quicksmart

Annual Numeracy Program Report

2020

The SiMERR National Research Centre
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ARMIDALE NSW

SiMERR

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1 *QuickSmart* Executive Summary in 2020

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 under-utilised, 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, Indigenous teaching assistants (trained 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, 2016). 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 2020, the *QuickSmart* team at the University of New England received matched data from 2,970 students who participated in *QuickSmart* Numeracy lessons and 822 average-achieving comparison peers. These students were drawn from schools from 32 regions around Australia.

The global COVID-19 pandemic in 2020 resulted in schools conducting lessons online for the majority of students for a period of time. Many schools were unable to run *QuickSmart* lessons with their students during this period. Some schools were able to adapt a portion of their *QuickSmart* lesson to an online format using Zoom or a similar online meeting tool, but this appears to have been mostly for practice components. As a result in fewer students participated in *QuickSmart* during the year and also fewer students were able to complete the recommended number of *QuickSmart* lessons normally done within the year.

Despite the challenges schools faced in providing *QuickSmart* lessons to their struggling students with the disrupted year in 2020, the results achieved are similar to those from previous years, but for a smaller number of students.

In terms of the OZCAAS (a computer-generated random number fact 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 evidence provided illustrates that *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 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 strong to substantial over all operations.

A further mark of the success of *QuickSmart* can be found in the post-test results of those students who did not succeed in completing the pre-test. In such cases, (see Table 18) Instructors are advised not to continue collecting data in the pre-test as doing so would confront these students with the extent of their weaknesses at the beginning of the program. Significantly, the fact that these students are now able to complete all OZCAAS assessments at the end of the program is an achievement in and of itself.

In addition and subtraction, the average response times were below 4.6 seconds with above 95% average accuracy. In multiplication and division, the average response times were below 3.9 seconds and average accuracy over 84% 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' 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; and
3. students have increased their ability to benefit from classroom instruction.

In the case of the ACER PATM tests, norm tables (2016) were used to convert raw scores from various forms of the PATM to consistent scaled 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 third analysis is the shift in national percentile performance.

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 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 ($p = 0.161$).

Once again, these results show very strong improvement for Indigenous students who participated in *QuickSmart*. This improvement is slightly smaller 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. Strong to substantial effect sizes and shifts in national percentile performance 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 *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 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 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 through targeted practice; 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.

The program is designed to be run for 90 lessons across the school year.

2.2.1 Impact of COVID-19 on *QuickSmart* in 2020

The global COVID-19 pandemic in 2020 resulted in schools conducting lessons online for the majority of students for a period of time. Many schools were unable to run *QuickSmart* lessons with their students during this period. Some schools were able to adapt a portion of their *QuickSmart* lesson to an online format using Zoom or a similar online meeting tool, but this appears to have been mostly for practice components. Consequently, fewer students participated fully in *QuickSmart* during the year and also fewer students had the opportunity to complete the recommended number of *QuickSmart* lessons normally done within the year.

In addition to the impact of online lessons, the timing of the lockdown resulted in a number of schools new to the program not being able to start their *QuickSmart* year. The reason for this was that the lockdown happened soon after their training, while they were only beginning to identify and pre-test students. Some of these schools decided to only do enough *QuickSmart* in 2020 to practice their lessons with a view to fully activate in 2021, and so did not provide data for this report. Other schools chose to halt their implementation of the program and restart the following year.

Despite the challenges schools faced in providing *QuickSmart* lessons to their struggling students with the disrupted year in 2020, the results achieved are similar to those from previous years, but for a smaller number of students.

3 *QuickSmart* Tests — 2020

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 response time and accuracy data from OZCAAS measures. These are 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 a 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-group instruction. It is important to note that the comparison students do not represent an experimental 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, an experimental design with a control group would not be appropriate and 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 2020, the *QuickSmart* team at the SiMERR National Research Centre at the University of New England received matched data from 2,970 students who participated in *QuickSmart* Numeracy lessons and 822 'average-achieving' comparison peers. These students were drawn from schools from 32 regions around Australia.

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.

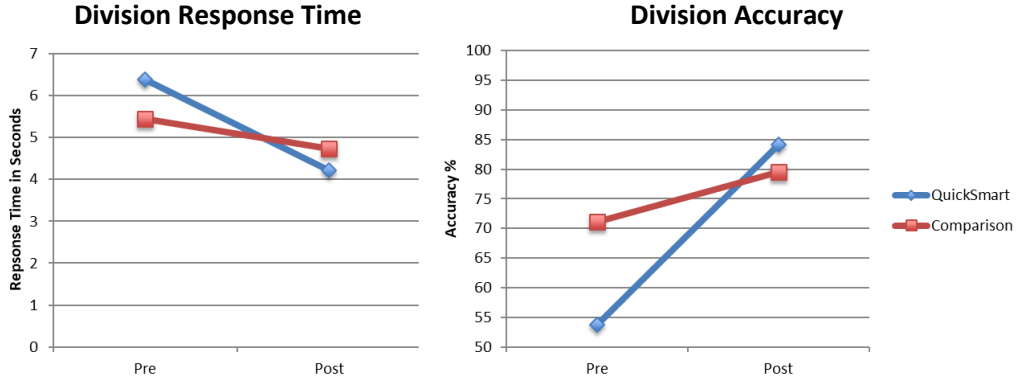
4.2 Combined OZCAAS Analysis

4.2.1 Division

Table 1 below summarises the data submitted for OZCAAS division.

Table 1: OZCAAS division – all students 2020

Division	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Res Time (secs) QS	6.374	3.046	4.206	2.557	-2.168	<0.001*	0.771
Res Time (secs) Comp	5.447	2.803	4.734	2.484	-0.713	<0.001*	0.269
Accuracy (%) QS	53.768	26.187	84.179	20.888	30.411	<0.001*	1.284
Accuracy (%) Comp	71.071	25.371	79.578	20.081	8.507	<0.001*	0.372



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 2.168 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 0.771, 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 two-to-three years' growth.

In terms of accuracy, the *QuickSmart* students' average scores have improved by over 30 percentage points, which is a very strong result. The effect size for this result is 1.284, which indicates substantial improvement for the *QuickSmart* group.

