for all subsequent calculations. Two analyses were undertaken on the PATM scores.

The first analysis presents a calculation of a standard gain score and the significance of this result. The second analysis is an Effect Size calculated from the Means and Standard Deviations on PATM scores for each group. Effect Size statistics indicate the magnitude of the change in academic achievement for the *QuickSmart* and comparison students.

The results indicate a very strong improvement for *QuickSmart* students. This improvement is greater than those recorded for the comparison group of their average-achieving peers. The gain recorded here for the *QuickSmart* group is also well in excess of the expected yearly growth of students' scores as measured on the PATM assessment of five scale score points.

The results of independent sample *t*-tests of *QuickSmart* students show that for the ACER PAT results the differences in male and female scores are not statistically significant at the 0.01 significance level (p = 0.091).

Once again, these results show substantial improvement for the Indigenous students who participated in *QuickSmart*. This improvement is greater than that of the overall *QuickSmart* group. Their improvement is also in excess of the expected yearly growth of students' scores as measured on the PATM assessment of 5 scale score points.

Overall, the focus of this report is on the quantitative aspects of the program. In all analyses, the data report a narrowing of the achievement gap between *QuickSmart* students and their average-performing comparison group peers. Impressive Effect Sizes have been reported as well as highly significant gains on the part of individual students who, in some cases, could not complete the full suite of pre-test assessments.

Additionally, substantial qualitative data (reported in school presentations during professional workshops 2 and 3) indicate that *QuickSmart* students gained a new confidence in the area of mathematics. Many stories within the corpus of qualitative data document improvements for *QuickSmart* students not only in relation to their performance in class, but also with regard to students' attitudes to school, their attendance rates and levels of academic confidence both inside and outside the classroom.

The data collected to date from tens of thousands of *QuickSma*rt students indicate that the narrowing of the achievement gap between *QuickSmart* and comparison students results in low-achieving students proceeding with their studies more successfully by learning to 'trust their heads' in the same ways that effective learners do. Importantly, previous *QuickSmart* studies demonstrate that *QuickSmart* students can maintain the gains made during the program for years after they completed the program. Analyses have consistently identified impressive statistically significant end-of-program and longitudinal gains in terms of probability measures and effect sizes that mirror the qualitative improvements reported by teachers, paraprofessionals, parents and *QuickSmart* students.

2 Background

2.1 Purpose of *QuickSmart*

The prime purpose of the *QuickSmart in Schools* program is to reverse the trend of ongoing poor academic performance for students who have been struggling at school and who are caught in a cycle of continued failure. These targeted students experience significant and sustained difficulties in basic mathematics and/or literacy, and have a profile of low progress despite attempts to overcome their learning problems. Many such students have not drawn lasting benefits from other in-class and withdrawal instructional activities.

A second purpose concerns the professional learning program designed for classroom teachers, special needs support teachers, and paraprofessionals to learn how to work with, and significantly improve, the learning outcomes in basic mathematics and/or literacy of under-achieving middle-school students. The program features professional learning and support for working in a small-class instructional setting with two students, using a specially constructed teaching program supported by extensive material and computer-based resources.

2.2 *QuickSmart* program description

The *QuickSmart* Numeracy and Literacy interventions were developed through the National Centre of Science, Information and Communication Technology and Mathematics Education for Rural and Regional Australia (SiMERR) at the University of New England, Armidale. The *QuickSmart* programs have been under development and continuous improvement since 2001, involving many tens of thousands of students.

The intervention is called *QuickSmart* to encourage students to become *quick* in their response speed and *smart* in their understanding and the strategic use of mental and other resources. In *QuickSmart*, the aim is to improve students' information retrieval times to levels that free working-memory capacity from an excessive focus on mundane or routine tasks. In this way, students are able to engage meaningfully with more demanding cognitive activities. In these interventions, automaticity is fostered; time, accuracy and understanding are incorporated as key dimensions of learning; and an emphasis is placed on ensuring maximum student on-task time. *QuickSmart* lessons develop learners' abilities to monitor their academic learning and set realistic goals for themselves.

3 *QuickSmart* Tests — 2014

3.1 Introduction

Three major sets of analyses help quantify the academic benefits of the *QuickSmart* program. These analyses are presented in this report and provide information about students' performance:

(i) on the Cognitive Aptitude Assessment System, Australian version (OZCAAS);
(ii) on standardised test measures, specifically the Progressive Achievement Tests in Mathematics (ACER, 2005); and
(iii) in terms of gender and participating Indigenous students.

The first analysis examines data from speed and accuracy OZCAAS measures related to arithmetic operations collected at the beginning and end of the *QuickSmart* program. These results are a direct measure of the work of *QuickSmart* instructors and reflect the primary focus of the *QuickSmart* lessons.

Eight tests measured students' speed and accuracy both before *QuickSmart* began and at the end of the program. The tests were:

1. Basic Addition facts;
2. Addition facts;
3. Basic Subtraction facts;
4. Subtraction facts;
5. Basic Multiplication facts;
6. Multiplication facts;
7. Basic Division facts; and
8. Division facts.

The second set of analyses concerns the results of independent tests in mathematics. Most schools utilise the Progressive Achievement Test Mathematics (PATM) assessment for this purpose. This is a standardised test developed by the Australian Council for Education Research (ACER). The PATM is an independent test taken prior to commencement of *QuickSmart* and at the completion of the program. Students' PATM results provide information about how the knowledge, skills and attitudes developed in *QuickSmart* are used, and how they transfer to other broad areas of mathematics, which are not the target of *QuickSmart* instruction.

The third set of analyses includes further analyses of the data by gender, and participating Indigenous students.

The results from these analyses are reported below in separate sections. (Note: Some schools provided data for other independent tests, however, there was insufficient use of these tests for inclusion in this report.)

3.2 Background to Test interpretation

For all tests in this study (OZCAAS and PATM) the comparison group represents average-achieving students selected from the same class as *QuickSmart* students. The comparison students did the pre-intervention and post-intervention tests but did not receive any *QuickSmart* small-class instruction. It is important to note that the comparison students do not represent a 'true' control group because they do not share the same achievement starting points with the *QuickSmart* students. The former were average-achieving students, the latter were low-achieving students. This point is demonstrated in all tables of results in this report with comparison students achieving better average pre-intervention scores than students in the *QuickSmart* group.

As is often the case in educational studies of this nature, to obtain a ‘true’ control group could be ethically problematic since this would potentially deprive a selected group of low-achieving students of the educational benefits that other low-achieving students, (often) in the same class would receive. Thus, even though the results in this report consistently show that the *QuickSmart* students improve more than the comparison students, it has to be borne in mind that, if the comparison group consisted of low-achieving students, it is most likely that the *QuickSmart* students would show an even greater margin of improvement relative to that group of comparison students.

Additionally, as *QuickSmart* programs become established in schools, sometimes even within the first year of operation, it becomes increasingly difficult to establish even a true ‘comparison’ group. This occurs as more and more *QuickSmart* practitioners are sharing *QuickSmart* teaching practices, resources and activities throughout their schools. Our information from school reports is that a majority of Principals begin this school wide implementation of *QuickSmart* in their schools within the first two years. While this attests to the impact that *QuickSmart* is having in schools, it does not allow a straightforward interpretation of results. Specifically, in many schools average-achieving comparison students are receiving some experience with *QuickSmart* approaches, activities and resources in their classrooms, and consequently their scores are higher at post-test because of this exposure.

It should also be noted that in order to obtain the difference between the improvement of *QuickSmart* students and comparison students we analysed the data using paired-samples *t*-tests. To protect against the cascading Type I error associated with multiple *t*-tests we lowered the significance level from the customary 0.05 to 0.01. (The reason for this is to adjust for the situation where *t*-tests are repeated many times. This repetition means that, on average, the decision that the means of two groups are significantly different would be incorrect one time in every one hundred replications.) This means that in our analysis for any two means to be judged significantly different from each other, there has to be a less than 1% chance that the result was obtained by chance.

4 Results on the OZCAAS assessments

4.1 Introduction

In 2014, the *QuickSmart* team at the SiMERR National Research Centre at the University of New England received matched data from 6350 students who participated in *QuickSmart* Numeracy lessons and 1601 average-achieving comparison peers. These students were drawn from schools from 29 regions around Australia. Further data were also submitted for independent analysis to the Northern Territory (NT) Department of Education and Training by NT schools.

To assist with interpretation of these results, the tests are shown below in reverse order as often the most revealing results are shown in the operations which are at first weakest, in this case division. A detailed analysis of division is also provided. It is important to note that interpretation of results in some other operations (e.g., basic addition) can be impacted by a 'ceiling effect' as many students record strong results at pre-test and this does not leave much room for improvement. The OZCAAS results recorded for average-achieving comparison students should also be interpreted with the knowledge that many of these students' results were constrained by a ceiling effect.

The results of our analyses of data related to OZCAAS are presented in Tables 1 to 8 below. A detailed discussion of Table 1 is provided for clarification purposes and as a model for understanding the results in Tables 2 to 8.

