quicksmart

Annual Numeracy Program Report

2017

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

SiMERR

une University of New England

Acknowledgements

This report was compiled by Dr Stefan Horarik (Research Fellow – Data Analysis), Ambrose McDermott and June Billings (Executive Assistant). It would not be possible to do this reporting without the support of the rest of the *QuickSmart* team in SiMERR who have assisted with proof reading and interpretation of data.

We also acknowledge the work of staff in *QuickSmart* schools in collecting the data and entering into the SiMERR data system.

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1 *QuickSmart* Executive Summary in 2017

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 replicability (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 participating Indigenous students.

In 2017, the *QuickSmart* team at the University of New England received matched data from 4,988 students who participated in *QuickSmart* Numeracy lessons and 1,362 average-achieving comparison peers. These students were drawn from schools from 28 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 reaction time (speed) and the accuracy of basic arithmetic computation) the results for the four operations offered at each of two levels indicate a very strong to substantial improvement for the *QuickSmart* students in terms of accuracy and response time. 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 average-achieving 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, particularly those linked to higher-order thinking, that are not specifically taught in *QuickSmart*.

Some small differences between male and female students were observed. Females performed slightly better in most operations and some of these results are statistically significant. However, the small effect sizes indicate that these statistical findings are not meaningful for practical purposes.

It is acknowledged that Indigenous students had improvements comparable to those of non-indigenous *QuickSmart* students with effect sizes 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 3.6 seconds and above 94% accuracy. In multiplication and division, the average response times were below 4.3 seconds and accuracy over 79% at post-test. This improvement is most likely due to the fact that:

1. there has been some mutually beneficial development of 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 of independent samples *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 ($p = 0.658$).

Once again, these results show substantial improvement for Indigenous students who participated in *QuickSmart*. This improvement is greater than that of the overall *QuickSmart* group.

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 many tens of thousands of *QuickSmar*t 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 continuous development and improvement since 2001, based on the results of many tens of thousands of students.

The intervention is called *QuickSmart* to encourage students to become *quick* in their response time 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 — 2017

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 set of analyses examine data from response time 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' response time 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 a 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 2017, the *QuickSmart* team at the SiMERR National Research Centre at the University of New England received matched data from 4,988 students who participated in *QuickSmart* Numeracy lessons and 1,362 'average-achieving' comparison peers. These students were drawn from schools from 28 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 OZCAAS 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.

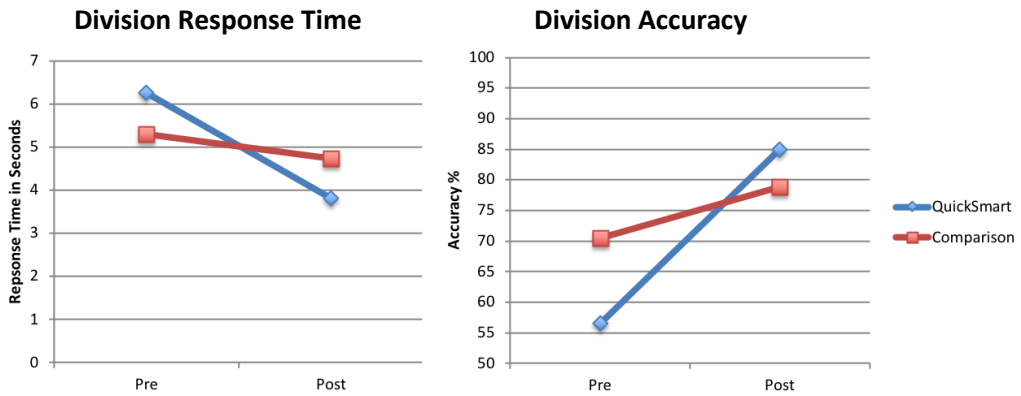
4.2 Combined OZCAAS Analysis

4.2.1 Division

Table 1 below summarises the data submitted for OZCAAS division.

Table 1: OZCAAS division – all students 2017

Division	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Res Time (secs) QS	3037	6.258	2.973	3.815	2.306	-2.443	<0.001*	0.918
Res Time (secs) Comp	967	5.301	2.953	4.734	2.685	-0.567	<0.001*	0.201
Accuracy (%) QS	3037	56.578	26.559	84.958	21.071	28.38	<0.001*	1.184
Accuracy (%) Comp	967	70.53	26.44	78.81	22.352	8.28	<0.001*	0.338



On the division test, there were paired data for 3,037 *QuickSmart* students and 967 comparison students. The desired criterion for response time on the OZCAAS assessments is

between 1 and 2 seconds as an indication of automaticity. The decrease in time for *QuickSmart* students is 2.443 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 0.918, which indicates substantial 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 two-to-three years' growth.

In terms of accuracy, the *QuickSmart* students' average scores have improved by over 28 percentage points, which is a very strong result. The effect size for this result is 1.184, which again indicates substantial improvement for the *QuickSmart* group.

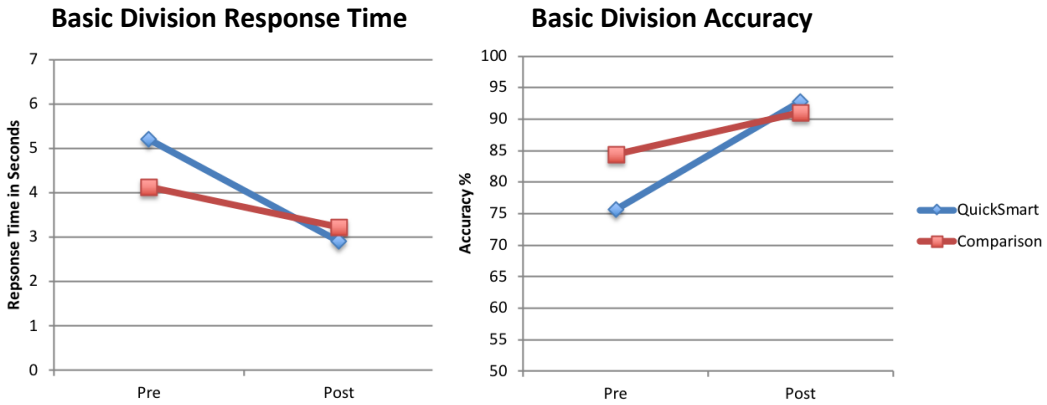
Division is typically (but not always) the final focus of the *QuickSmart* program for students. As a result a number of students may not reach the lessons that focus on division facts. Interestingly, students still appear to make important gains even if lessons on division had not been undertaken. It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

In summary, Table 1 shows that when compared to the scores of the comparison students, *QuickSmart* students' scores indicate substantial improvement for both response time and accuracy. The diagrams illustrate that *QuickSmart* students improved to reach better levels than their comparison average-achieving peers.