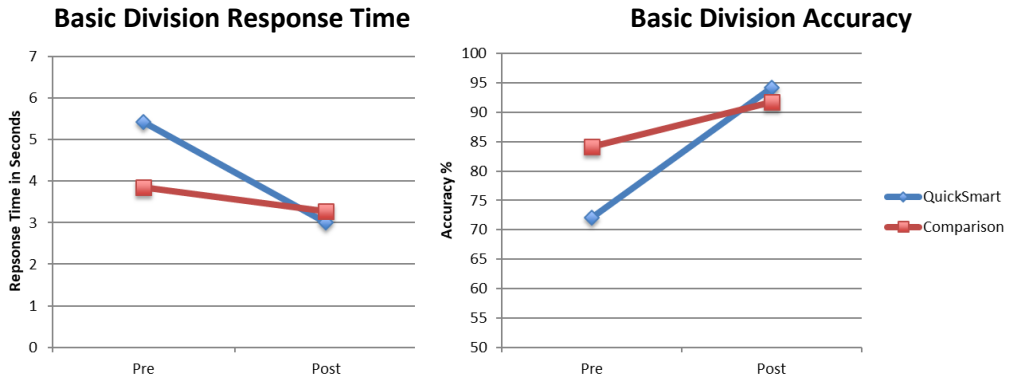
Division is typically (but not always) the final focus of the *QuickSmart* program for students. As a result, a number of students may not reach the lessons that focus on division facts. Interestingly, students still appear to make important gains even if lessons on division had not been undertaken. 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 a stronger gain for both response time and accuracy. The graphs 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 2020

Basic Division	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Res Time (secs) QS	5.43	2.73	3.007	1.891	-2.423	<0.001*	1.032
Res Time (secs) Comp	3.853	2.007	3.279	2.011	-0.574	<0.001*	0.286
Accuracy (%) QS	72.019	26.045	94.146	11.393	22.127	<0.001*	1.101
Accuracy (%) Comp	84.11	21.909	91.69	14.358	7.58	<0.001*	0.409

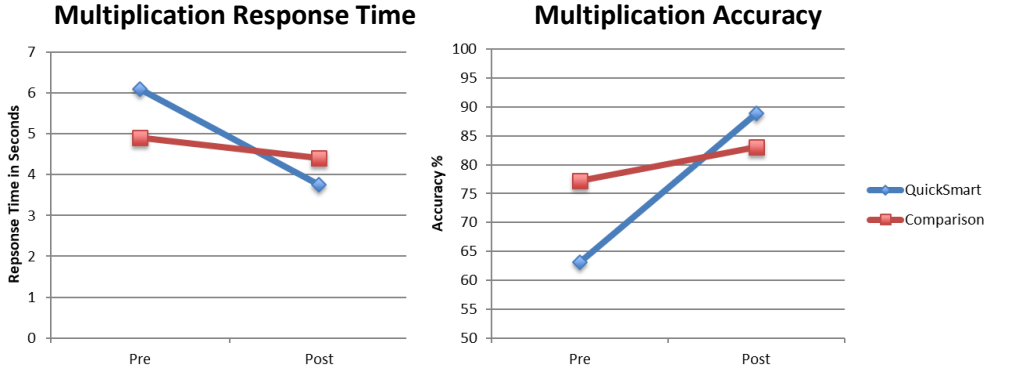


In summary, the results for basic division indicate a substantial improvement for the *QuickSmart* students in both response time and accuracy. The graphs illustrate that the *QuickSmart* students improved to reach a slightly better level of performance than the comparison students.

4.2.3 Multiplication

Table 3: OZCAAS multiplication – all students 2020

Multiplication	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Res Time (secs) QS	6.094	2.794	3.763	2.35	-2.331	<0.001*	0.903
Res Time (secs) Comp	4.907	2.597	4.4	2.459	-0.507	<0.001*	0.2
Accuracy (%) QS	63.182	21.783	88.942	16.466	25.76	<0.001*	1.334
Accuracy (%) Comp	77.289	20.418	83.115	16.478	5.826	<0.001*	0.314

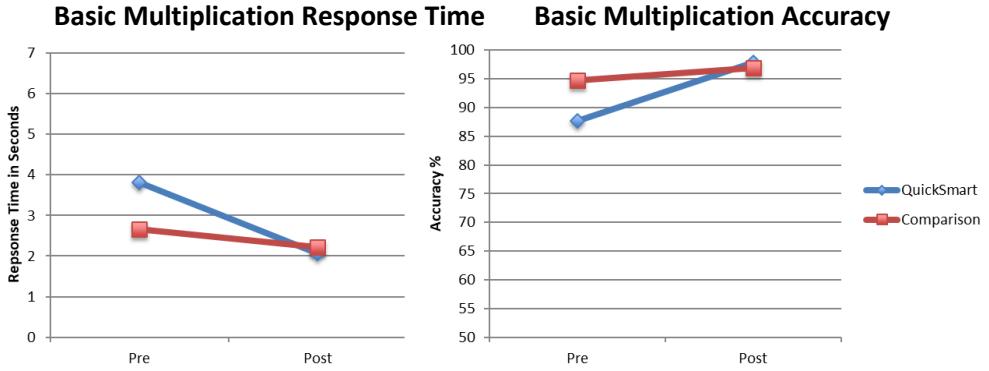


In summary, the results for multiplication indicate a substantial improvement in both response time and accuracy. The graphs illustrate that the *QuickSmart* students improved to reach a better level of performance than the comparison students.

4.2.4 Basic Multiplication

Table 4: OZCAAS basic multiplication – all students 2020

Basic Multiplication	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Res Time (secs) QS	3.806	2.237	2.068	1.249	-1.738	<0.001*	0.959
Res Time (secs) Comp	2.652	1.497	2.218	1.338	-0.434	<0.001*	0.305
Accuracy (%) QS	87.689	16.826	97.854	5.483	10.165	<0.001*	0.812
Accuracy (%) Comp	94.796	10.868	96.972	6.636	2.176	0.002	0.242

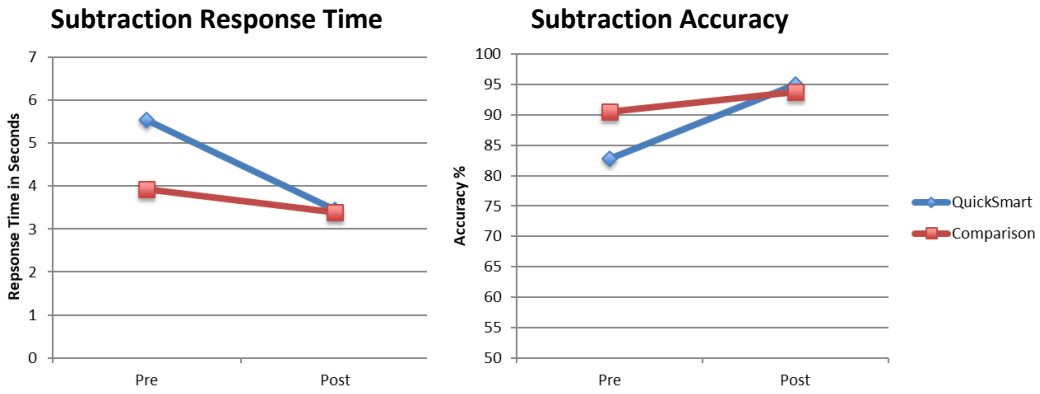


In summary, the results for basic multiplication indicate a substantial improvement for the *QuickSmart* students in both response time and accuracy. The graphs illustrate that the *QuickSmart* students improved to reach a slightly better level of performance than the comparison students.