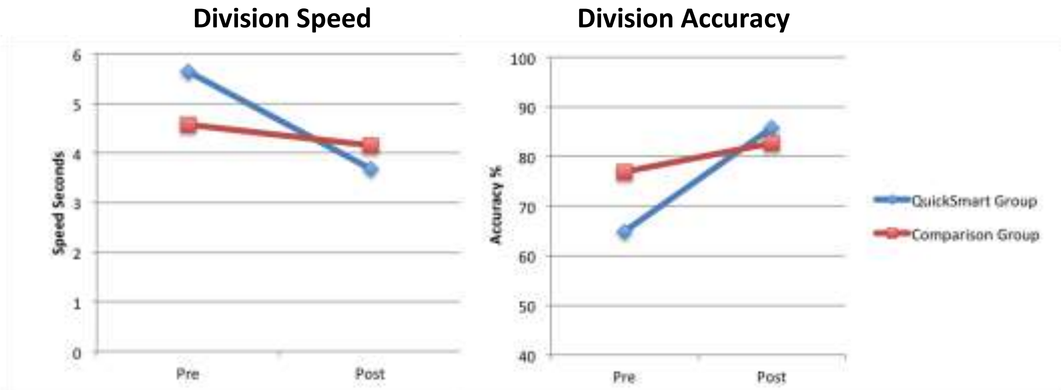
4.2 Combined OZCAAS Analysis

4.2.1 Division

Table 1 below summarises the data submitted for OZCAAS division.

Table 1: OZCAAS division – all students 2014

Division	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Speed (secs) QS	3881	5.637	2.791	3.684	2.268	-1.953	<0.001*	0.768
Speed (secs) Comp	1075	4.569	2.536	4.155	2.332	-0.414	<0.001*	0.17
Accuracy (%) QS	3881	64.853	24.446	85.723	18.307	20.87	<0.001*	0.966
Accuracy (%) Comp	1075	76.894	21.367	82.713	18.559	5.819	<0.001*	0.291



On the division test, there were paired data for 3881 *QuickSmart* students and 1075 comparison students. The desired criterion for response speed on the OZCAAS assessments is between 1 and 2 seconds as an indication of automaticity. The decrease in time for *QuickSmart* students is 1.953 seconds, which is a strong result (Note: The negative number in the table means that the post-test time is lower than the pre-test time which is the desired pattern of improvement.) The effect size for this result is 0.768, which indicates very strong improvement.

Effect size statistics can be understood based on the work of Hattie (Hattie, J. 2009. *Visible Learning: A synthesis of over 800 meta-analyses relating to achievement.* London: Routledge) such that over an academic year for a student cohort:

- Effect sizes below 0.2 are considered **poor**;
- Effect sizes within the range of 0.2 to 0.4 are considered **appropriate**;
- Effect sizes within the range of 0.4 to 0.6 are considered **strong**;
- Effect sizes within the range of 0.6 and 0.8 are considered **very strong**; and
- Effect sizes above 0.8 are considered **substantial improvement** of the order of nearly three years' growth.

In terms of accuracy, the *QuickSmart* students' average scores have improved by over 20 percentage points, which is a very strong result. The effect size for this result is 0.966, which again indicates substantial improvement for the *QuickSmart* group.

Division is typically (but not always) the final focus of the *QuickSmart* program for students. As a result a number of students may not reach the lessons that focus on division facts. Interestingly, students still appear to make important gains even if lessons on division had not been undertaken. It appears that there is some residual benefit from other earlier aspects of *QuickSmar*t learning that has been transferable.

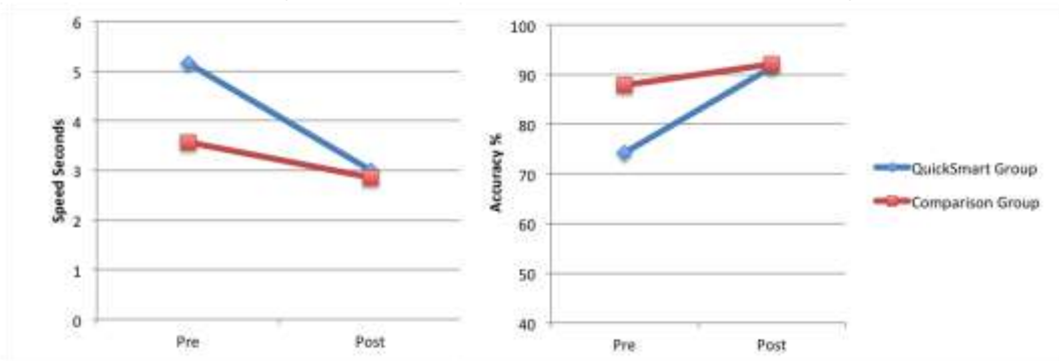
In summary, Table 1 shows that when compared to the scores of the comparison students, *QuickSmart* students' scores indicate an improved performance with very strong for speed in division and with substantial improvement for accuracy. The diagrams illustrate the *QuickSmart* students improved to reach a slightly better level than the comparison average-achieving peers.

4.2.2 Basic Division

Table 2: OZCAAS basic division – all students 2014

Basic Division	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Speed (secs) QS	1360	5.149	2.852	3.006	1.891	-2.143	<0.001*	0.886
Speed (secs) Comp	341	3.569	2.043	2.858	1.481	-0.712	<0.001*	0.399
Accuracy (%) QS	1360	74.167	23.797	91.433	13.534	17.266	<0.001*	0.892
Accuracy (%) Comp	341	87.774	14.631	92.06	12.771	4.286	<0.001*	0.312

Basic Division Speed **Basic Division Accuracy**



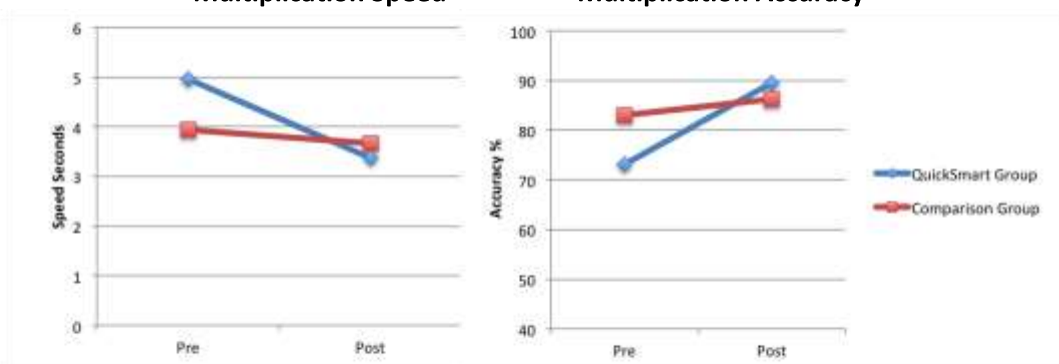
In summary, the results for basic division indicate a substantial improvement in effect size for the *QuickSmart* students in both speed and accuracy. The diagrams illustrate that the *QuickSmart* students improved to such an extent that there was no substantial difference between them and the comparison students.

4.2.3 Multiplication

Table 3: OZCAAS multiplication – all students 2014

Multiplication	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Speed (secs) QS	4514	4.963	2.623	3.366	2.165	-1.596	<0.001*	0.664
Speed (secs) Comp	1173	3.933	2.335	3.659	2.131	-0.275	<0.001*	0.123
Accuracy (%) QS	4514	73.106	20.275	89.42	14.994	16.314	<0.001*	0.915
Accuracy (%) Comp	1173	83.01	17.621	86.198	16.087	3.188	<0.001*	0.189

Multiplication Speed **Multiplication Accuracy**

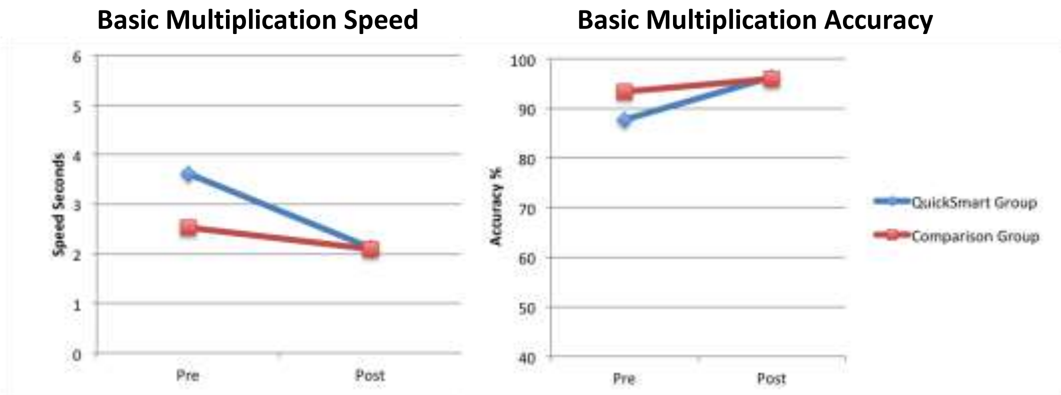


In summary, the results for multiplication indicate a very strong improvement for the *QuickSmart* students in speed and a substantial improvement in accuracy. The diagrams illustrate that the *QuickSmart* students improved to reach a slightly better level of performance than the comparison students.