4.2.2 Basic Division

Table 2: OZCAAS basic division – all students 2017

Basic Division	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Res Time (secs) QS	1520	5.211	2.736	2.903	1.776	-2.308	<0.001*	1.001
Res Time (secs) Comp	284	4.124	2.359	3.224	1.923	-0.9	<0.001*	0.418
Accuracy (%) QS	1520	75.637	23.193	92.82	13.094	17.183	<0.001*	0.912
Accuracy (%) Comp	284	84.475	19.938	90.986	13.528	6.511	<0.001*	0.382

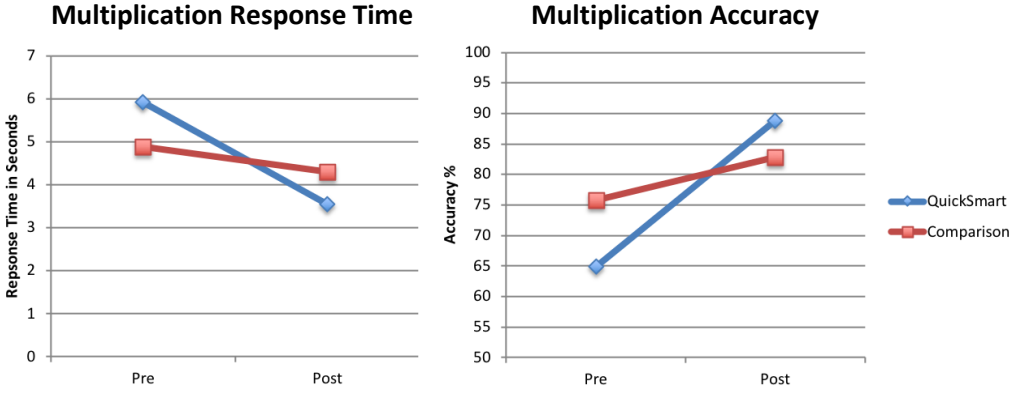


In summary, the results for basic division indicate a substantial improvement for the *QuickSmart* students in both response time and accuracy. The diagrams illustrate that the *QuickSmart* students improved to reach a slightly better level of performance than the comparison students.

4.2.3 Multiplication

Table 3: OZCAAS multiplication – all students 2017

Multiplication	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Res Time (secs) QS	3581	5.913	2.805	3.556	2.172	-2.357	<0.001*	0.94
Res Time (secs) Comp	1076	4.885	2.6	4.299	2.42	-0.586	<0.001*	0.233
Accuracy (%) QS	3581	64.948	22.267	88.849	16.702	23.901	<0.001*	1.214
Accuracy (%) Comp	1076	75.77	21.539	82.857	17.969	7.087	<0.001*	0.357

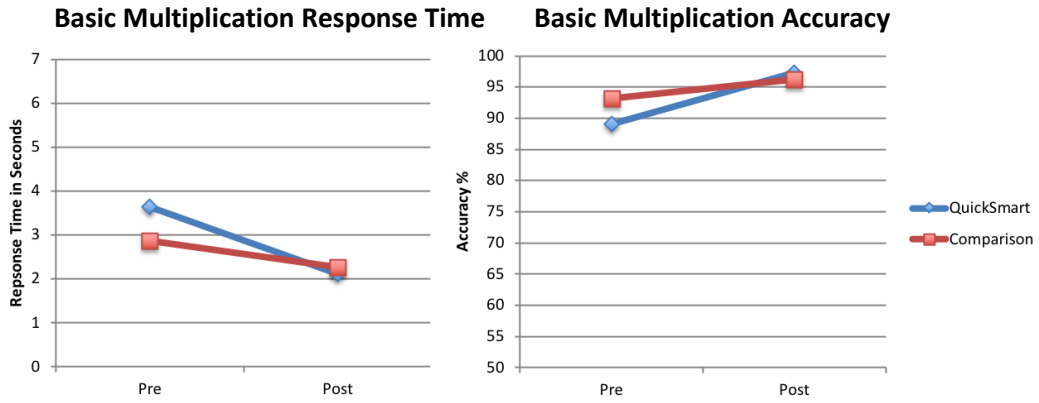


In summary, the results for multiplication indicate a substantial improvement in both response time and accuracy. The diagrams illustrate that the *QuickSmart* students improved to reach a better level of performance than the comparison students.

4.2.4 Basic Multiplication

Table 4: OZCAAS basic multiplication – all students 2017

Basic Multiplication	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Res Time (secs) QS	1663	3.633	2.117	2.117	1.31	-1.516	<0.001*	0.861
Res Time (secs) Comp	296	2.877	1.737	2.27	1.384	-0.607	<0.001*	0.386
Accuracy (%) QS	1663	89.083	14.396	97.296	6.283	8.213	<0.001*	0.739
Accuracy (%) Comp	296	93.229	10.137	96.208	8.218	2.979	<0.001*	0.323

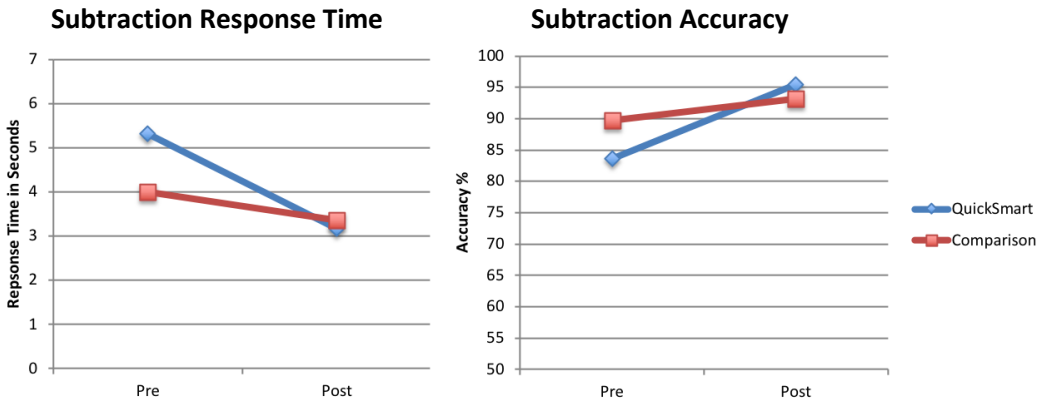


In summary, the results for basic multiplication indicate a substantial improvement for the *QuickSmart* students in response time and a very strong improvement in accuracy. The diagrams illustrate that the *QuickSmart* students improved to reach a slightly better level of performance than the comparison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

4.2.5 Subtraction

Table 5: OZCAAS subtraction – all students 2017

Subtraction	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Res Time (secs) QS	4107	5.312	2.775	3.175	1.914	-2.137	<0.001*	0.896
Res Time (secs) Comp	1152	3.995	2.332	3.36	1.877	-0.635	<0.001*	0.3
Accuracy (%) QS	4107	83.653	16.393	95.409	8.45	11.756	<0.001*	0.901
Accuracy (%) Comp	1152	89.671	13.003	93.202	9.783	3.531	<0.001*	0.307

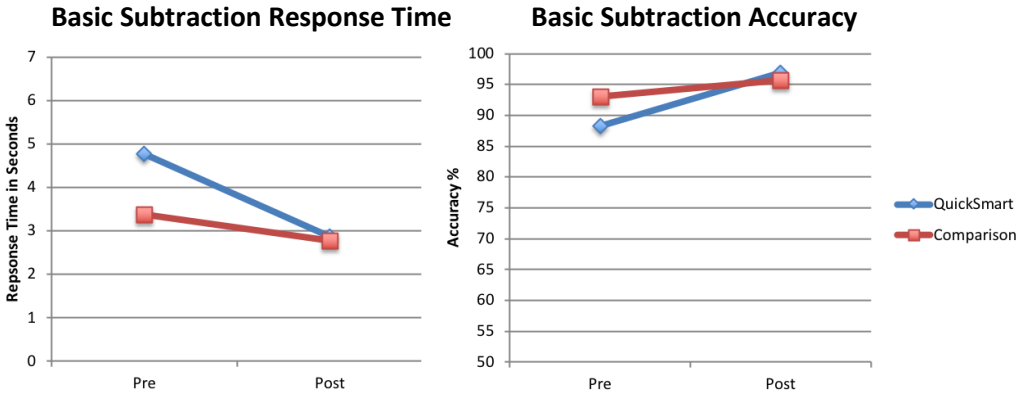


In summary, the results for subtraction indicate a substantial improvement for the *QuickSmart* students in both response time and accuracy. The diagrams illustrate that the *QuickSmart* students improved to reach a slightly better level of performance than the comparison students.