4.2.5 Subtraction

Table 5: OZCAAS subtraction – all students 2020

Subtraction	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Res Time (secs) QS	5.531	2.778	3.448	2.05	-2.083	<0.001*	0.853
Res Time (secs) Comp	3.923	2.122	3.394	1.852	-0.529	<0.001*	0.266
Accuracy (%) QS	82.86	17.106	95.003	9.473	12.143	<0.001*	0.878
Accuracy (%) Comp	90.531	12.372	93.727	9.194	3.196	<0.001*	0.293

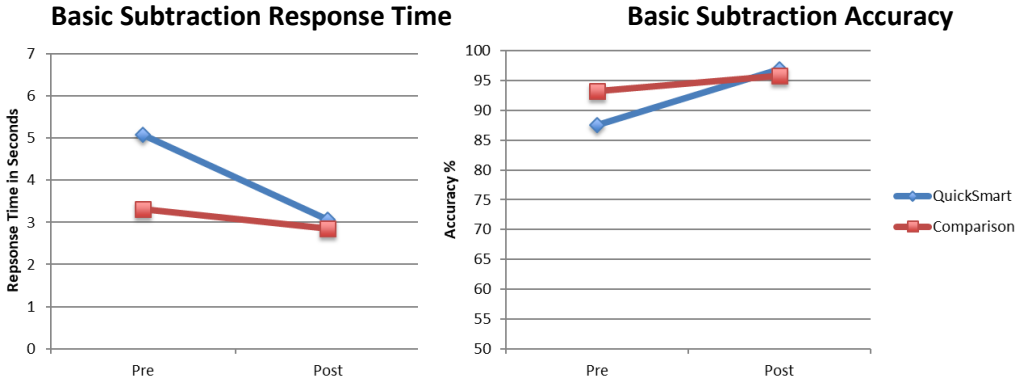


In summary, the results for subtraction indicate a substantial improvement for the *QuickSmart* students in both response time and accuracy. The graphs illustrate that the *QuickSmart* students improved to such an extent that there was no substantial difference between them and the comparison students.

4.2.6 Basic Subtraction

Table 6: OZCAAS basic subtraction – all students 2020

Basic Subtraction	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Res Time (secs) QS	5.083	2.556	3.064	1.833	-2.019	<0.001*	0.908
Res Time (secs) Comp	3.314	1.878	2.858	1.471	-0.456	0.002	0.27
Accuracy (%) QS	87.567	14.332	96.86	6.487	9.293	<0.001*	0.835
Accuracy (%) Comp	93.257	10.981	95.777	7.668	2.52	0.008	0.266

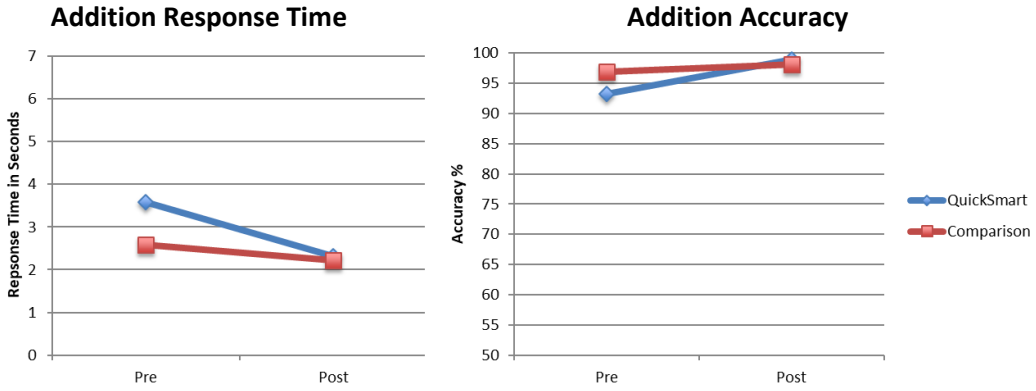


In summary, the results for basic subtraction indicate a substantial improvement for the *QuickSmart* students in both response time and accuracy. The graphs illustrate that the *QuickSmart* students improved to such an extent that there was no substantial difference between them and the comparison students.

4.2.7 Addition

Table 7: OZCAAS addition – all students 2020

Addition	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Res Time (secs) QS	3.591	1.899	2.317	1.145	-1.274	<0.001*	0.813
Res Time (secs) Comp	2.594	1.26	2.221	0.998	-0.373	<0.001*	0.328
Accuracy (%) QS	93.228	10.585	98.889	3.334	5.661	<0.001*	0.721
Accuracy (%) Comp	96.846	6.972	98.074	4.66	1.228	<0.001*	0.207

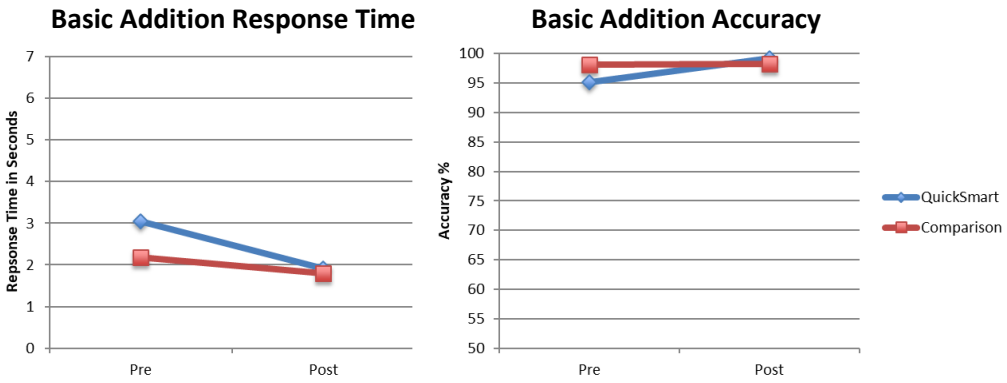


In summary, the results for addition indicate a substantial improvement for the *QuickSmart* students in response time and a very strong improvement in accuracy. The graphs illustrate that the *QuickSmart* students improved to reach a slightly better level of performance than the comparison students in accuracy and a similar level in response time. 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 2020

Basic Addition	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Res Time (secs) QS	3.053	1.606	1.922	0.868	-1.131	<0.001*	0.876
Res Time (secs) Comp	2.19	0.98	1.804	0.634	-0.386	<0.001*	0.468
Accuracy (%) QS	95.136	7.257	99.264	2.699	4.128	<0.001*	0.754
Accuracy (%) Comp	98.136	4.177	98.203	4.425	0.067	0.883	0.016



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 graphs 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 2020

Group	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Response Time (seconds)							
Male *QuickSmart*	6.127	2.86	4.082	2.408	-2.046	<0.001*	0.774
Male Comparison	5.206	2.734	4.408	2.36	-0.798	<0.001*	0.313
Female *QuickSmart*	6.6	3.191	4.319	2.683	-2.281	<0.001*	0.774
Female Comparison	5.721	2.859	5.108	2.574	-0.613	<0.001*	0.226
Accuracy (%)							
Male *QuickSmart*	53.611	25.853	83.59	20.828	29.979	<0.001*	1.277
Male Comparison	73.344	24.425	79.88	19.768	6.536	<0.001*	0.294
Female *QuickSmart*	53.912	26.501	84.718	20.937	30.806	<0.001*	1.29
Female Comparison	68.474	26.213	79.233	20.463	10.759	<0.001*	0.458

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 ($p = 0.121$ for response time and 0.441 for accuracy).