4.2.4 Basic Multiplication

Table 4: OZCAAS basic multiplication – all students 2014

Basic Multiplication	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Speed (secs) QS	1603	3.614	2.399	2.122	1.358	-1.492	<0.001*	0.765
Speed (secs) Comp	367	2.536	1.469	2.094	1.194	-0.442	<0.001*	0.33
Accuracy (%) QS	1603	87.72	16.553	96.343	7.773	8.623	<0.001*	0.667
Accuracy (%) Comp	367	93.301	10.794	96.033	8.81	2.732	<0.001*	0.277

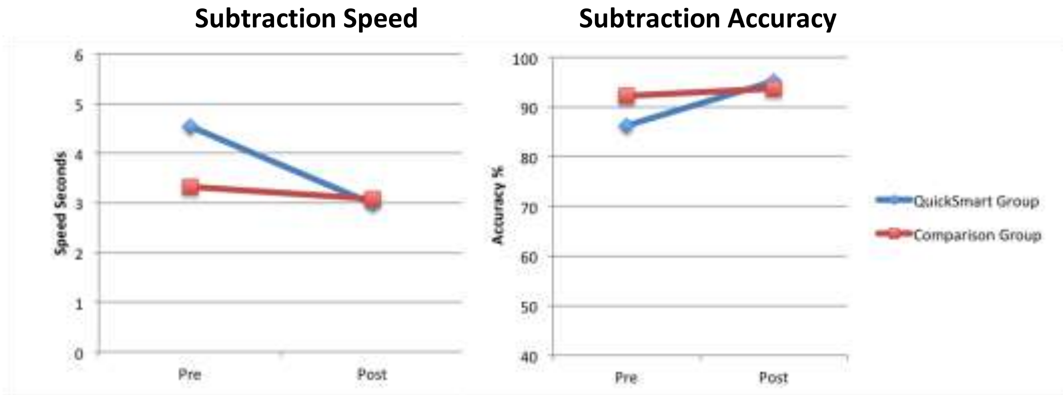


In summary, the results for basic multiplication indicate a very strong improvement for the *QuickSmart* students in both speed and accuracy. The diagrams illustrate that the *QuickSmart* students improved to such an extent that there was no substantial difference between them and the comparison students.

4.2.5 Subtraction

Table 5: OZCAAS subtraction – all students 2014

Subtraction	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Speed (secs) QS	4623	4.534	2.519	2.976	1.721	-1.558	<0.001*	0.722
Speed (secs) Comp	1182	3.327	1.866	3.073	1.783	-0.254	<0.001*	0.139
Accuracy (%) QS	4623	86.194	14.519	95.094	8.415	8.9	<0.001*	0.75
Accuracy (%) Comp	1182	92.218	10.099	93.696	8.379	1.478	<0.001*	0.159

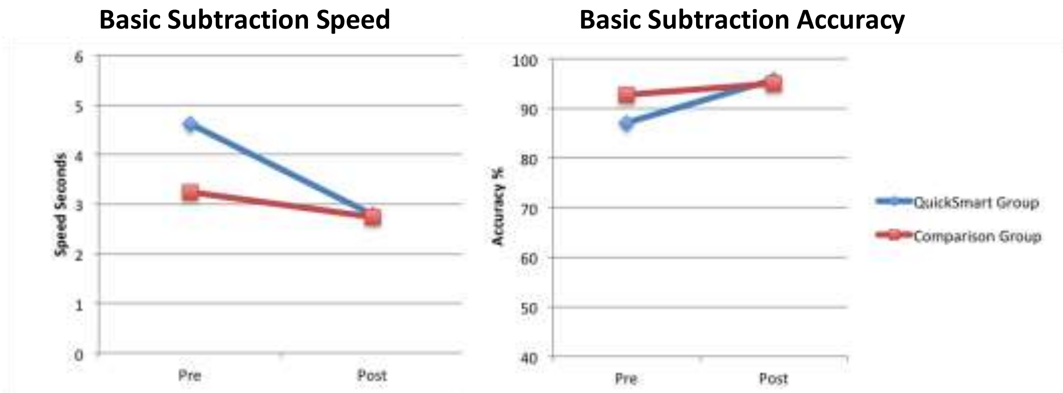


In summary, the results for subtraction indicate a very strong improvement for the *QuickSmart* students in both speed and accuracy. The diagrams illustrate that the *QuickSmart* students improved to such an extent that there was no substantial difference between them and the comparison students.

4.2.6 Basic Subtraction

Table 6: OZCAAS basic subtraction – all students 2014

Basic Subtraction	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Speed (secs) QS	2640	4.626	2.492	2.781	1.647	-1.846	<0.001*	0.874
Speed (secs) Comp	569	3.248	2.003	2.737	1.53	-0.511	<0.001*	0.287
Accuracy (%) QS	2640	87.091	13.593	95.78	7.788	8.689	<0.001*	0.784
Accuracy (%) Comp	569	92.746	11.058	94.96	8.699	2.214	<0.001*	0.223



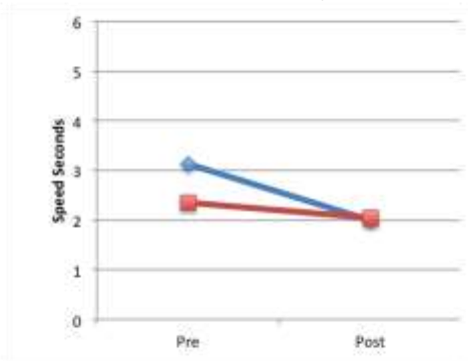
In summary, the results for basic subtraction indicate a substantial improvement for the *QuickSmart* students in speed and a very strong improvement in accuracy. The diagrams illustrate that the *QuickSmart* students improved to such an extent that there was no substantial difference between them and the comparison students.

4.2.7 Addition

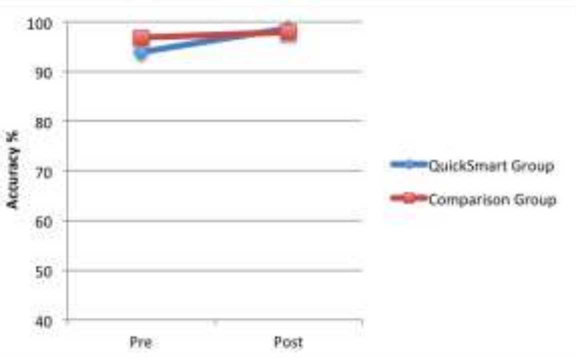
Table 7: OZCAAS addition – all students 2014

Addition	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Speed (secs) QS	4858	3.13	1.556	1.995	0.928	-1.135	<0.001*	0.886
Speed (secs) Comp	1208	2.353	1.15	2.042	0.926	-0.311	<0.001*	0.298
Accuracy (%) QS	4858	93.897	8.743	98.757	3.519	4.86	<0.001*	0.729
Accuracy (%) Comp	1208	96.833	5.589	97.978	4.52	1.145	<0.001*	0.225

Addition Speed



Addition Accuracy



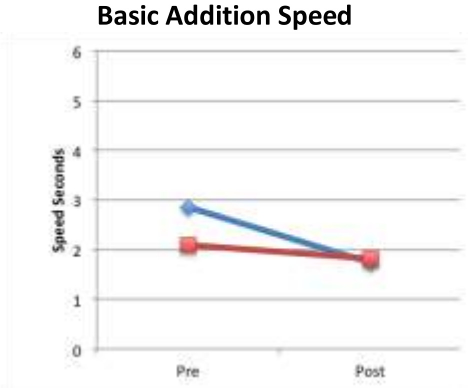
In summary, the results for addition indicate a strong improvement for the *QuickSmart* students in accuracy and a substantial improvement in speed. The diagrams illustrate that the *QuickSmart* students improved to such an extent that there was no substantial difference between them and the comparison students. In accuracy, both *QuickSmart* and comparison students exhibit a strong ceiling effect.

4.2.8 Basic Addition

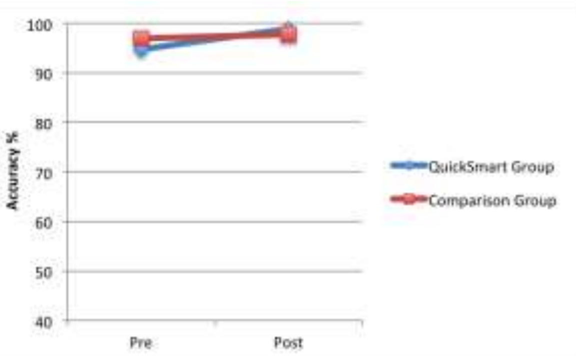
Table 8: OZCAAS Basic Addition results – all students 2014

Basic Addition	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Speed (secs) QS	2641	2.853	1.47	1.729	0.793	-1.123	<0.001*	0.951
Speed (secs) Comp	573	2.088	1.219	1.819	0.942	-0.269	<0.001*	0.247
Accuracy (%) QS	2641	94.715	7.823	98.8	3.262	4.085	<0.001*	0.682
Accuracy (%) Comp	573	96.857	6.379	97.824	5.707	0.967	<0.001*	0.16

Basic Addition Speed



Basic Addition Accuracy



In summary, the results for basic addition indicate a strong improvement for the *QuickSmart* students in accuracy and a substantial improvement in speed. The diagrams illustrate that the *QuickSmart* students improved to such an extent that there was no substantial difference between them and the comparison students. In accuracy, both *QuickSmart* and comparison students exhibit a strong ceiling effect.

4.3 OZCAAS By Demographics

4.3.1 Division by Gender

The following tables show an analysis of OZCAAS results for each operation by gender (Tables 9, 10, 11, 12, 13, 14, 15, 16) and for Indigenous students (Table 17).