4.2.6 Basic Subtraction

Table 6: OZCAAS basic subtraction – all students 2017

Basic Subtraction	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Res Time (secs) QS	1476	4.765	2.502	2.861	1.756	-1.904	<0.001*	0.881
Res Time (secs) Comp	251	3.383	1.965	2.773	1.641	-0.61	<0.001*	0.337
Accuracy (%) QS	1476	88.298	12.903	96.943	6.17	8.645	<0.001*	0.855
Accuracy (%) Comp	251	93.043	9.45	95.722	6.701	2.679	<0.001*	0.327

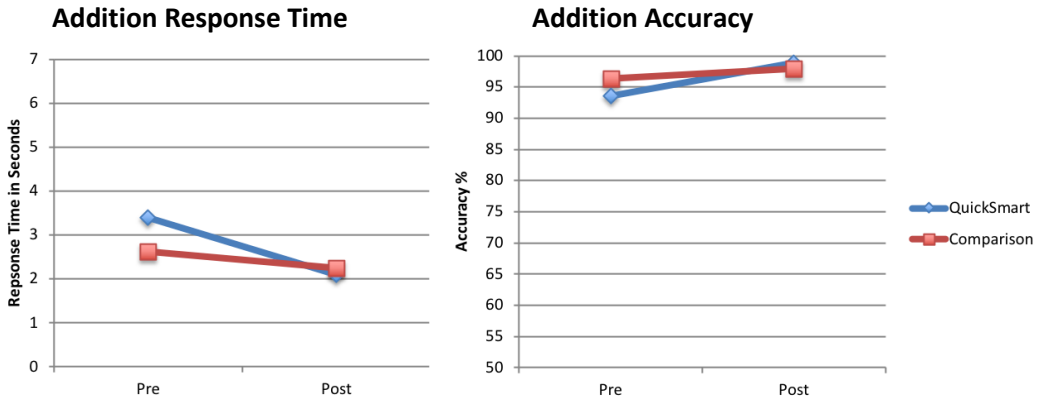


In summary, the results for basic subtraction indicate a substantial improvement for the *QuickSmart* students in both response time and accuracy. The diagrams illustrate that the *QuickSmart* students improved to such an extent that there was no substantial difference between them and the comparison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

4.2.7 Addition

Table 7: OZCAAS addition – all students 2017

Addition	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Res Time (secs) QS	4298	3.395	1.729	2.106	0.992	-1.289	<0.001*	0.915
Res Time (secs) Comp	1169	2.621	1.339	2.252	1.116	-0.369	<0.001*	0.3
Accuracy (%) QS	4298	93.508	9.651	98.852	3.568	5.344	<0.001*	0.734
Accuracy (%) Comp	1169	96.398	7.202	97.978	4.326	1.58	<0.001*	0.266

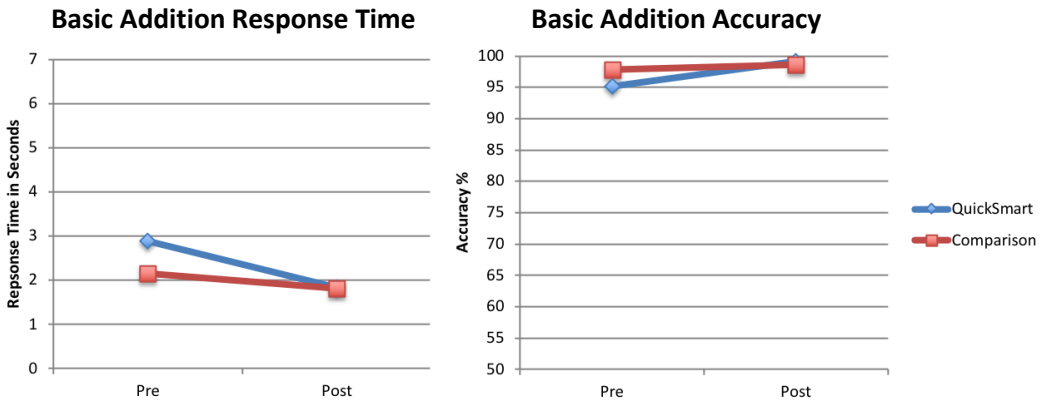


In summary, the results for addition indicate a substantial improvement for the *QuickSmart* students in response time and a very strong improvement in accuracy. The diagrams illustrate that the *QuickSmart* students improved to reach a slightly better level of performance than the comparison students. 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 2017

Basic Addition	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Res Time (secs) QS	1427	2.893	1.561	1.831	0.931	-1.062	<0.001*	0.826
Res Time (secs) Comp	247	2.147	0.991	1.812	0.824	-0.335	<0.001*	0.368
Accuracy (%) QS	1427	95.141	7.982	99.194	3.364	4.053	<0.001*	0.662
Accuracy (%) Comp	247	97.797	3.787	98.562	3.224	0.765	0.016	0.218



In summary, the results for basic addition indicate a very strong improvement for the *QuickSmart* students in accuracy and a substantial improvement in response time. 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 2017

Group	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Response Time (seconds)								
Male *QuickSmart*	1441	5.979	2.824	3.693	2.302	-2.286	<0.001*	0.887
Male Comparison	479	5.101	2.858	4.542	2.665	-0.559	<0.001*	0.203
Female *QuickSmart*	1596	6.511	3.081	3.926	2.304	-2.585	<0.001*	0.95
Female Comparison	488	5.496	3.033	4.923	2.693	-0.573	<0.001*	0.2
Accuracy (%)								
Male *QuickSmart*	1441	57.527	26.357	84.861	20.922	27.334	<0.001*	1.149
Male Comparison	479	72.244	26.045	79.782	22.075	7.538	<0.001*	0.312
Female *QuickSmart*	1596	55.721	26.72	85.046	21.21	29.325	<0.001*	1.216
Female Comparison	488	68.848	26.742	77.857	22.602	9.009	<0.001*	0.364

These results indicate that females did slightly better than males in both response time and accuracy. The results of independent samples *t*-tests of *QuickSmart* students show that these differences are statistically significant at the 0.01 significance level (p = 0.009 for response time and 0.017 for accuracy). However, the small effect sizes (Cohen's d = 0.096 for response time and 0.087 for accuracy) indicate that these statistical findings are not meaningful for practical purposes.