4.3.2 Basic Division by Gender

Table 10: OZCAAS basic division results – all students by gender 2020

Group	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Response Time (seconds)							
Male *QuickSmart*	5.139	2.546	2.878	1.76	-2.261	<0.001*	1.033
Male Comparison	3.627	1.798	3.244	2.078	-0.383	0.03	0.197
Female *QuickSmart*	5.661	2.849	3.109	1.985	-2.552	<0.001*	1.04
Female Comparison	4.08	2.183	3.314	1.954	-0.766	<0.001*	0.37
Accuracy (%)							
Male *QuickSmart*	72.666	25.986	94.245	10.746	21.579	<0.001*	1.085
Male Comparison	85.06	21.024	92.055	12.684	6.995	<0.001*	0.403
Female *QuickSmart*	71.505	26.104	94.068	11.891	22.563	<0.001*	1.112
Female Comparison	83.16	22.836	91.324	15.919	8.164	<0.001*	0.415

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 ($p = 0.075$ for response time and 0.511 for accuracy).

4.3.3 Multiplication by Gender

Table 11: OZCAAS multiplication results – all students by gender 2020

Group	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Response Time (seconds)							
Male *QuickSmart*	6.103	2.793	3.722	2.324	-2.381	<0.001*	0.927
Male Comparison	4.581	2.434	4.165	2.369	-0.416	<0.001*	0.173
Female *QuickSmart*	6.086	2.797	3.8	2.374	-2.286	<0.001*	0.881
Female Comparison	5.261	2.722	4.656	2.533	-0.605	<0.001*	0.23
Accuracy (%)							
Male *QuickSmart*	62.762	20.888	88.524	16.545	25.762	<0.001*	1.367
Male Comparison	78.14	20.738	83.317	16.252	5.177	<0.001*	0.278
Female *QuickSmart*	63.567	22.575	89.324	16.392	25.757	<0.001*	1.306
Female Comparison	76.365	20.056	82.895	16.742	6.53	<0.001*	0.353

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 these differences are not statistically significant at the 0.01 significance level (p = 0.468 in response time and 0.996 in accuracy).

4.3.4 Basic Multiplication by Gender

Table 12: OZCAAS Basic multiplication results – all students by gender 2020

Group	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Response Time (seconds)							
Male *QuickSmart*	3.739	2.112	2.077	1.35	-1.662	<0.001*	0.938
Male Comparison	2.652	1.473	2.171	1.149	-0.48	<0.001*	0.364
Female *QuickSmart*	3.862	2.337	2.06	1.159	-1.802	<0.001*	0.976
Female Comparison	2.652	1.532	2.27	1.525	-0.382	0.018	0.249
Accuracy (%)							
Male *QuickSmart*	87.766	16.613	97.743	5.755	9.977	<0.001*	0.803
Male Comparison	94.149	10.383	97.473	5.659	3.324	0.002	0.398
Female *QuickSmart*	87.625	17.017	97.947	5.246	10.322	<0.001*	0.82
Female Comparison	95.509	11.397	96.419	7.567	0.91	0.3	0.094

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 = 0.242 in response time and 0.719 in accuracy).

4.3.5 Subtraction by Gender

Table 13: OZCAAS subtraction results – all students by gender 2020

Group	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Response Time (seconds)							
Male *QuickSmart*	5.101	2.652	3.17	1.938	-1.93	<0.001*	0.831
Male Comparison	3.536	1.953	3.091	1.765	-0.445	<0.001*	0.239
Female *QuickSmart*	5.909	2.832	3.692	2.114	-2.217	<0.001*	0.887
Female Comparison	4.353	2.221	3.731	1.892	-0.622	<0.001*	0.301
Accuracy (%)							
Male *QuickSmart*	83.619	16.388	95.248	8.914	11.629	<0.001*	0.882
Male Comparison	91.115	11.462	94.258	8.327	3.143	<0.001*	0.314
Female *QuickSmart*	82.193	17.692	94.787	9.937	12.594	<0.001*	0.878
Female Comparison	89.882	13.299	93.137	10.051	3.255	<0.001*	0.276

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 ($p = 0.127$) but they are significant in speed of response ($p = 0.004$). However, the small effect size for response time (Cohen's $d = 0.115$) indicates that this 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 2020

Group	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Response Time (seconds)							
Male *QuickSmart*	4.688	2.366	2.944	1.853	-1.744	<0.001*	0.821
Male Comparison	3.245	2.063	2.636	1.239	-0.609	0.008	0.358
Female *QuickSmart*	5.441	2.669	3.173	1.81	-2.268	<0.001*	0.994
Female Comparison	3.38	1.695	3.072	1.647	-0.308	0.082	0.184
Accuracy (%)							
Male *QuickSmart*	88.378	13.356	96.736	6.663	8.358	<0.001*	0.792
Male Comparison	94.354	11.473	95.446	9.015	1.091	0.396	0.106
Female *QuickSmart*	86.835	15.137	96.971	6.33	10.136	<0.001*	0.874
Female Comparison	92.195	10.469	96.098	6.15	3.903	0.005	0.455

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 ($p = 0.062$) but they are significant in speed of response ($p = 0.001$). However, the small effect size for response time (Cohen's $d = 0.234$) 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 2020

Group	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Response Time (seconds)							
Male *QuickSmart*	3.449	1.929	2.192	1.111	-1.257	<0.001*	0.799
Male Comparison	2.449	1.268	2.054	0.925	-0.395	<0.001*	0.355
Female *QuickSmart*	3.717	1.863	2.427	1.164	-1.29	<0.001*	0.83
Female Comparison	2.753	1.233	2.405	1.043	-0.348	<0.001*	0.305
Accuracy (%)							
Male *QuickSmart*	93.211	10.807	98.914	3.078	5.703	<0.001*	0.718
Male Comparison	97.102	5.741	98.37	3.676	1.268	<0.001*	0.263
Female *QuickSmart*	93.243	10.389	98.866	3.545	5.623	<0.001*	0.724
Female Comparison	96.563	8.113	97.748	5.532	1.185	0.004	0.171

These results indicate that females did better than males in speed of response and males did better in 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 = 0.619 in response time and 0.843 in accuracy).

4.3.8 Basic Addition by Gender

Table 16: OZCAAS basic addition results – all students by gender 2020

Group	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Response Time (seconds)							
Male *QuickSmart*	2.965	1.395	1.887	0.92	-1.078	<0.001*	0.912
Male Comparison	2.238	1.077	1.755	0.664	-0.483	<0.001*	0.54
Female *QuickSmart*	3.133	1.774	1.954	0.819	-1.179	<0.001*	0.853
Female Comparison	2.141	0.875	1.855	0.603	-0.286	0.001	0.38
Accuracy (%)							
Male *QuickSmart*	94.921	6.81	99.16	2.611	4.239	<0.001*	0.822
Male Comparison	98.035	4.453	97.343	5.706	-0.692	0.333	0.135
Female *QuickSmart*	95.331	7.642	99.358	2.775	4.027	<0.001*	0.7
Female Comparison	98.241	3.906	99.091	2.217	0.85	0.115	0.268

These results indicate that females did better than males in speed of response and males did better in 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 = 0.325 for response time and 0.671 for accuracy).