Table 9: OZCAAS division results – all students by gender 2014

Group	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Male QS (speed)	1796	5.526	2.74	3.623	2.228	-1.903	<0.001*	0.762
Male COMP (speed)	516	4.38	2.41	3.951	2.159	-0.428	<0.001*	0.187
Female QS (speed)	2085	5.733	2.832	3.737	2.302	-1.996	<0.001*	0.773
Female COMP (speed)	559	4.745	2.637	4.343	2.469	-0.401	<0.001*	0.157
Male QS (accuracy)	1796	64.383	24.814	84.988	18.995	20.605	<0.001*	0.932
Male COMP (accuracy)	516	76.672	21.522	82.233	19.039	5.561	<0.001*	0.274
Female QS (accuracy)	2085	65.257	24.124	86.356	17.673	21.099	<0.001*	0.998
Female COMP (accuracy)	559	77.1	21.24	83.157	18.11	6.057	<0.001*	0.307

The results of independent sample *t*-tests of *QuickSmart* students show that in both speed and accuracy the differences are not statistically significant at the 0.01 significance level ($p = 0.307$ for speed and 0.460 for accuracy).

4.3.2 Basic Division by Gender

Table 10: OZCAAS basic division results – all students by gender 2014

Group	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Male QS (speed)	618	5.112	2.824	3.0	1.843	-2.112	<0.001*	0.886
Male COMP (speed)	175	3.575	2.183	2.826	1.49	-0.749	<0.001*	0.401
Female QS (speed)	742	5.18	2.878	3.011	1.931	-2.169	<0.001*	0.885
Female COMP (speed)	166	3.563	1.889	2.891	1.476	-0.672	<0.001*	0.397
Male QS (accuracy)	618	74.444	24.259	91.168	13.803	16.724	<0.001*	0.847
Male COMP (accuracy)	175	87.876	14.632	92.03	12.956	4.154	<0.001*	0.301
Female QS (accuracy)	742	73.936	23.419	91.654	13.311	17.718	<0.001*	0.93
Female COMP (accuracy)	166	87.666	14.673	92.091	12.612	4.425	<0.001*	0.323

The results of independent sample *t*-tests of *QuickSmart* students show that in both speed and accuracy the differences are not statistically significant at the 0.01 significance level ($p = 0.689$ for speed and 0.389 for accuracy).

4.3.3 Multiplication by Gender

Table 11: OZCAAS multiplication results – all students by gender 2014

Group	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Male QS (speed)	2086	4.965	2.619	3.344	2.156	-1.621	<0.001*	0.676
Male COMP (speed)	561	3.784	2.188	3.562	2.088	-0.222	<0.001*	0.104
Female QS (speed)	2428	4.961	2.626	3.386	2.174	-1.576	<0.001*	0.654
Female COMP (speed)	612	4.07	2.456	3.747	2.168	-0.323	<0.001*	0.139
Male QS (accuracy)	2086	72.578	20.34	88.958	15.464	16.38	<0.001*	0.907
Male COMP (accuracy)	561	82.765	17.708	85.598	16.806	2.833	<0.001*	0.164
Female QS (accuracy)	2428	73.56	20.212	89.817	14.569	16.257	<0.001*	0.923
Female COMP (accuracy)	612	83.235	17.551	86.748	15.392	3.513	<0.001*	0.213

The results of independent sample *t*-tests of *QuickSmart* students show that in both speed and accuracy the differences are not statistically significant at the 0.01 significance level ($p = 0.555$ for speed and 0.817 for accuracy).

4.3.4 Basic Multiplication by Gender

Table 12: OZCAAS Basic multiplication results – all students by gender 2014

Group	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Male QS (speed)	717	3.588	2.407	2.137	1.419	-1.451	<0.001*	0.734
Male COMP (speed)	189	2.654	1.645	2.111	1.313	-0.543	<0.001*	0.365
Female QS (speed)	886	3.635	2.394	2.11	1.307	-1.525	<0.001*	0.791
Female COMP (speed)	178	2.411	1.247	2.076	1.056	-0.335	<0.001*	0.29
Male QS (accuracy)	717	86.952	17.729	96.056	8.318	9.104	<0.001*	0.657
Male COMP (accuracy)	189	92.81	12.22	95.445	10.647	2.635	<0.001*	0.23
Female QS (accuracy)	886	88.341	15.518	96.574	7.299	8.233	<0.001*	0.679
Female COMP (accuracy)	178	93.821	9.042	96.657	6.269	2.836	<0.001*	0.365

The results of independent sample *t*-tests of *QuickSmart* students show that in both speed and accuracy the differences are not statistically significant at the 0.01 significance level ($p = 0.477$ for speed and 0.226 for accuracy).

4.3.5 Subtraction by Gender

Table 13: OZCAAS subtraction results – all students by gender 2014

Group	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Male QS (speed)	2120	4.228	2.354	2.798	1.69	-1.43	<0.001*	0.698
Male COMP (speed)	577	2.993	1.612	2.751	1.575	-0.242	<0.001*	0.152
Female QS (speed)	2503	4.793	2.623	3.126	1.733	-1.667	<0.001*	0.75
Female COMP (speed)	605	3.646	2.03	3.381	1.913	-0.265	<0.001*	0.134
Male QS (accuracy)	2120	86.717	13.989	95.124	8.684	8.407	<0.001*	0.722
Male COMP (accuracy)	577	92.564	9.883	93.938	8.727	1.374	<0.001*	0.147
Female QS (accuracy)	2503	85.751	14.942	95.069	8.181	9.318	<0.001*	0.774
Female COMP (accuracy)	605	91.887	10.297	93.466	8.034	1.579	<0.001*	0.171

The results of independent sample *t*-tests of *QuickSmart* students show that in both speed and accuracy the differences are not statistically significant for accuracy at the 0.01 significance level ($p = 0.021$). However, the results are statistically significant for speed ($p < 0.001$) in favour of females.

This finding for speed is clearly an artefact of sample sizes, which may tend to increase the power of the test to the point when even small differences become statistically significant. This was confirmed by a weak effect size (Cohen's $d = 0.109$) for gender differences in speed. The small effect size indicates that the statistical finding is not meaningful for practical purposes.

4.3.6 Basic Subtraction by Gender

Table 14: OZCAAS Basic subtraction results – all students by gender 2014

Group	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Male QS (speed)	1214	4.297	2.331	2.657	1.546	-1.64	<0.001*	0.829
Male COMP (speed)	279	3.049	1.904	2.607	1.605	-0.442	<0.001*	0.251
Female QS (speed)	1426	4.907	2.589	2.886	1.721	-2.021	<0.001*	0.919
Female COMP (speed)	290	3.44	2.079	2.862	1.446	-0.578	<0.001*	0.323
Male QS (accuracy)	1214	87.279	13.531	95.819	8.109	8.54	<0.001*	0.766
Male COMP (accuracy)	279	92.604	11.415	94.874	8.511	2.27	<0.001*	0.225
Female QS (accuracy)	1426	86.932	13.649	95.746	7.507	8.814	<0.001*	0.8
Female COMP (accuracy)	290	92.882	10.722	95.042	8.891	2.16	<0.001*	0.219

The results of independent sample *t*-tests of *QuickSmart* students show that in both speed and accuracy the differences are not statistically significant at the 0.01 significance level for accuracy ($p = 0.588$). However, the results are statistically significant for speed ($p < 0.001$) in favour of females.

This finding is clearly an artefact of sample sizes, which tend to increase the power of the test to the point when even small differences become statistically significant. This was confirmed by a weak effect size (Cohen's $d = 0.187$) for gender differences in speed. The small effect size indicates that the statistical finding is not meaningful for practical purposes.

4.3.7 Addition by Gender

Table 15: OZCAAS addition results – all students by gender 2014

Group	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Male QS (speed)	2242	3.055	1.539	1.937	0.935	-1.118	<0.001*	0.878
Male COMP (speed)	586	2.23	1.099	1.909	0.884	-0.322	<0.001*	0.322
Female QS (speed)	2616	3.194	1.568	2.044	0.919	-1.151	<0.001*	0.895
Female COMP (speed)	622	2.468	1.186	2.167	0.947	-0.301	<0.001*	0.281
Male QS (accuracy)	2242	93.598	9.059	98.785	3.726	5.187	<0.001*	0.749
Male COMP (accuracy)	586	96.806	5.88	98.072	4.45	1.266	<0.001*	0.243
Female QS (accuracy)	2616	94.154	8.456	98.733	3.332	4.579	<0.001*	0.712
Female COMP (accuracy)	622	96.86	5.305	97.889	4.586	1.029	<0.001*	0.208

The results of independent sample *t*-tests of *QuickSmart* students show that in both speed and accuracy the differences are not statistically significant at the 0.01 significance level ($p = 0.394$ for speed and 0.016 for accuracy).

4.3.8 Basic Addition by Gender

Table 16: OZCAAS basic addition results – all students by gender 2014

Group	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Male QS (speed)	1206	2.794	1.511	1.707	0.769	-1.087	<0.001*	0.907
Male COMP (speed)	287	2.019	1.117	1.742	0.945	-0.276	<0.001*	0.267
Female QS (speed)	1435	2.902	1.433	1.749	0.813	-1.153	<0.001*	0.99
Female COMP (speed)	286	2.158	1.312	1.897	0.934	-0.261	<0.001*	0.229
Male QS (accuracy)	1206	94.467	8.085	98.801	3.305	4.334	<0.001*	0.702
Male COMP (accuracy)	287	96.643	7.152	97.765	5.592	1.122	0.001*	0.175
Female QS (accuracy)	1435	94.923	7.594	98.799	3.227	3.876	<0.001*	0.664
Female COMP (accuracy)	286	97.071	5.5	97.882	5.83	0.811	<0.001*	0.143

The results of independent sample *t*-tests of *QuickSmart* students show that in both speed and accuracy the differences are not statistically significant at the 0.01 significance level ($p = 0.168$ for speed and 0.203 for accuracy).