4.3.2 Basic Division by Gender

Table 10: OZCAAS basic division results – all students by gender 2017

Group	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Response Time (seconds)								
Male *QuickSmart*	682	4.872	2.62	2.707	1.622	-2.165	<0.001*	0.994
Male Comparison	132	3.74	2.055	3.008	1.868	-0.732	<0.001*	0.373
Female *QuickSmart*	838	5.487	2.799	3.063	1.877	-2.424	<0.001*	1.017
Female Comparison	152	4.458	2.554	3.412	1.957	-1.046	<0.001*	0.46
Accuracy (%)								
Male *QuickSmart*	682	75.877	23.087	93.29	12.972	17.413	<0.001*	0.93
Male Comparison	132	83.251	21.861	91.036	14.543	7.785	<0.001*	0.419
Female *QuickSmart*	838	75.441	23.29	92.438	13.188	16.997	<0.001*	0.898
Female Comparison	152	85.538	18.109	90.943	12.629	5.405	<0.001*	0.346

These results indicate that males did marginally better than females in accuracy and females did slightly better in response time. The results of independent samples *t*-tests of *QuickSmart* students show that in accuracy the differences are not statistically significant at the 0.01 significance level (p = 0.702) but they are significant in response time (p = 0.048). However, the small effect size for response time (Cohen's d = 0.102) indicates that this statistical finding is not meaningful for practical purposes.

4.3.3 Multiplication by Gender

Table 11: OZCAAS multiplication results – all students by gender 2017

Group	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Response Time (seconds)								
Male *QuickSmart*	1683	5.753	2.678	3.481	2.211	-2.272	<0.001*	0.925
Male Comparison	533	4.694	2.532	4.222	2.448	-0.472	<0.001*	0.19
Female *QuickSmart*	1898	6.055	2.907	3.622	2.135	-2.433	<0.001*	0.954
Female Comparison	543	5.071	2.653	4.375	2.392	-0.696	<0.001*	0.276
Accuracy (%)								
Male *QuickSmart*	1683	64.973	22.607	88.831	16.499	23.858	<0.001*	1.206
Male Comparison	533	76.148	21.483	82.848	17.869	6.7	<0.001*	0.339
Female *QuickSmart*	1898	64.925	21.966	88.865	16.884	23.94	<0.001*	1.222
Female Comparison	543	75.4	21.606	82.865	18.084	7.465	<0.001*	0.375

These results indicate that females did slightly better than males in both response time and accuracy. The results of independent samples *t*-tests of *QuickSmart* students show that these differences are not statistically significant at the 0.01 significance level (p = 0.083 in response time and 0.900 in accuracy).

4.3.4 Basic Multiplication by Gender

Table 12: OZCAAS Basic multiplication results – all students by gender 2017

Group	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Response Time (seconds)								
Male *QuickSmart*	753	3.605	2.192	2.071	1.325	-1.534	<0.001*	0.847
Male Comparison	140	2.561	1.262	2.086	0.925	-0.475	<0.001*	0.429
Female *QuickSmart*	910	3.656	2.055	2.154	1.298	-1.502	<0.001*	0.874
Female Comparison	156	3.16	2.036	2.434	1.68	-0.726	<0.001*	0.389
Accuracy (%)								
Male *QuickSmart*	753	88.393	15.632	97.125	6.454	8.732	<0.001*	0.73
Male Comparison	140	94.182	8.596	96.644	7.848	2.462	0.001	0.299
Female *QuickSmart*	910	89.655	13.269	97.437	6.139	7.782	<0.001*	0.753
Female Comparison	156	92.374	11.303	95.817	8.542	3.443	<0.001*	0.344

These results indicate that males did slightly better than females in both response time and accuracy. The results of independent samples *t*-tests of *QuickSmart* students show that in both response time and accuracy the differences are not statistically significant at the 0.01 significance level (p = 0.722 for response time and 0.155 for accuracy).

4.3.5 Subtraction by Gender

Table 13: OZCAAS subtraction results – all students by gender 2017

Group	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Response Time (seconds)								
Male *QuickSmart*	1912	4.817	2.576	2.888	1.712	-1.929	<0.001*	0.882
Male Comparison	563	3.511	1.917	2.949	1.565	-0.561	<0.001*	0.321
Female *QuickSmart*	2195	5.743	2.869	3.426	2.042	-2.317	<0.001*	0.931
Female Comparison	589	4.458	2.588	3.753	2.059	-0.705	<0.001*	0.301
Accuracy (%)								
Male *QuickSmart*	1912	84.365	15.861	95.439	8.323	11.074	<0.001*	0.874
Male Comparison	563	90.538	12.397	94.195	8.256	3.657	<0.001*	0.347
Female *QuickSmart*	2195	83.033	16.822	95.382	8.561	12.349	<0.001*	0.925
Female Comparison	589	88.842	13.516	92.253	10.97	3.411	<0.001*	0.277

These results indicate that females did better than males in both response time and accuracy. The independent samples *t*-tests of *QuickSmart* students show that these results are statistically significant at the 0.01 significance level ($p < 0.001$ for response time and 0.010 in accuracy). However, the small effect sizes (Cohen's $d = 0.167$ for response time and 0.084 for accuracy) indicate that these statistical findings are not meaningful for practical purposes.

4.3.6 Basic Subtraction by Gender

Table 14: OZCAAS Basic subtraction results – all students by gender 2017

Group	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Response Time (seconds)								
Male *QuickSmart*	672	4.405	2.431	2.666	1.665	-1.739	<0.001*	0.835
Male Comparison	123	2.924	1.586	2.473	1.306	-0.451	<0.001*	0.311
Female *QuickSmart*	804	5.066	2.522	3.024	1.814	-2.042	<0.001*	0.93
Female Comparison	128	3.823	2.188	3.061	1.869	-0.762	<0.001*	0.374
Accuracy (%)								
Male *QuickSmart*	672	88.362	12.755	96.914	5.971	8.552	<0.001*	0.859
Male Comparison	123	93.269	9.086	95.846	6.561	2.577	0.002	0.325
Female *QuickSmart*	804	88.245	13.033	96.968	6.335	8.723	<0.001*	0.851
Female Comparison	128	92.825	9.818	95.602	6.856	2.777	0.001	0.328

These results indicate that females did better than males in both response time and accuracy. The results of independent samples *t*-tests of *QuickSmart* students show that in accuracy the differences are not statistically significant at the 0.01 significance level ($p = 0.799$) but they are significant in response time ($p = 0.003$). However, the small effect size for response time (Cohen's $d = 0.153$) indicates that this statistical finding is not meaningful for practical purposes.

4.3.7 Addition by Gender

Table 15: OZCAAS addition results – all students by gender 2017

Group	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Response Time (seconds)								
Male *QuickSmart*	1998	3.227	1.732	2.012	1.02	-1.215	<0.001*	0.855
Male Comparison	568	2.369	1.166	2.062	0.997	-0.307	<0.001*	0.283
Female *QuickSmart*	2300	3.541	1.713	2.187	0.96	-1.354	<0.001*	0.975
Female Comparison	601	2.859	1.446	2.432	1.191	-0.427	<0.001*	0.323
Accuracy (%)								
Male *QuickSmart*	1998	93.225	9.517	98.872	3.486	5.647	<0.001*	0.788
Male Comparison	568	96.645	7.014	98.301	4.005	1.656	<0.001*	0.29
Female *QuickSmart*	2300	93.754	9.762	98.834	3.639	5.08	<0.001*	0.69
Female Comparison	601	96.164	7.374	97.672	4.591	1.508	<0.001*	0.246

These results indicate that males did better than females in accuracy and females did better in response time. The results of independent samples *t*-tests of *QuickSmart* students show that these differences are statistically significant at the 0.01 significance level (p = 0.002 for response time and 0.037 for accuracy). However, the small effect sizes (Cohen's d = 0.097 for response time and 0.061 for accuracy) indicate that these statistical findings are not meaningful for practical purposes.