4.3.9 Indigenous Students

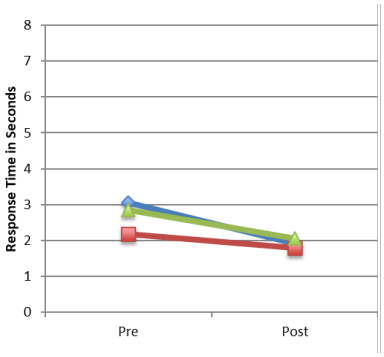
Table 17: OZCAAS results – Indigenous students 2020

Test	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	p	Effect size
Basic Addition							
Response time (seconds)	2.861	1.443	2.06	1.19	-0.801	<0.001*	0.605
Accuracy (%)	95.814	6.907	99.009	3.145	3.195	<0.001*	0.595
Addition							
Response time (seconds)	3.735	1.977	2.389	1.202	-1.346	<0.001*	0.823
Accuracy (%)	93.702	11.285	98.89	3.01	5.188	<0.001*	0.628
Basic Subtraction							
Response time (seconds)	4.906	2.45	3.09	1.809	-1.816	<0.001*	0.843
Accuracy (%)	89.776	12.322	97.33	5.891	7.554	<0.001*	0.782
Subtraction							
Response time (seconds)	5.95	2.948	3.664	2.221	-2.286	<0.001*	0.876
Accuracy (%)	83.931	17.332	94.611	10.125	10.68	<0.001*	0.752
Basic Multiplication							
Response time (seconds)	3.786	2.027	2.245	1.553	-1.541	<0.001*	0.853
Accuracy (%)	90.309	11.336	97.458	4.916	7.149	<0.001*	0.818
Multiplication							
Response time (seconds)	6.348	2.619	3.998	2.586	-2.35	<0.001*	0.903
Accuracy (%)	63.918	21.329	89.297	16.352	25.379	<0.001*	1.335
Basic Division							
Response time (seconds)	5.458	2.578	3.436	1.921	-2.022	<0.001*	0.89
Accuracy (%)	74.193	22.41	94.013	9.232	19.82	<0.001*	1.156
Division							
Response time (seconds)	6.768	3.052	4.373	2.539	-2.395	<0.001*	0.853
Accuracy (%)	56.562	25.003	84.86	19.968	28.298	<0.001*	1.251

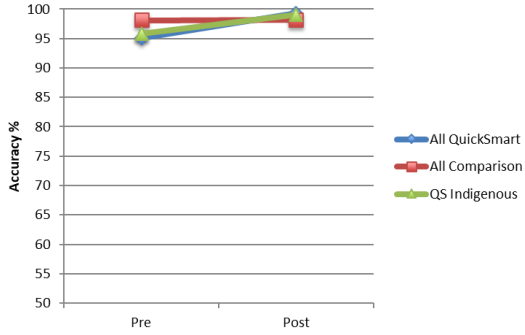
These results indicate that in most instances the Indigenous students' improvement was very similar to that of the overall *QuickSmart* group. For basic addition and addition, the accuracy results exhibit the ceiling effect (the pre-intervention scores were so high that the students did not have much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