4.3.9 Indigenous students

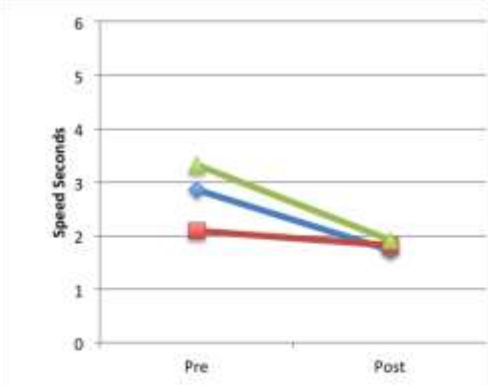
Table 17: OZCAAS results – Indigenous students 2014

Test	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Basic Add QS (speed)	226	3.324	1.888	1.918	1.05	-1.406	<0.001*	0.92
Basic Add QS (acc)	226	94.29	9.567	99.061	2.762	4.771	<0.001*	0.678
Addition QS (speed)	488	3.484	1.94	2.145	1.086	-1.339	<0.001*	0.852
Addition QS (acc)	488	93.911	9.511	98.555	3.714	4.644	<0.001*	0.643
Basic Sub QS (speed)	223	5.251	2.868	3.109	1.914	-2.141	<0.001*	0.878
Basic Sub QS (acc)	223	85.403	16.537	95.437	7.42	10.034	<0.001*	0.783
Sub QS (speed)	447	4.981	2.904	3.325	2.083	-1.657	<0.001*	0.656
Sub QS (accuracy)	447	85.422	16.05	94.377	10.129	8.955	<0.001*	0.667
Basic Mult QS (speed)	171	4.11	3.235	2.42	1.635	-1.69	<0.001*	0.659
Basic Mult QS (acc)	171	87.05	18.873	95.451	8.819	8.401	<0.001*	0.57
Mult QS (speed)	393	5.414	2.937	3.829	2.423	-1.585	<0.001*	0.589
Mult QS (accuracy)	393	71.427	22.773	87.245	17.33	15.818	<0.001*	0.782
Basic Div QS (speed)	127	5.616	3.554	3.397	2.399	-2.22	<0.001*	0.732
Basic Div QS (acc)	127	74.047	23.96	90.034	14.118	15.987	<0.001*	0.813
Division QS (speed)	313	5.687	2.739	3.895	2.284	-1.792	<0.001*	0.711
Division QS (acc)	313	64.088	27.809	83.572	21.697	19.484	<0.001*	0.781

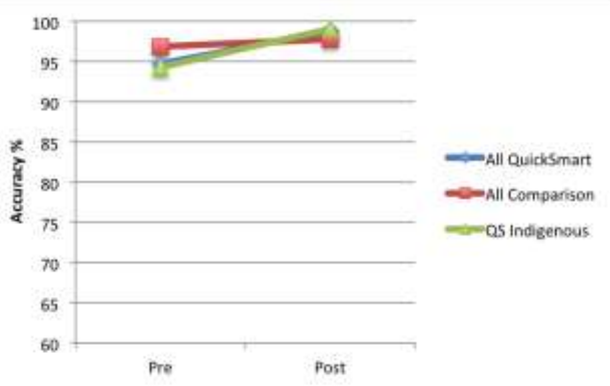
These results indicate that in most instances for both the pre-intervention and post-intervention the Indigenous students' mean scores were slightly lower than those of the overall *QuickSmart* group. In other words, these students had lower starting and finishing points. However, their improvement was very similar to that of the overall *QuickSmart* group, and sometimes better. This is particularly so for addition and subtraction. For addition, the accuracy results exhibit the ceiling effect (the pre-intervention scores were so high that the students did not have much room for further improvement).

The following graphs illustrate how the Indigenous students (green) have performed in each operation compared to the whole *QuickSmart* group (blue) as well as the comparison students (red).