4.3.8 Basic Addition by Gender

Table 16: OZCAAS basic addition results – all students by gender 2017

Group	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Response Time (seconds)								
Male *QuickSmart*	666	2.783	1.44	1.764	0.919	-1.019	<0.001*	0.844
Male Comparison	123	2.008	0.836	1.687	0.675	-0.321	<0.001*	0.423
Female *QuickSmart*	761	2.99	1.654	1.89	0.939	-1.1	<0.001*	0.817
Female Comparison	124	2.285	1.11	1.936	0.935	-0.349	<0.001*	0.34
Accuracy (%)								
Male *QuickSmart*	666	95.28	7.737	99.258	2.34	3.978	<0.001*	0.696
Male Comparison	123	97.964	3.352	98.615	3.409	0.651	0.135	0.193
Female *QuickSmart*	761	95.019	8.194	99.137	4.054	4.118	<0.001*	0.637
Female Comparison	124	97.631	4.182	98.509	3.043	0.878	0.057	0.24

These results indicate that females did better than males in both response time and accuracy. The results of independent samples *t*-tests of *QuickSmart* students show that in both response time and accuracy the differences are not statistically significant at the 0.01 significance level (p = 0.228 for response time and 0.731 for accuracy).

4.3.9 Indigenous Students

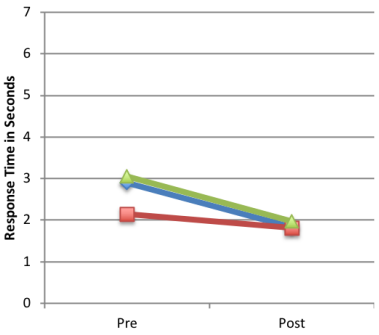
Table 17: OZCAAS results – Indigenous students 2017

Test	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Basic Addition								
Response time (seconds)	136	3.049	1.819	1.976	1.403	-1.073	<0.001*	0.661
Accuracy (%)	136	94.257	11.399	99.418	2.175	5.161	<0.001*	0.629
Addition								
Response time (seconds)	282	3.567	1.947	2.204	1.057	-1.363	<0.001*	0.87
Accuracy (%)	282	93.546	11.021	98.745	3.548	5.199	<0.001*	0.635
Basic Subtraction								
Response time (seconds)	142	5.345	3.123	3.342	2.254	-2.003	<0.001*	0.735
Accuracy (%)	142	87.763	13.158	96.631	6.449	8.868	<0.001*	0.856
Subtraction								
Response time (seconds)	261	5.541	2.851	3.543	2.201	-1.998	<0.001*	0.785
Accuracy (%)	261	81.639	19.439	94.542	9.182	12.903	<0.001*	0.849
Basic Multiplication								
Response time (seconds)	147	3.826	2.253	2.283	1.299	-1.543	<0.001*	0.839
Accuracy (%)	147	88.9	14.653	97.198	6.135	8.298	<0.001*	0.739
Multiplication								
Response time (seconds)	223	6.257	3.061	3.823	2.163	-2.434	<0.001*	0.918
Accuracy (%)	223	62.518	24.903	86.275	20.001	23.757	<0.001*	1.052
Basic Division								
Response time (seconds)	108	5.284	2.963	3.003	1.683	-2.281	<0.001*	0.947
Accuracy (%)	108	75.442	23.179	91.941	16.179	16.499	<0.001*	0.825
Division								
Response time (seconds)	193	6.131	3.131	4.237	2.314	-1.894	<0.001*	0.688
Accuracy (%)	193	51.466	27.343	80.683	24.707	29.217	<0.001*	1.121

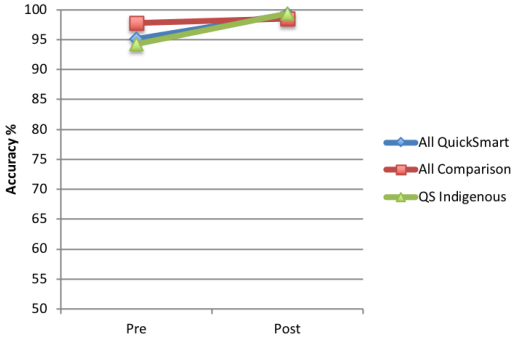
These results indicate that in most instances the Indigenous students' improvement was very similar to that of the overall *QuickSmart* group. For addition, the accuracy results exhibit the ceiling effect (the pre-intervention scores were so high that the students did not have much room for further improvement).

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).