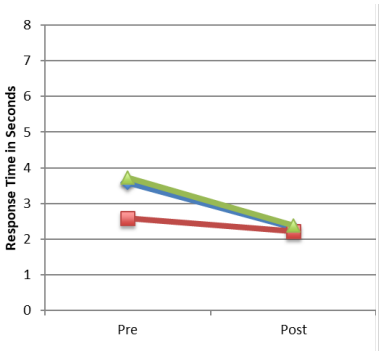
Basic Addition Response Time



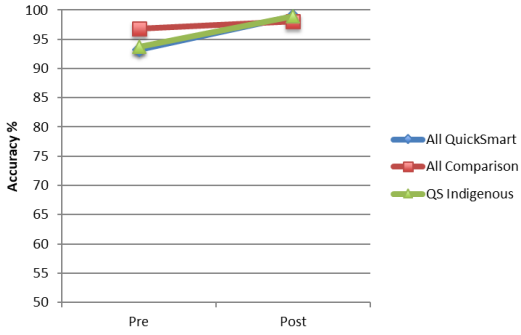
Basic Addition Accuracy



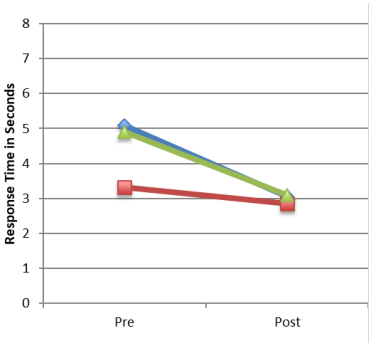
Addition Response Time



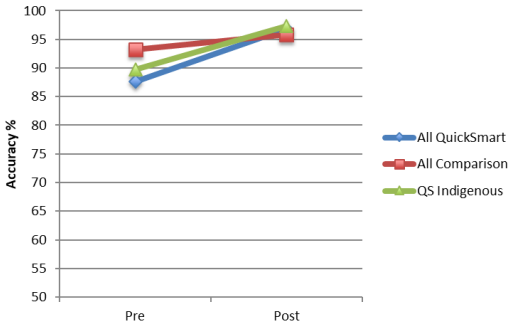
Addition Accuracy



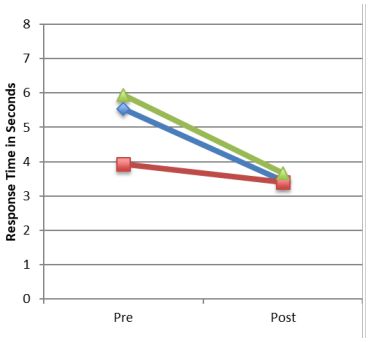
Basic Subtraction Response Time



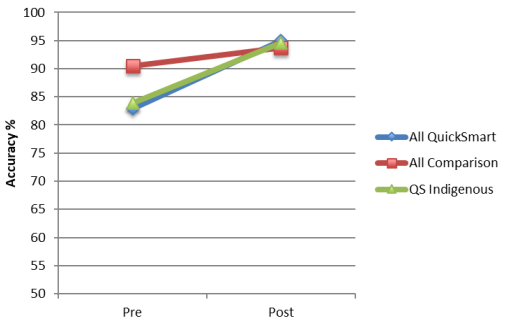
Basic Subtraction Accuracy



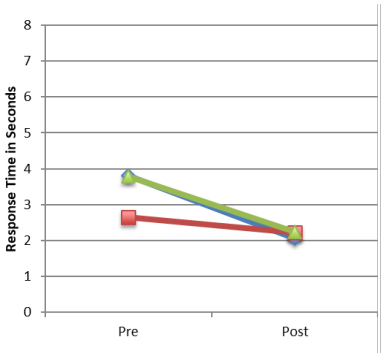
Subtraction Response Time



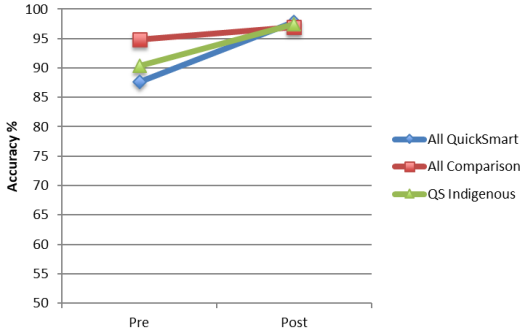
Subtraction Accuracy



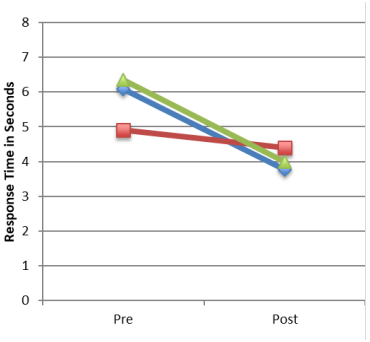
Basic Multiplication Response Time



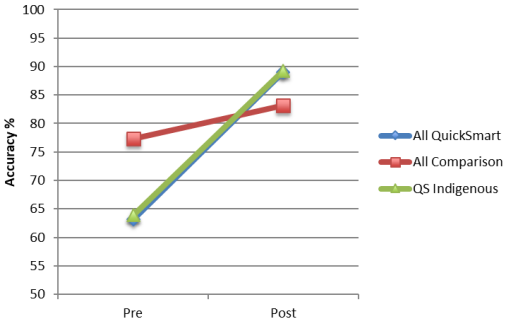
Basic Multiplication Accuracy



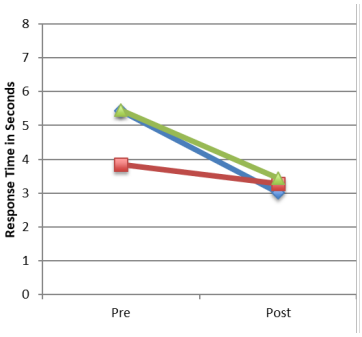
Multiplication Response Time



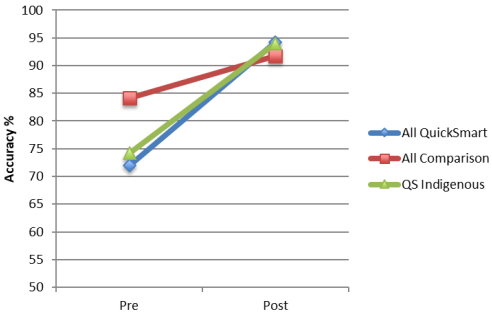
Multiplication Accuracy



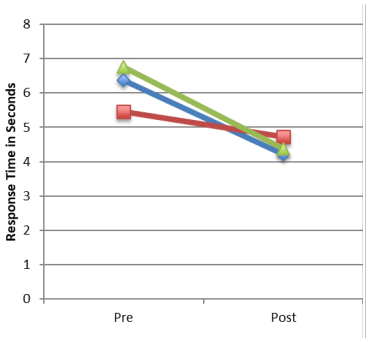
Basic Division Response Time



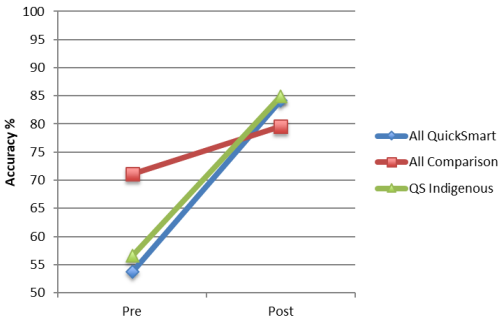
Basic Division Accuracy



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 – 2020

	Mean	Std. Deviation
Basic Addition		
Response time (seconds)	2.356	1.091
Accuracy (%)	96.28	4.342
Addition		
Response time (seconds)	2.155	0.878
Accuracy (%)	99.511	1.839
Basic Subtraction		
Response time (seconds)	4.537	3.433
Accuracy (%)	97.36	5.122
Subtraction		
Response time (seconds)	3.498	1.891
Accuracy (%)	95.006	7.885
Basic Multiplication		
Response time (seconds)	2.886	3.398
Accuracy (%)	98.08	4.092
Multiplication		
Response time (seconds)	3.876	2.523
Accuracy (%)	87.193	15.751
Basic Division		
Response time (seconds)	3.558	2.557
Accuracy (%)	91.007	16.807
Division		
Response time (seconds)	3.838	2.122
Accuracy (%)	84.84	19.69

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 4.6 seconds and above 95% accuracy. In multiplication and division, the average response times were below 3.9 seconds and accuracy over 84% 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' 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; and
3. students have increased their ability to benefit from classroom instruction.

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 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 strong to substantial over all operations.

5 Independent Assessments

5.1 Why They are Used

The *QuickSmart* pre- and post-intervention 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 scaled 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) 2020

	Average Gain score	Significance	Effect size
All *QuickSmart*	6.945	<0.001*	0.702
All comparison	4.488	<0.001*	0.42

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) 2020

Gender	Average Gain score	Significance	Effect size
Male			
QuickSmart Students	7.208	<0.001*	0.755
Comparison Students	5.241	<0.001*	0.519
Female			
QuickSmart Students	6.725	<0.001*	0.66
Comparison Students	3.695	<0.001*	0.328

These results indicate that *QuickSmart* males did slightly better than females in PATM assessment. However, 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 ($p = 0.161$).

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) 2020

Indigenous students	Average Gain score	Significance	Effect size
Indigenous *QuickSmart*	6.773	<0.001*	0.739
All *QuickSmart*	6.945	<0.001*	0.702

Once again, these results show very strong improvement for the Indigenous students who participated in *QuickSmart*. This improvement is slightly smaller 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 4 through to Year 9. The tables of figures for these graphs are available in the Appendices. Note: Other grades were excluded from the analyses as they had fewer than 15 QuickSmart students.