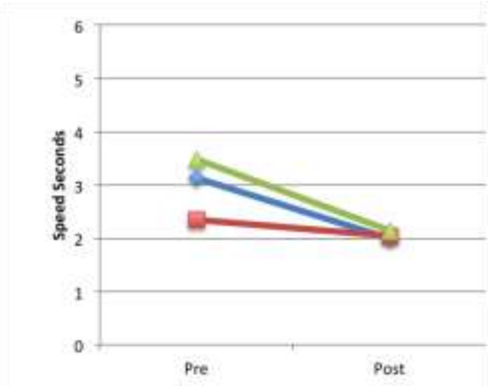
Basic Addition Speed



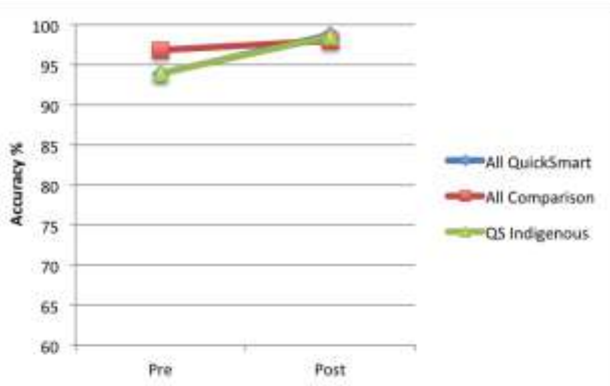
Basic Addition Accuracy



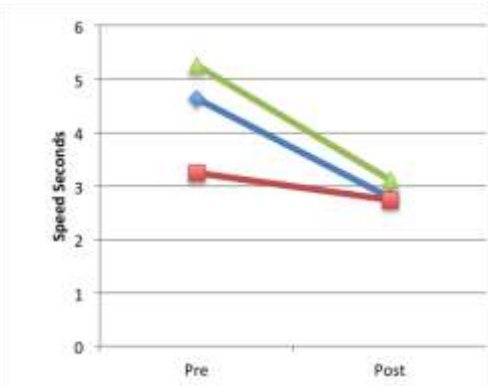
Addition Speed



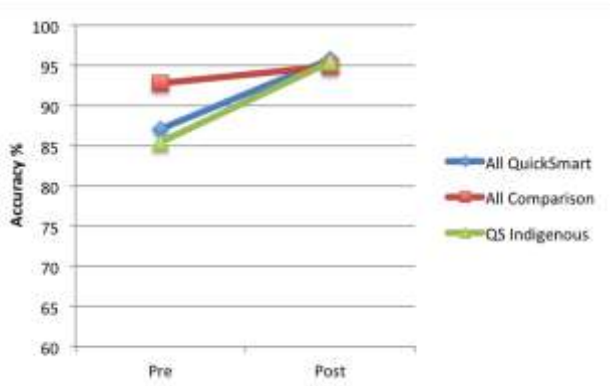
Addition Accuracy



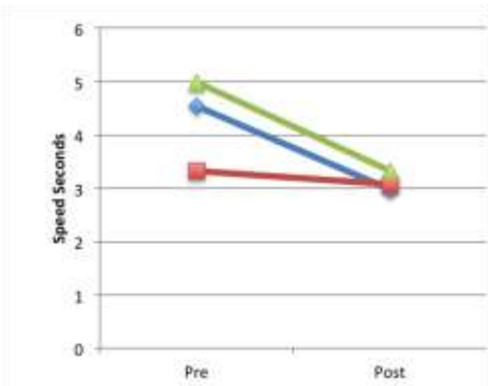
Basic Subtraction Speed



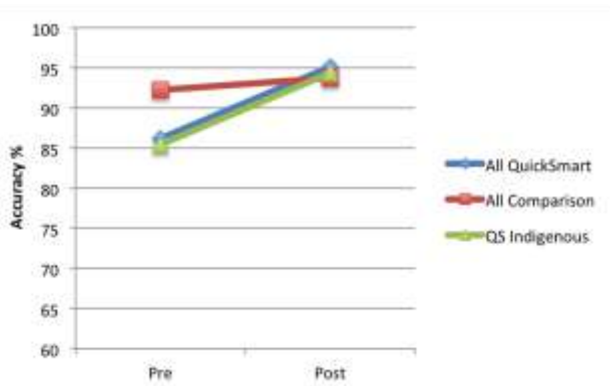
Basic Subtraction Accuracy



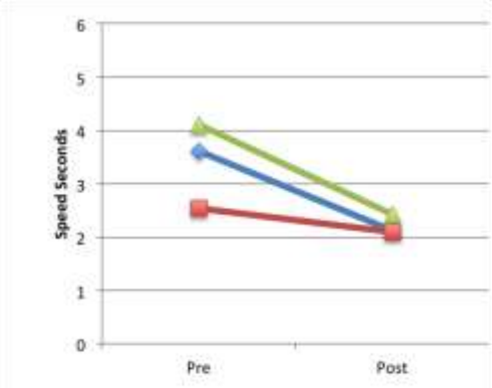
Subtraction Speed



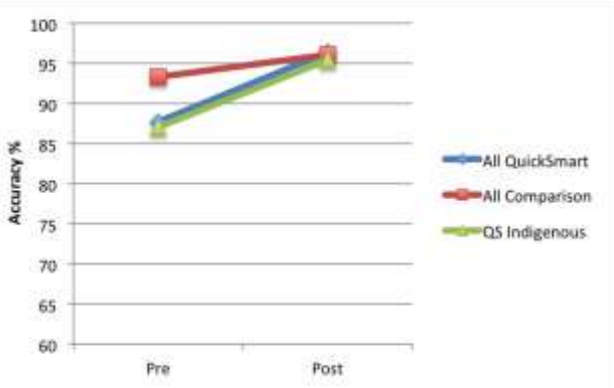
Subtraction Accuracy



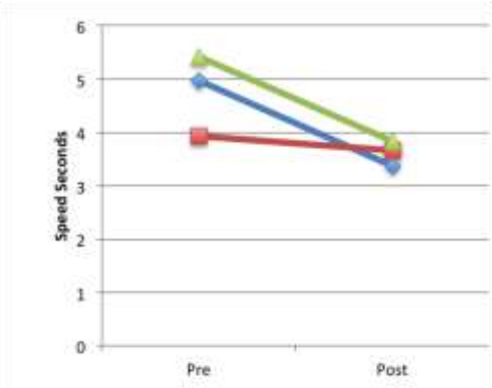
Basic Multiplication Speed



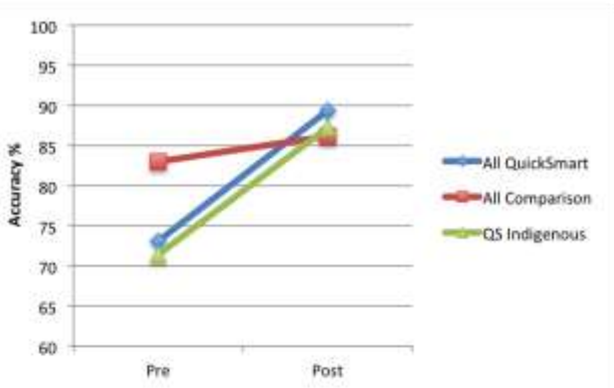
Basic Multiplication Accuracy



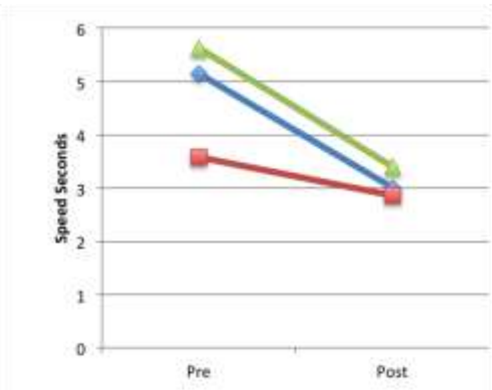
Multiplication Speed



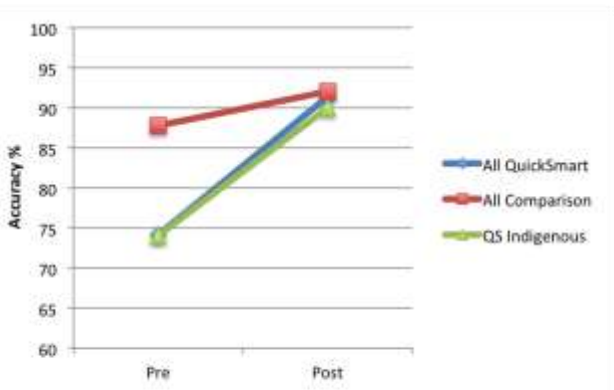
Multiplication Accuracy



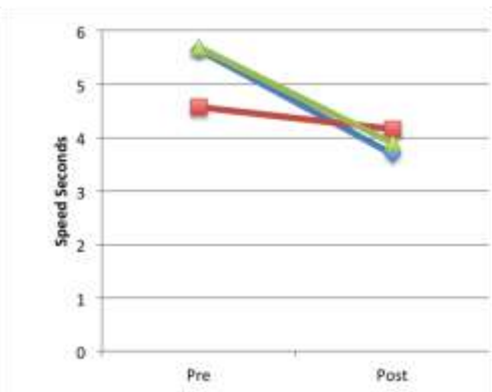
Basic Division Speed



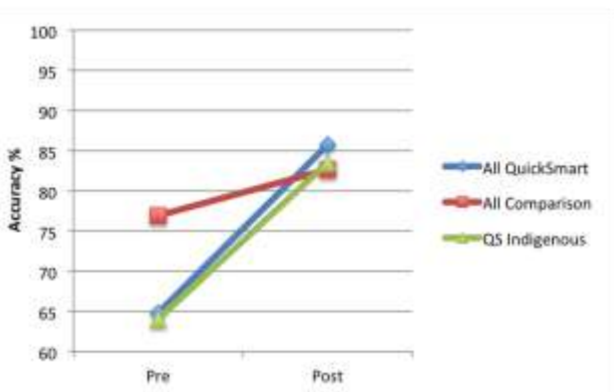
Basic Division Accuracy



Division Speed



Division Accuracy



4.4 Students who were unable to complete the pre-intervention test

To complete this section on OZCAAS results, it is important to note that there were students who the instructors confirmed were not able to complete all the OZCAAS pre-tests. In such cases Instructors were advised not to continue collecting data as doing so would have confronted these students dramatically with their weaknesses at the beginning of the program.

A mark of the success of *QuickSmart* is that many of these students were able to complete all OZCAAS assessments at the end of the program. These students' results could not be included in the previous analyses and are presented in Table 18 below.

Table 18: OZCAAS results where no pre-test data was available – 2014

	N	Mean	Std. Deviation
Basic Addition Speed	38	1.828	0.753
Basic Addition Accuracy	38	98.842	2.915
Addition Speed	129	2.433	1.272
Addition Accuracy	129	97.598	5.191
Basic Subtraction Speed	42	2.939	1.6
Basic Subtraction Accuracy	42	94.533	10.465
Subtraction Speed	169	3.386	1.974
Subtraction Accuracy	169	92.781	11.14
Basic Multiplication Speed	186	2.55	2.262
Basic Multiplication Accuracy	186	95.347	9.434
Multiplication Speed	203	4.278	2.729
Multiplication Accuracy	203	82.802	20.184
Basic Division Speed	279	3.583	2.309
Basic Division Accuracy	279	89.272	16.42
Division Speed	407	4.247	2.577
Division Accuracy	407	77.81	22.354

The results in Table 18 are impressive given that these students did not have the skills or confidence to complete the OZCAAS pre-tests initially. In addition and subtraction, the average response rates were below 3.4 seconds and above 92.7% accuracy. Even though some of these students may not have progressed to multiplication and division during *QuickSmart* lessons, their results are encouraging.

In multiplication and division the average response speeds were below 4.3 seconds and accuracy over 77.8% at post-test. It is likely that part of this improvement may be due to the fact that:

1. there has been some mutually beneficial development of the common areas of the brain that process the four operations;
2. students have increased their ability to benefit from classroom instruction; and
3. students' overall improved levels of confidence may have led to a 'have a go attitude' that was not present at the beginning of the *QuickSmart* program.

4.5 Conclusion on OZCAAS Testing

Overall, the *QuickSmart* students showed very strong growth in their understanding and use of number facts. In all four mathematical operations, they either closed the gap between them and the comparison group of average-achieving peers or narrowed this gap to a very small margin. Such growth is critical for these students as number facts are a vital skill underpinning mathematics functioning in general. This improvement provides the necessary foundation for students to improve in other areas of mathematics that are not specifically taught in *QuickSmart*.

Some small differences between male and female students were observed. Females performed slightly better in most operations. However, except in two of the sixteen analyses undertaken these differences (both related to subtraction) were not significant. As a result, these data do not warrant further investigation.

It is acknowledged that Indigenous students had lower starting and finishing points in most operations but their overall improvement in terms of effect size is rated very strong to substantial over all operations.

5 Independent Assessments

5.1 Why they are used

The *QuickSmart* pre- and post-assessments include use of independent tests in order to demonstrate whether the students are able to take the basic facts and problem-solving strategies taught in *QuickSmart* and apply these to higher-level mathematical concepts.

5.2 Results on the PATM Assessments

Table 19 reports the paired-samples *t*-tests analysis of the PATM data for all students for whom paired data were available. PATM analyses for individual clusters are provided in an Appendix to this report. (Note: Students who were absent at the end of the year were not included in the analysis.)

The PATM (2005) Norm Tables were used to convert raw scores from various forms of the PATM to consistent Scale scores, which were used for all subsequent calculations. Two analyses are reported in Table 19. The first analysis presents a calculation of a standard gain score and the significance of this result. The second analysis is an Effect Size calculated from the Means and Standard Deviations on PATM scores for each group. Effect Size statistics indicate the magnitude of the change in academic achievement for the *QuickSmart* and comparison students.

Table 19: PATM results – (Scale scores) 2014

	Students with paired data	Average Gain score	Significance	Effect size
All *QuickSmart*	**4824**	**7.382**	**<0.001***	**0.731**
All comparison	**1238**	**5.556**	**<0.001***	**0.499**

The results indicate a very strong improvement for *QuickSmart* students. This improvement is greater than those recorded for the comparison group of their average-achieving peers. The gain recorded here for the *QuickSmart* group is also well in excess of the expected yearly growth of students' scores as measured on the PATM assessment of 5 scale score points.

Table 20 reports the same information as Table 19 but shows a comparison of males and females included in the *QuickSmart* program.

Table 20: PATM results – By Gender (Scale scores) 2014

Gender	Students with paired data	Average Gain score	Significance	Effect size
Male QS Students	2197	7.599	<0.001*	0.737
Male Comp Students	606	5.684	<0.001*	0.498
Female QS Students	2627	7.2	<0.001*	0.725
Female Comp Students	632	5.435	<0.001*	0.5

The results of independent sample *t*-tests of *QuickSmart* students show that for the ACER PAT results the differences are not statistically significant at the 0.01 significance level ($p = 0.091$).