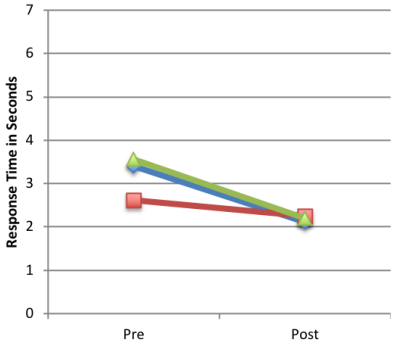
Basic Addition Response Time



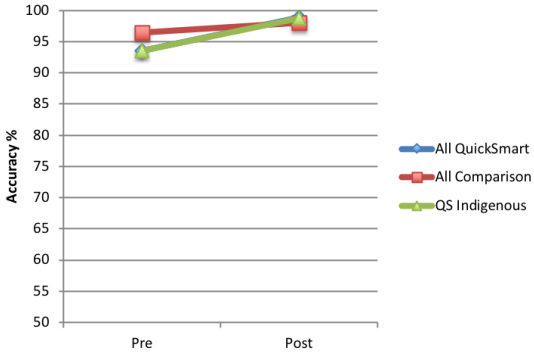
Basic Addition Accuracy



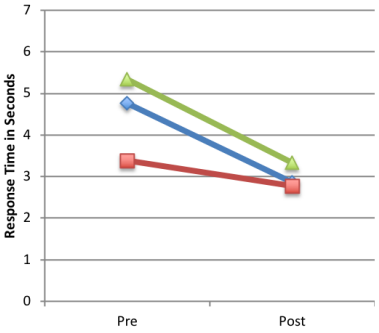
Addition Response Time



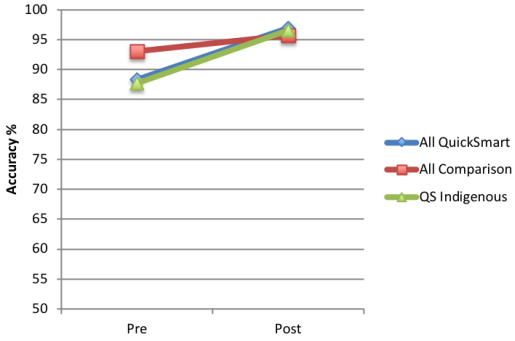
Addition Accuracy



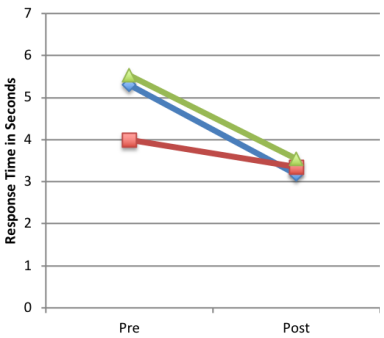
Basic Subtraction Response Time



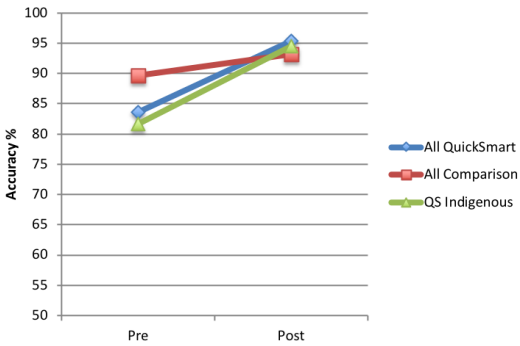
Basic Subtraction Accuracy



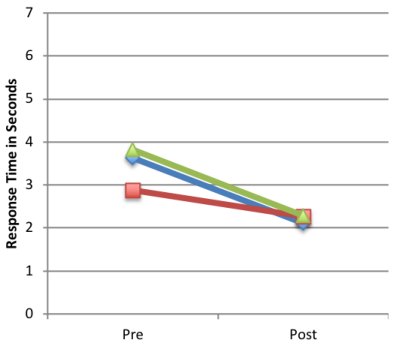
Subtraction Response Time



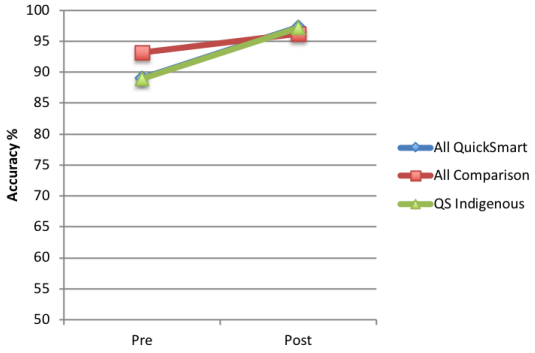
Subtraction Accuracy



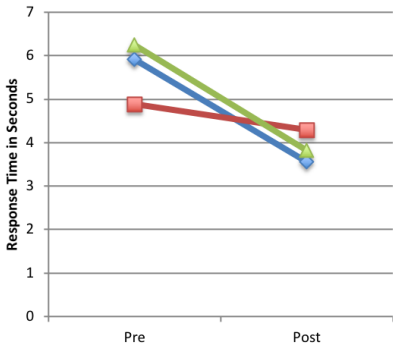
Basic Multiplication Response Time



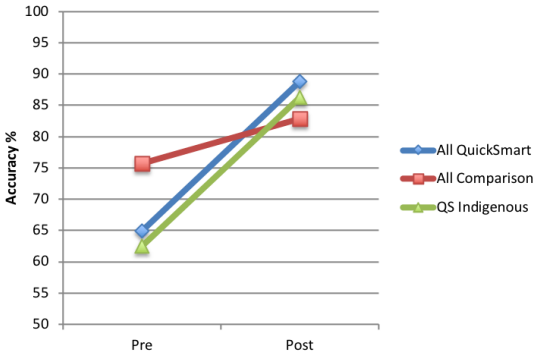
Basic Multiplication Accuracy



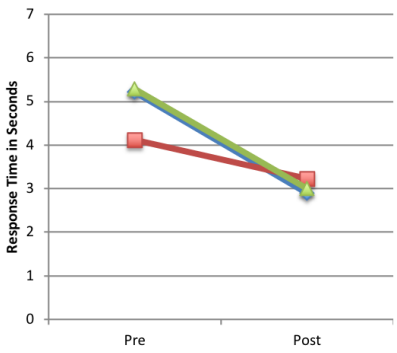
Multiplication Response Time



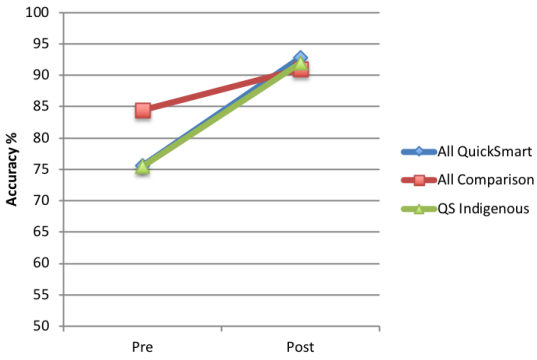
Multiplication Accuracy



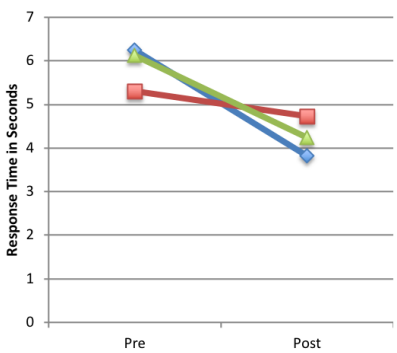
Basic Division Response Time



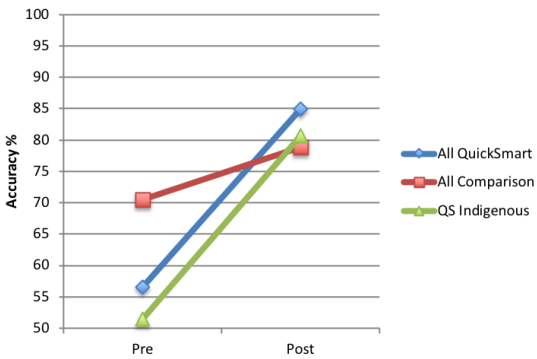
Basic Division Accuracy



Division Response Time



Division Accuracy



4.5 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 – 2017

	N	Mean	Std. Deviation
Basic Addition			
Response time (seconds)	12	1.875	1.125
Accuracy (%)	12	100.0	0.0
Addition			
Response time (seconds)	71	2.195	1.052
Accuracy (%)	71	98.587	3.083
Basic Subtraction			
Response time (seconds)	39	3.556	1.92
Accuracy (%)	39	94.051	11.245
Subtraction			
Response time (seconds)	117	3.233	1.892
Accuracy (%)	117	95.628	8.453
Basic Multiplication			
Response time (seconds)	77	2.412	1.658
Accuracy (%)	77	96.786	6.66
Multiplication			
Response time (seconds)	183	4.211	2.681
Accuracy (%)	183	81.914	20.209
Basic Division			
Response time (seconds)	135	3.149	1.965
Accuracy (%)	135	90.481	13.565
Division			
Response time (seconds)	297	4.278	2.786
Accuracy (%)	297	79.3	23.874

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 3.6 seconds and above 94% accuracy. In multiplication and division, the average response times were below 4.3 seconds and accuracy over 79% at post-test. Even though some of these students may not have progressed to multiplication and division during *QuickSmart* lessons, their results are encouraging. 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.

4.6 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 and some of these results are statistically significant. However, the small effect sizes indicate that these statistical findings are not meaningful for practical purposes. As a result, these data do not warrant further investigation.

It is acknowledged that Indigenous students' improvements were comparable to those of the overall *QuickSmart* group with effect sizes 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 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) 2017

	Students with paired data	Average Gain score	Significance	Effect size
All *QuickSmart*	**3358**	**6.766**	**<0.001***	**0.655**
All comparison	**859**	**4.783**	**<0.001***	**0.428**

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.