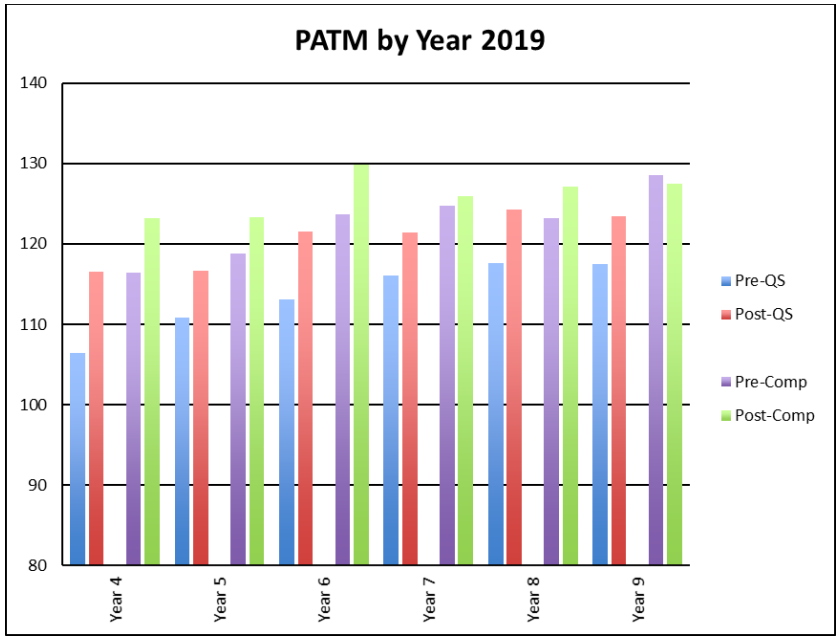


Figure 1: PATM by Year

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	No. of students with gain	No. of students with PATM	Percentage with Gain
QuickSmart	1759	2185	80.5
Indigenous *QuickSmart*	165	208	79.3
Comparison	478	639	74.8

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. Despite the disruptions due to the COVID-19 pandemic, 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) 6773 5067.

Professor John Pegg

7 APPENDIX A: Independent Assessment Results

7.1 PAT Results by Region (Scale Scores) 2020

School Region	Pre-Intervention		Post-Intervention				
	Mean	SD	Mean	SD	Gain	*p*	Effect size
Adelaide QS Students	111.832	13.407	119.261	12.932	7.429	<0.001*	0.564
Ballarat QS Students	116.491	9.557	121.196	6.68	4.705	<0.001*	0.571
Eyre Peninsula QS Students	105.632	8.33	114.627	8.465	8.995	<0.001*	1.071
Geelong QS Students	118.745	5.876	122.536	6.86	3.791	<0.001*	0.594
Gippsland QS Students	113.2	4.174	118.906	5.705	5.706	0.004	1.142
Goulbourn QS Students	119.417	5.761	122.1	6.152	2.683	0.366	0.45
Horsham QS Students	121.45	9.181	124.729	8.88	3.279	0.016	0.363
Hunter QS Students	112.004	8.895	120.574	12.353	8.57	<0.001*	0.796
Limestone Coast QS Students	115.836	9.245	120.553	8.199	4.717	<0.001*	0.54
Melbourne QS Students	115.105	9.481	123.373	10.747	8.268	<0.001*	0.816
Mid West QS Students	115.052	7.681	119.314	6.973	4.262	<0.001*	0.581
Murray/Mallee QS Students	117.146	7.565	121.431	8.416	4.285	0.079	0.536
New England QS Students	105.212	10.966	119.136	8.037	13.924	<0.001*	1.448
North Coast QS Students	111.159	8.229	122.028	11.463	10.869	<0.001*	1.089
North Sydney QS Students	112.133	5.025	118.933	5.407	6.8	0.002	1.303
North Tas QS Students	115.32	8.995	118.092	8.32	2.772	0.095	0.32
North West QS Students	111.567	6.663	118.876	6.189	7.309	<0.001*	1.137
Northern Territory QS Students	105.461	7.326	109.711	7.291	4.25	<0.001*	0.582
Perth QS Students	115.091	5.427	123.573	4.148	8.482	0.001	1.756
Port Augusta QS Students	106.735	9.584	111.7	10.214	4.965	0.033	0.501
Port Pirie QS Students	115.611	7.238	122.465	8.756	6.854	<0.001*	0.853
Queensland QS Students	115.988	5.875	121.208	6.871	5.22	<0.001*	0.817
Remote QS Students	110.689	9.083	118.092	9.643	7.403	<0.001*	0.79
Riverina QS Students	116.233	6.187	124.304	9.614	8.071	<0.001*	0.998
Southern Sydney QS Students	113.905	7.637	121.637	7.187	7.732	<0.001*	1.043
Sydney QS Students	109.903	8.056	117.106	8.196	7.203	<0.001*	0.886
Warrnambool QS Students	119.507	7.174	123.136	6.883	3.629	<0.001*	0.516
Western QS Students	116.238	9.014	122.565	8.967	6.327	<0.001*	0.704
Western Syd QS Students	110.405	5.499	118.351	9.594	7.946	<0.001*	1.016
Yorke Peninsula/Mid North QS Students	113.65	3.15	115.625	5.438	1.975	0.315	0.444

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

7.2 PAT Results by Demographic (Scale Scores) 2020

Demographic	Pre-Intervention		Post-Intervention				
	Mean	SD	Mean	SD	Gain	*p*	Effect size
All QS Students	**112.916**	**9.791**	**119.861**	**10.005**	**6.945**	**<0.001***	**0.702**
All comparison students	**121.684**	**10.385**	**126.172**	**10.961**	**4.488**	**<0.001***	**0.42**
Indigenous QS Students	113.037	8.448	119.81	9.837	6.773	<0.001*	0.739
Male QS Students	112.888	9.497	120.096	9.6	7.208	<0.001*	0.755
Male comparison students	121.422	10.137	126.663	10.056	5.241	<0.001*	0.519
Female QS Students	112.939	10.035	119.664	10.332	6.725	<0.001*	0.66
Female comparison Students	121.96	10.649	125.655	11.832	3.695	<0.001*	0.328
Male Indigenous QS Students	113.693	8.088	120.456	10.516	6.763	<0.001*	0.721
Female Indigenous QS Students	112.442	8.757	119.223	9.188	6.781	<0.001*	0.756