Table 21 reports the same information as Table 19 but does so for the scores of Indigenous students included in the *QuickSmart* program.

Table 21: PATM results – Indigenous (Scale scores) 2014

Indigenous students	Students with paired data	Average Gain score	Significance	Effect size
Indigenous *QuickSmart*	466	7.749	<0.001*	0.709

Once again these results show very strong improvement for the Indigenous students who participated in *QuickSmart*. This improvement is greater than that of the overall *QuickSmart* group. Their improvement is also in excess of the expected yearly growth of students' scores as measured on the PATM assessment of 5 scale score points.

The following figure shows that the *QuickSmart* students consistently achieve the gains in PAT across the middle school grades targeted by the program, that is Grade 3 through to Grade 9. The tables of figures for these graphs are available in the Appendices.

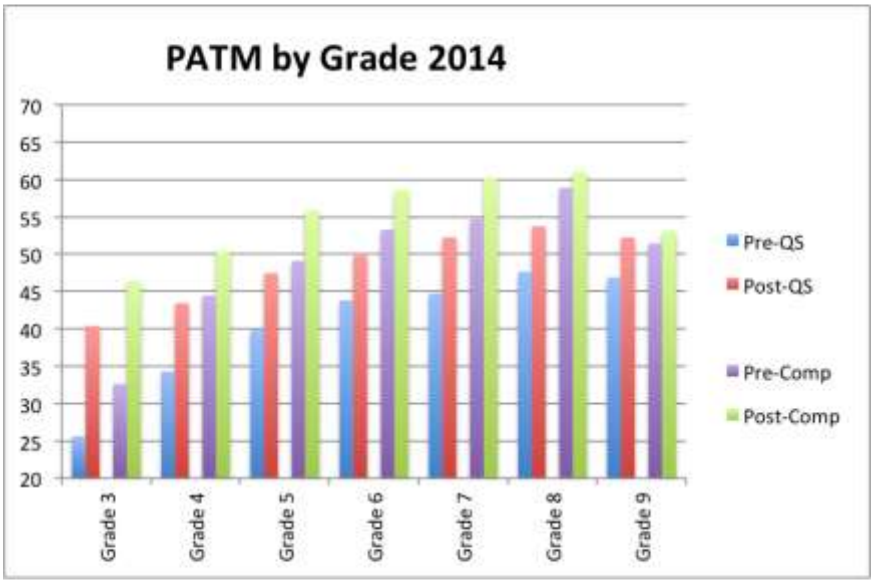


Figure 1: PAT by Grade

The following table shows the percentage of *QuickSmart* students that achieved a gain on the PATM results

Table 22: Percentage students with PAT Gain

Student Type	N with gain	N with PATM	Percentage with Gain
QuickSmart	3986	4824	82.6
Indigenous QS	390	466	83.7
Comparison	916	1238	74.0

These results show that in the *QuickSmart* group, a greater percentage of students achieved gain in PAT than in the comparison group of their average-achieving peers.

6 Conclusion to Report

The support provided by the Schools and Clusters has been critical in making more positive the hopes and aspirations of students participating in the *QuickSmart* program. This report has focused on the quantitative aspects of the program. In all analyses, the data report a narrowing of the achievement gap between *QuickSmart* students and their average-performing comparison group peers. Impressive Effect Sizes have been reported as well as highly significant gains on the part of individual students who, in some cases, could not complete the full suite of pre-test assessments.

Additionally, substantial qualitative data (reported in school presentations during professional workshops 2 and 3) indicate that *QuickSmart* students gained a new confidence in the area of mathematics. Many stories within the corpus of qualitative data document improvements for *QuickSmart* students not only in relation to their performance in class, but also with regard to students' attitudes to school, their attendance rates and levels of academic confidence both inside and outside the classroom.

The data collected to date from thousands of *QuickSma*rt students indicate that the narrowing of the achievement gap between *QuickSmart* and comparison students results in low-achieving students proceeding with their studies more successfully by learning to 'trust their heads' in the same ways that effective learners do. Importantly, previous *QuickSmart* studies (references at http://www.une.edu.au/simerr/quicksmart/pages/qsresearchpublications.php) demonstrate that *QuickSmart* students can maintain the gains made during the program for years after they completed the program. Analyses have consistently identified impressive statistically significant end-of-program and longitudinal gains in terms of probability measures and effect sizes that mirror the qualitative improvements reported by teachers, paraprofessionals, parents and *QuickSmart* students.

If you have any questions concerning this report or *QuickSmart* please contact us at the SiMERR National Centre at UNE on (02) 67735065.

Professor John Pegg

7 APPENDIX A: Independent Assessment Results

7.1 PAT results by Region (Scale scores) 2014

School Region	Pre-Intervention			Post-Intervention				
	N	Mean	SD	Mean	SD	Gain	*p*	Effect size
Adelaide QS Students	779	39.65	9.866	46.128	9.294	6.478	<0.001*	0.676
Ballarat QS Students	250	41.29	9.686	49.166	9.294	7.876	<0.001*	0.83
Eyre Peninsula QS Students	80	35.82	11.515	39.789	9.935	3.969	<0.001*	0.369
Gawler QS Students	87	35.22	10.15	45.831	9.814	10.611	<0.001*	1.063
Horsham QS Students	97	42.8	7.768	50.256	9.13	7.456	<0.001*	0.88
Hunter QS Students	377	40.53	9.12	48.609	10.729	8.079	<0.001*	0.811
Limestone Coast QS Students	39	42.12	6.627	46.754	8.181	4.634	<0.001*	0.622
Melbourne QS Students	287	44.8	9.649	52.971	10.142	8.171	<0.001*	0.825
Mid West QS Students	139	44.01	7.874	50.853	9.377	6.843	<0.001*	0.79
Murray/Mallee QS Students	83	40.48	7.773	47.376	8.587	6.896	<0.001*	0.842
New England QS Students	20	42.78	9.327	58.47	13.575	15.69	<0.001*	1.347
North Coast QS Students	576	43.34	9.344	51.681	10.768	8.341	<0.001*	0.827
North Tasmania QS Students	70	44.45	9.937	49.829	9.023	5.379	<0.001*	0.567
North West QS Students	189	37.05	9.855	47.761	12.057	10.711	<0.001*	0.973
Perth QS Students	46	35.67	9.369	49.813	12.222	14.143	<0.001*	1.299
Port Augusta QS Students	84	43.64	9.183	50.468	8.559	6.828	<0.001*	0.769
Port Pirie QS Students	82	43.55	5.959	50.109	9.745	6.559	<0.001*	0.812
Queensland QS Students	82	43.22	9.413	48.438	10.463	5.218	<0.001*	0.524
Riverina QS Students	42	45.79	6.655	50.967	6.623	5.177	<0.001*	0.78
South Tasmania QS Students	25	42.88	7.82	48.448	8.989	5.568	<0.001*	0.661
Southern Sydney QS Students	76	45.27	11.604	52.013	12.671	6.743	<0.001*	0.555
Sydney QS Students	1065	41.82	9.375	48.624	9.553	6.804	<0.001*	0.719
Western QS Students	156	48.17	11.979	53.512	13.228	5.342	<0.001*	0.423
Western Sydney QS Students	58	34.36	6.489	41.488	8.121	7.128	<0.001*	0.97
Yorke Peninsula/Mid North QS Students	35	35.39	10.405	48.8	8.33	13.41	<0.001*	1.423

Note 1: only students who did both 'pre' and 'post' test are included in the table.

7.2 PAT results by demographic (Scale scores) 2014

Demographic		Pre-Intervention		Post-Intervention				
	N	Mean	SD	Mean	SD	Gain	*p*	Effect size
All QS Students	**4824**	**41.59**	**9.827**	**48.972**	**10.37**	**7.382**	**<0.001***	**0.731**
All comparison students	**1238**	**51.44**	**10.922**	**56.996**	**11.343**	**5.556**	**<0.001***	**0.499**
Indigenous QS Students	466	38.84	10.59	46.589	11.25	7.749	<0.001*	0.709
Male QS Students	2197	41.65	10.099	49.249	10.516	7.599	<0.001*	0.737
Male comparison students	606	51.48	11.198	57.164	11.631	5.684	<0.001*	0.498
Female QS Students	2627	41.54	9.596	48.74	10.242	7.2	<0.001*	0.725
Female comparison Students	632	51.4	10.66	56.835	11.067	5.435	<0.001*	0.5
Male Indigenous QS Students	211	38.78	10.92	47.26	11.091	8.48	<0.001*	0.77
Female Indigenous QS Students	255	38.88	10.331	46.035	11.372	7.155	<0.001*	0.659

Note: only students who did both 'pre' and 'post' test are included in the table.