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) 2017

Gender	Students with paired data	Average Gain score	Significance	Effect size
Male				
QuickSmart Students	1548	6.839	<0.001*	0.669
Comparison Students	423	4.615	<0.001*	0.409
Female				
QuickSmart Students	1810	6.704	<0.001*	0.644
Comparison Students	436	4.946	<0.001*	0.446

These results indicate that QuickSmart males did slightly better than females in PATM assessment. However, the results of independent samples *t*-tests of *QuickSmart* students show that for the ACER PAT results the differences are not statistically significant at the 0.01 significance level ($p = 0.658$).

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) 2017

Indigenous students	Students with paired data	Average Gain score	Significance	Effect size
Indigenous *QuickSmart*	253	6.788	<0.001*	0.618
All comparison	859	4.783	<0.001*	0.428

Once again these results show very strong improvement for the Indigenous students who participated in *QuickSmart*. This improvement is slightly higher than that of the overall *QuickSmart* group.

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

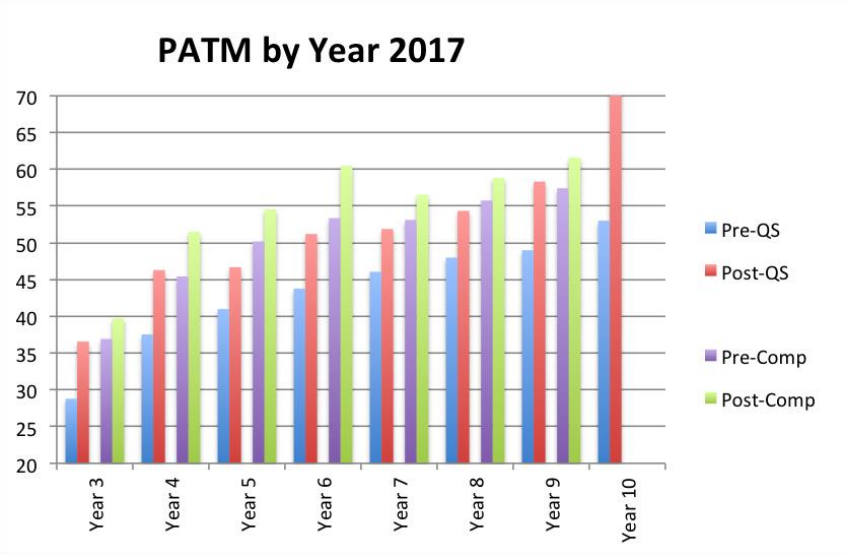


Figure 1: PAT by Year

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	2661	3358	79.2
Indigenous *QuickSmart*	200	253	79.1
Comparison	634	859	73.8

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 *QuickSmar*t 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) 67735067.

Professor John Pegg

7 APPENDIX A: Independent Assessment Results

7.1 PAT Results by Region (Scale Scores) 2017

School Region		Pre-Intervention		Post-Intervention				
	N	Mean	SD	Mean	SD	Gain	*p*	Effect size
Adelaide QS Students	686	40.363	8.939	46.729	8.412	6.366	<0.001*	0.733
Ballarat QS Students	205	44.329	8.244	49.424	8.659	5.095	<0.001*	0.603
Eyre Peninsula QS Students	47	34.94	7.942	39.498	9.584	4.558	<0.001*	0.518
Geelong QS Students	61	45.485	6.631	52.774	8.401	7.289	<0.001*	0.963
Gippsland QS Students	19	43.453	8.046	47.663	7.545	4.21	0.082	0.54
Goulbourn QS Students	25	45.332	5.08	46.636	7.833	1.304	0.523	0.198
Horsham QS Students	79	46.648	8.14	52.194	6.725	5.546	<0.001*	0.743
Hunter QS Students	316	41.808	9.65	50.573	11.867	8.765	<0.001*	0.81
Limestone Coast QS Students	31	38.8	8.192	47.016	9.226	8.216	<0.001*	0.942
Melbourne QS Students	234	45.339	8.348	51.955	10.361	6.616	<0.001*	0.703
Mid-West NSW QS Students	67	50.388	7.448	56.23	10.669	5.842	<0.001*	0.635
Mornington QS Students	15	41.333	7.86	50.5	4.6	9.167	<0.001*	1.424
Murray/Mallee QS Students	38	44.382	6.646	48.308	7.02	3.926	<0.001*	0.574
New England QS Students	17	45.553	6.792	55.082	8.773	9.529	<0.001*	1.215
North Coast QS Students	335	42.076	8.219	51.898	11.626	9.822	<0.001*	0.976
North Tasmania QS Students	19	45.589	6.917	48.647	8.897	3.058	0.049	0.384
North West NSW QS Students	94	43.664	8.282	50.643	11.175	6.979	<0.001*	0.71
Northern Territory QS Students	14	100.486	4.861	107.679	7.332	7.193	<0.001*	1.156
Port Pirie QS Students	72	46.003	7.992	53.674	8.935	7.671	<0.001*	0.905
Queensland QS Students	162	47.056	9.566	53.004	11.12	5.948	<0.001*	0.573
Remote SA QS Students	14	43.843	5.026	49.907	5.976	6.064	0.017	1.098
Riverina QS Students	54	45.657	7.617	51.22	8.856	5.563	<0.001*	0.674
South Tasmania QS Students	28	45.914	5.217	51.386	6.205	5.472	<0.001*	0.955
Southern Sydney QS Students	19	47.316	6.249	52.658	7.426	5.342	0.001	0.778
Sydney QS Students	458	43.2	8.807	49.967	9.384	6.767	<0.001*	0.744
Western NSW QS Students	89	45.144	11.31	50.811	11.86	5.667	<0.001*	0.489
Western Sydney QS Students	129	40.0	10.92	44.349	10.073	4.349	<0.001*	0.414
Yorke Peninsula/Mid North SA QS Students	31	42.848	8.087	51.265	9.712	8.417	<0.001*	0.942

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

7.2 PAT Results by Demographic (Scale Scores) 2017

Demographic		Pre-Intervention		Post-Intervention				
	N	Mean	SD	Mean	SD	Gain	*p*	Effect size
All QS Students	**3358**	**43.264**	**9.794**	**50.03**	**10.828**	**6.766**	**<0.001***	**0.655**
All comparison students	**859**	**51.247**	**11.21**	**56.03**	**11.166**	**4.783**	**<0.001***	**0.428**
Indigenous QS Students	253	42.485	9.238	49.273	12.5	6.788	<0.001*	0.618
Male QS Students	1548	43.226	9.871	50.064	10.569	6.839	<0.001*	0.669
Male comparison students	423	51.41	11.289	56.025	11.305	4.615	<0.001*	0.409
Female QS Students	1810	43.297	9.729	50.001	11.049	6.704	<0.001*	0.644
Female comparison Students	436	51.089	11.144	56.035	11.042	4.946	<0.001*	0.446
Male Indigenous QS Students	122	40.845	9.189	49.255	12.015	8.41	<0.001*	0.786
Female Indigenous QS Students	131	44.013	9.054	49.289	12.982	5.276	<0.001*	0.471