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

7.3 PAT Results by State (Scale Scores) 2020

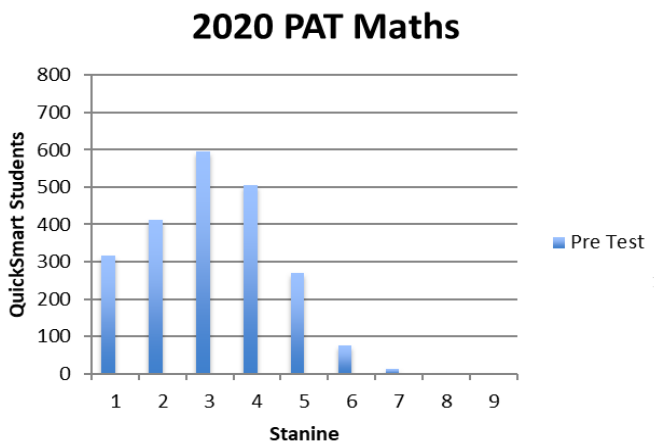
State	Pre-Intervention		Post-Intervention				
	Mean	SD	Mean	SD	Gain	*p*	Effect size
All *QuickSmart* Students	**112.916**	**9.791**	**119.861**	**10.005**	**6.945**	**<0.001***	**0.702**
All comparison students	**121.684**	**10.385**	**126.172**	**10.961**	**4.488**	**<0.001***	**0.42**
Australian Capital Territory							
QuickSmart							
Indigenous *QuickSmart*							
Comparison							
New South Wales							
QuickSmart	111.848	8.203	119.589	9.414	7.741	<0.001*	0.877
Indigenous *QuickSmart*	113.154	7.679	120.812	9.867	7.658	<0.001*	0.866
Comparison	121.974	9.54	126.901	10.188	4.927	<0.001*	0.499
Northern Territory							
QuickSmart	105.461	7.326	109.711	7.291	4.25	<0.001*	0.582
Indigenous *QuickSmart*							
Comparison							
Queensland							
QuickSmart	115.988	5.875	121.208	6.871	5.22	<0.001*	0.817
Indigenous *QuickSmart*	115.371	8.673	116.929	7.595	1.558	0.566	0.191
Comparison	122.575	7.234	124.147	8.753	1.572	0.188	0.196
South Australia							
QuickSmart	111.71	12.198	118.894	11.822	7.184	<0.001*	0.598
Indigenous *QuickSmart*	110.193	9.964	115.705	9.766	5.512	<0.001*	0.559
Comparison	120.225	12.42	125.867	13.03	5.642	<0.001*	0.443
Tasmania							
QuickSmart	115.32	8.995	118.092	8.32	2.772	0.095	0.32
Indigenous *QuickSmart*	126.7	0.0	122.85	13.506	-3.85		no improvement
Comparison	123.525	6.523	125.05	8.299	1.525	0.614	0.204
Victoria							
QuickSmart	117.725	8.406	122.723	8.153	4.998	<0.001*	0.604
Indigenous *QuickSmart*	119.878	6.732	124.611	3.992	4.733	0.101	0.855
Comparison	123.327	9.113	126.683	9.407	3.356	<0.001*	0.362
Western Australia							
QuickSmart	115.091	5.427	123.573	4.148	8.482	0.001	1.756
Indigenous *QuickSmart*							
Comparison	117.057	2.453	121.971	5.417	4.914	0.077	1.169

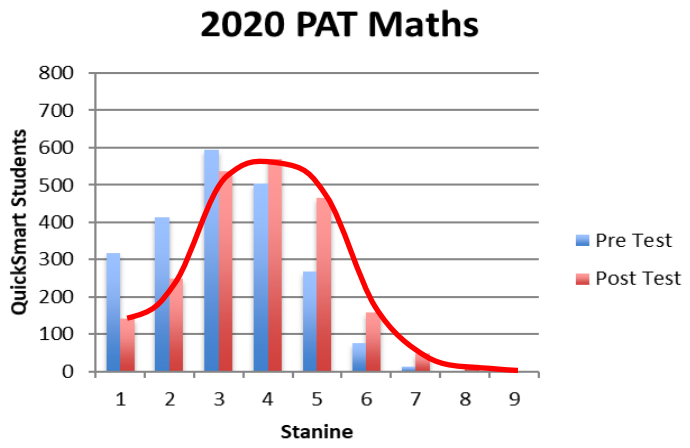
Note: only students who did both 'pre' and 'post' test are included in the table.

7.4 *QuickSmart* Students by Year (Scale Scores) 2020

Year	Pre-Intervention		Post-Intervention				
	Mean	SD	Mean	SD	Gain	*p*	Effect size
Year 4							
QuickSmart	106.413	13.268	116.544	13.034	10.131	<0.001*	0.77
Indigenous *QuickSmart*	105.368	8.05	113.64	8.219	8.272	<0.001*	1.017
Comparison	116.438	13.808	123.242	14.235	6.804	<0.001*	0.485
Year 5							
QuickSmart	110.773	7.519	116.593	9.27	5.82	<0.001*	0.69
Indigenous *QuickSmart*	112.537	8.059	120.079	12.208	7.542	<0.001*	0.729
Comparison	118.763	7.922	123.334	10.027	4.571	<0.001*	0.506
Year 6							
QuickSmart	113.101	7.484	121.47	7.55	8.369	<0.001*	1.113
Indigenous *QuickSmart*	111.524	8.525	120.786	6.678	9.262	<0.001*	1.21
Comparison	123.702	8.883	129.839	8.854	6.137	<0.001*	0.692
Year 7							
QuickSmart	116.111	7.457	121.381	8.051	5.27	<0.001*	0.679
Indigenous *QuickSmart*	114.363	7.553	117.552	8.453	3.189	0.006	0.398
Comparison	124.739	8.859	125.962	10.018	1.223	0.044	0.129
Year 8							
QuickSmart	117.598	7.856	124.228	8.384	6.63	<0.001*	0.816
Indigenous *QuickSmart*	118.283	6.281	125.592	6.458	7.309	<0.001*	1.147
Comparison	123.186	8.203	127.089	8.227	3.903	<0.001*	0.475
Year 9							
QuickSmart	117.515	7.535	123.473	5.153	5.958	0.003	0.923
Indigenous *QuickSmart*	118.0	7.346	120.625	5.041	2.625	0.621	0.417
Comparison	128.512	5.121	127.475	3.555	-1.037		no improvement
All Schools							
QuickSmart	**112.916**	**9.791**	**119.861**	**10.005**	**6.945**	**<0.001***	**0.702**
Indigenous *QuickSmart*	**113.037**	**8.448**	**119.81**	**9.837**	**6.773**	**<0.001***	**0.739**
Comparison	**121.684**	**10.385**	**126.172**	**10.961**	**4.488**	**<0.001***	**0.42**

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.

7.6 PAT Results by Percentile

Demographic	Mean Percentile		
	Pre	Post	Gain
All *QuickSmart*	**22.69**	**31.68**	**8.99**
All Comparison	**45.13**	**48.27**	**3.14**
Indigenous *QuickSmart*	21.70	31.14	9.44
QuickSmart Female	22.43	30.51	8.08
Comparison Female	45.15	46.71	1.56
QuickSmart Male	22.99	33.08	10.09
Comparison Male	45.11	49.75	4.64
Year			
QuickSmart Year 4	25.77	39.92	14.15
Comparison Year 4	53.49	58.46	4.97
QuickSmart Year 5	26.65	31.25	4.60
Comparison Year 5	48.46	50.07	1.61
QuickSmart Year 6	23.23	34.49	11.26
Comparison Year 6	49.68	56.45	6.77
QuickSmart Year 7	20.34	28.30	7.96
Comparison Year 7	39.53	38.83	no improvement
QuickSmart Year 8	17.19	27.50	10.31
Comparison Year 8	28.27	31.61	3.34
QuickSmart Year 9	11.15	17.92	6.77
Comparison Year 9	27.63	24.50	no improvement
Lessons attended			
<20	15.97	21.97	6.00
21-40	23.17	31.06	7.89
41-60	21.69	32.53	10.84
61-80	24.59	33.68	9.09
80+	24.36	29.70	5.34