7.3 PAT results by State (Scale scores) 2014

School		Pre-Intervention		Post-Intervention				
	N	Mean	SD	Mean	SD	Gain	*p*	Effect size
All QS Students	**4824**	**41.59**	**9.827**	**48.972**	**10.37**	**7.382**	**<0.001***	**0.731**
All comparison students	**1238**	**51.44**	**10.922**	**56.996**	**11.343**	**5.556**	**<0.001***	**0.499**
ACT QS students	0							
ACT Ind QS	0							
ACT COMP students	0							
NSW QS students	2698	42.12	9.777	49.663	10.683	7.543	<0.001*	0.737
NSW Ind QS	320	39.76	10.798	48.135	11.646	8.375	<0.001*	0.746
NSW COMP students	392	52.91	9.53	59.011	10.479	6.101	<0.001*	0.609
NT QS students	0							
NT Ind QS	0							
NT COMP students	0							
QLD QS students	82	43.22	9.413	48.438	10.463	5.218	<0.001*	0.524
QLD Ind QS	10	39.03	5.674	43.88	8.61	4.85	0.039	0.665
QLD COMP students	19	52.6	12.203	56.653	13.147	4.053	0.018	0.32
SA QS students	1269	39.64	9.794	46.427	9.498	6.787	<0.001*	0.704
SA Ind QS	103	36.92	10.282	43.061	10.049	6.141	<0.001*	0.604
SA COMP students	488	49.13	10.829	53.791	10.824	4.661	<0.001*	0.431
TAS QS students	95	44.04	9.412	49.465	8.987	5.425	<0.001*	0.59
TAS Ind QS	6	39.73	2.652	44.233	10.36	4.503	0.316	0.595
TAS COMP students	50	52.92	11.591	56.962	10.391	4.042	0.003*	0.367
VIC QS students	634	43.11	9.526	51.055	9.811	7.945	<0.001*	0.822
VIC Ind QS	12	43.68	5.965	47.008	6.568	3.328	0.058	0.53
VIC COMP students	269	53.34	12.168	60.209	12.056	6.869	<0.001*	0.567
WA QS students	46	35.67	9.369	49.813	12.222	14.143	<0.001*	1.299
WA Ind QS	15	27.94	7.266	40.26	7.821	12.32	<0.001*	1.632
WA COMP students	20	48.87	8.346	52.875	10.506	4.005	0.019	0.422

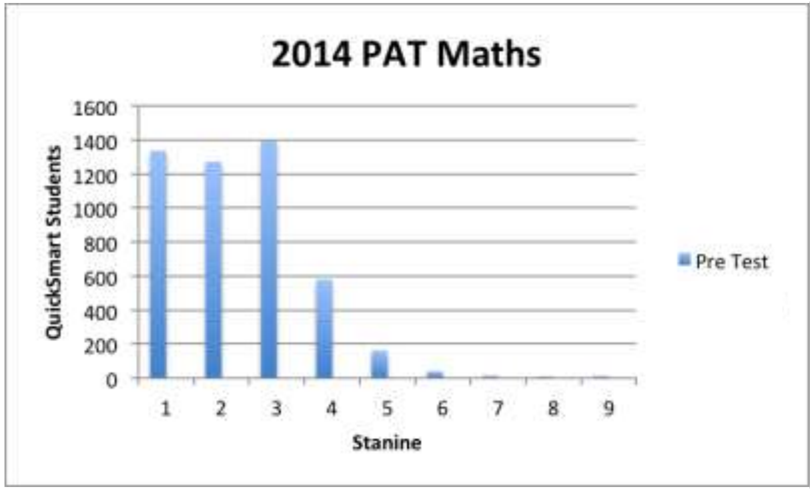
Note: only students who did both 'pre' and 'post' test are included in the table.

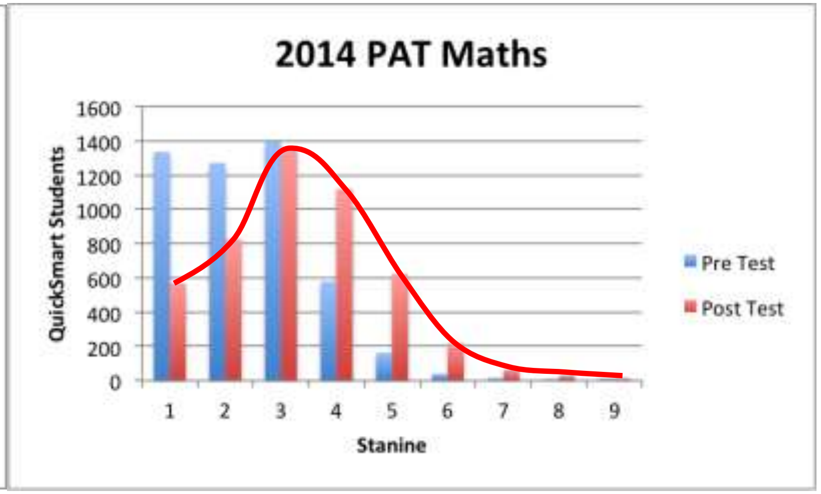
7.4 *QuickSmart* Students by Grade (Scale scores) 2014

Grade		Pre-Intervention		Post-Intervention				
	N	Mean	SD	Mean	SD	Gain	*p*	Effect size
Grade 3 QS	20	25.58	10.378	40.39	9.539	14.81	<0.001*	1.486
Grade 3 QS Ind	7	19.29	14.093	34.186	11.227	14.896	0.012	1.169
Grade 3 Comp	1	32.6		46.4		13.8		
Grade 4 QS	927	34.28	8.752	43.428	9.797	9.148	<0.001*	0.985
Grade 4 QS Ind	77	33.16	7.944	41.49	9.091	8.33	<0.001*	0.976
Grade 4 Comp	190	44.46	10.75	50.413	12.149	5.953	<0.001*	0.519
Grade 5 QS	1256	39.83	8.495	47.46	9.647	7.63	<0.001*	0.839
Grade 5 QS Ind	106	37.1	8.98	44.276	8.565	7.176	<0.001*	0.818
Grade 5 Comp	380	49.09	8.401	55.862	10.351	6.772	<0.001*	0.718
Grade 6 QS	938	43.81	7.883	49.825	8.941	6.015	<0.001*	0.714
Grade 6 QS Ind	75	41.16	7.889	46.497	9.307	5.337	<0.001*	0.619
Grade 6 Comp	319	53.27	10.057	58.629	10.457	5.359	<0.001*	0.522
Grade 7 QS	979	44.72	8.976	52.252	9.735	7.532	<0.001*	0.804
Grade 7 QS Ind	106	40.51	10.069	50.01	10.491	9.5	<0.001*	0.924
Grade 7 Comp	209	54.69	10.187	60.235	10.03	5.545	<0.001*	0.549
Grade 8 QS	634	47.62	9.762	53.705	11.157	6.085	<0.001*	0.58
Grade 8 QS Ind	82	43.84	12.041	51.205	14.939	7.365	<0.001*	0.543
Grade 8 Comp	131	58.88	12.928	61.011	11.838	2.131	<0.001*	0.172
Grade 9 QS	67	46.86	9.939	52.243	9.093	5.383	<0.001*	0.565
Grade 9 QS Ind	11	40.95	14.113	47.782	10.782	6.832	0.062	0.544
Grade 9 Comp	7	51.41	14.427	53.114	20.898	1.704	0.559	0.095
All Schools – QS Group	**4824**	**41.59**	**9.827**	**48.972**	**10.37**	**7.382**	**<0.001***	**0.731**
All Schools – Indigenous QS Group	**466**	**38.84**	**10.59**	**46.589**	**11.25**	**7.749**	**<0.001***	**0.709**
All Schools – Comp Group	**1238**	**51.44**	**10.922**	**56.996**	**11.343**	**5.556**	**<0.001***	**0.499**

Note: Other grades were excluded from the analyses as they had fewer than 5 *QuickSmart* students.

7.5 PATM Stanine improvement for *QuickSmart* students





The Australian Council for Educational Research (ACER) PAT tests use a framework for describing results against national Australian norms. This technique applies stanine scores that divide the population using a scale of 1 to 9.

A stanine score of:

1 represents performance below the bottom 4% of the population
2 represents performance in the lower 4-10% of the population
3 represents performance in the lower 11-22% of the population
4 represents performance in the lower 23-39% of the population
5 represents performance in middle 40-59% of the population
6 represents performance in the higher 60-76% of the population
7 represents performance in the higher77-88% of the population
8 represents performance in the higher 89-96% of the population
9 represents performance above the top 4% of the population.

It is particularly difficult to move students out of the lower stanine bands. The results above show that *QuickSmart* has been quite successful in moving students into higher bands, as measured by the various PAT.

8 APPENDIX B: *QuickSmart* sessions

8.1 Attendance summary

	N (students)	N (schools)	Mean Sessions Offered	Mean Sessions Attended	% Mean Attended	Weeks completed	% Program completed
All QS students	**3728**	**235**	**69.606**	**57.563**	**82.862**	**19.188**	**63.959**
Male QS students	1683	225	68.889	56.514	82.262	18.838	62.793
Female QS students	2045	232	70.196	58.427	83.355	19.476	64.919
Indigenous QS students	321	91	70.458	54.368	77.197	18.123	60.408
Grade 3	18	6	73.278	54.778	80.491	18.259	60.864
Grade 4	820	104	71.559	61.195	86.078	20.398	67.995
Grade 5	984	154	71.654	60.611	84.892	20.204	67.345
Grade 6	769	133	72.176	59.358	82.682	19.786	65.953
Grade 7	673	79	62.703	50.746	80.544	16.915	56.384
Grade 8	409	40	69.741	53.511	76.588	17.837	59.457
Grade 9	52	12	49.269	38.538	77.781	12.846	42.821

Note: Only students and schools for whom attendance data were provided are included in the table (about 59% of students).
Note: 'Weeks completed' is based on the assumption that the school did three *QuickSmart* sessions a week.
Note: '% Program completed' is calculated relative to the full *QuickSmart* program of 30 weeks.