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

7.3 PAT Results by State (Scale Scores) 2017

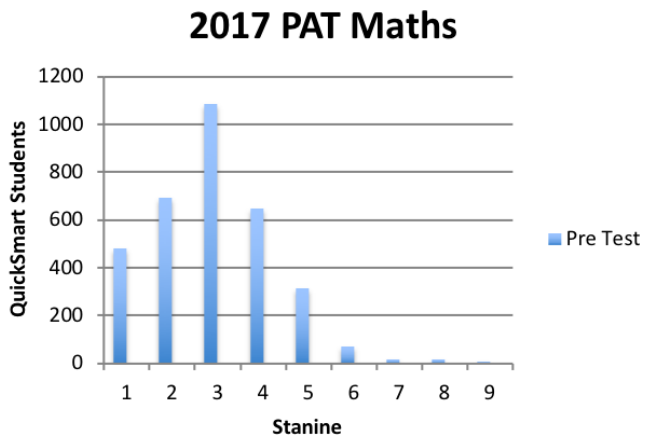
School		Pre-Intervention		Post-Intervention				
	N	Mean	SD	Mean	SD	Gain	*p*	Effect size
All *QuickSmart* Students	**3358**	**43.264**	**9.794**	**50.03**	**10.828**	**6.766**	**<0.001***	**0.655**
All comparison students	**859**	**51.247**	**11.21**	**56.03**	**11.166**	**4.783**	**<0.001***	**0.428**
Australian Capital Territory								
QuickSmart	0							
Indigenous *QuickSmart*	0							
Comparison	0							
New South Wales								
QuickSmart	1578	43.022	9.262	50.523	10.947	7.501	<0.001*	0.74
Indigenous *QuickSmart*	212	42.636	9.132	50.094	12.778	7.458	<0.001*	0.672
Comparison	190	49.721	11.986	55.569	11.145	5.849	<0.001*	0.505
Northern Territory								
QuickSmart	14	100.486	4.861	107.679	7.332	7.193	<0.001*	1.156
Indigenous *QuickSmart*	0							
Comparison	5	106.6	7.834	106.82	5.096	0.22	0.917	0.033
Queensland								
QuickSmart	162	47.056	9.566	53.004	11.12	5.948	<0.001*	0.574
Indigenous *QuickSmart*	6	48.733	4.289	48.333	8.986	-0.4	0.886	0.057
Comparison	77	53.638	7.398	57.862	9.626	4.224	<0.001*	0.492
South Australia								
QuickSmart	919	40.778	8.897	47.18	8.896	6.402	<0.001*	0.72
Indigenous *QuickSmart*	21	35.9	9.178	40.695	9.95	4.795	0.010	0.501
Comparison	285	49.007	9.326	53.796	10.406	4.789	<0.001*	0.485
Tasmania								
QuickSmart	47	45.783	5.893	50.279	7.445	4.496	<0.001*	0.67
Indigenous *QuickSmart*	5	46.92	6.709	48.18	9.207	1.26	0.627	0.156
Comparison	11	54.218	7.701	59.818	5.627	5.6	0.012	0.83
Victoria								
QuickSmart	638	45.04	8.038	50.879	9.085	5.839	<0.001*	0.681
Indigenous *QuickSmart*	9	47.667	7.615	51.167	7.661	3.5	0.281	0.458
Comparison	291	52.741	10.6	57.018	10.209	4.277	<0.001*	0.411
Western Australia								
QuickSmart	0							
Indigenous *QuickSmart*	0							
Comparison	0							

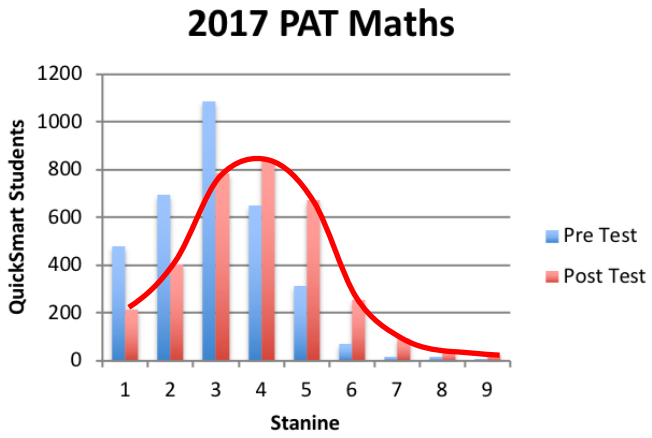
Note: only students who did both 'pre' and 'post' test are included in the table.

7.4 *QuickSmart* Students by Year (Scale Scores) 2017

Year		Pre-Intervention		Post-Intervention				
	N	Mean	SD	Mean	SD	Gain	*p*	Effect size
Year 3								
QuickSmart	27	28.785	5.787	36.563	8.133	7.778	<0.001*	1.102
Indigenous *QuickSmart*	5	28.68	4.477	36.18	9.271	7.5	0.214	1.03
Comparison	11	36.936	8.158	39.736	10.369	2.8	0.192	0.3
Year 4								
QuickSmart	597	37.546	12.601	46.293	13.106	8.747	<0.001*	0.68
Indigenous *QuickSmart*	52	36.448	8.191	43.471	9.887	7.023	<0.001*	0.774
Comparison	167	45.422	14.667	51.503	13.246	6.081	<0.001*	0.435
Year 5								
QuickSmart	774	40.987	7.896	46.683	8.622	5.696	<0.001*	0.689
Indigenous *QuickSmart*	52	38.546	7.299	45.919	7.525	7.373	<0.001*	0.995
Comparison	182	50.195	8.446	54.549	10.057	4.354	<0.001*	0.469
Year 6								
QuickSmart	509	43.769	7.77	51.207	8.27	7.438	<0.001*	0.927
Indigenous *QuickSmart*	18	44.0	11.216	45.417	10.41	1.417	0.493	0.131
Comparison	157	53.369	11.458	60.48	9.488	7.111	<0.001*	0.676
Year 7								
QuickSmart	860	46.062	8.404	51.888	9.795	5.826	<0.001*	0.638
Indigenous *QuickSmart*	76	44.753	7.076	52.122	11.353	7.369	<0.001*	0.779
Comparison	224	53.119	8.936	56.55	10.255	3.431	<0.001*	0.357
Year 8								
QuickSmart	511	47.995	7.339	54.349	10.892	6.354	<0.001*	0.684
Indigenous *QuickSmart*	44	49.98	7.237	57.695	16.923	7.715	0.003	0.593
Comparison	96	55.757	7.597	58.814	8.001	3.057	<0.001*	0.392
Year 9								
QuickSmart	73	48.996	10.757	58.334	11.345	9.338	<0.001*	0.845
Indigenous *QuickSmart*	6	52.233	1.657	53.233	3.002	1.0	0.481	0.412
Comparison	22	57.427	10.581	61.605	13.012	4.178	0.022	0.352
Year 10								
QuickSmart	7	53.014	9.949	75.143	9.884	22.129	0.002	2.232
All Schools								
QuickSmart	**3358**	**43.264**	**9.794**	**50.03**	**10.828**	**6.766**	**<0.001***	**0.655**
Indigenous *QuickSmart*	**253**	**42.485**	**9.238**	**49.273**	**12.5**	**6.788**	**<0.001***	**0.618**
Comparison	**859**	**51.247**	**11.21**	**56.03**	**11.166**	**4.783**	**<0.001***	**0.428**

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 higher 77-88% 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.