quicksmart

Annual Numeracy Program Report

2023

The SiMERR National Research Centre
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1.1 Introduction

Students who experience ongoing failure in upper-primary and lower-secondary school face a myriad of difficulties in pursuing post-school options and by 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 have trouble reading with comprehension are particularly vulnerable. Such students are usually caught in a cycle of continued failure, as it is particularly difficult to bring about sustainable change within usual classroom environments for students who by Year 4 are persistently at or below national or age-expected benchmarks.

Four issues confront Australian schools in 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 problems they face. 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
   (i) underutilised,
   (ii) poorly supported, and
   (iii) a seldom recognised resource in school education.

   Based on *QuickSmart* experience of over 20 years, these adults, with appropriate training, are highly motivated, and offer cost-effective, long-term sustainable ways to close the achievement gap for low-achieving students.
3. In remote and rural areas, trained Indigenous teaching assistants (as *QuickSmart* Instructors) are a resource able to enrich their whole community.
4. Educational support programs need to be sustainable in the short- and long-term without large drains on the public purse. Sustainability means
   (i) cost-efficient,
   (ii) clear exit criteria,
   (iii) proven longitudinal results,
   (iv) documented ongoing benefits for students and instructors, and
   (v) replicability (including quality assurance) across all regions of Australia.

1.2 Overview of *QuickSmart*

The analyses presented in this report provide information about students' performance in the *QuickSmart* Numeracy program. In particular, the focus here is on an assessment of basic skills, using either the Cognitive Aptitude Assessment System, Australian version

(OZCAAS) or the QuickSmart Basic Skills Assessor (QBSA), 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.

The basic skills assessment data is obtained from the OZCAAS assessment program developed by Academic staff at the Massachusetts's Institute of Technology, or the QBSA, developed by the National Centre of Science, Information and Communication Technology and Mathematics Education for Rural and Regional Australia (SiMERR). Both programs offer a random number computer generated testing approach that measures the reaction time (speed) and the accuracy of basic arithmetic computation. The QBSA is an online program with automatic cloud storage of data, whereas OZCAAS stores data locally only.

The results for the four operations offered at each of two levels indicate a strong to substantial improvement for the *QuickSmart* students in terms of accuracy and response time. The evidence provided illustrates that *QuickSmart* students narrowed the achievement gap by

(i) improving to such an extent that there was either no substantial difference between them and the comparison students, or
(ii) 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, which are skills not directly targeted in *QuickSmart*.

1.3 Findings – Speed and Accuracy

In 2023, the *QuickSmart* team at the University of New England received matched data from 1,939 students who participated in *QuickSmart* Numeracy lessons and 466 average-achieving comparison peers. These students were drawn from schools from across Australia.

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 Basic Skills assessments at the end of the program is an achievement in and of itself.

In addition and subtraction, the average response rates were below 4.4 seconds and above 94% accuracy. In multiplication and division, the average response times were below 5.4 seconds and accuracy over 63% at post-test. This improvement is most likely due to the fact that:

(i) there has been some mutually beneficial development of common areas of the brain that process the four operations;
(ii) 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
(iii) students have increased their ability to benefit from classroom instruction.

1.4 Findings – ACER tests

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 Scale scores, which were used for all subsequent calculations. Three analyses were undertaken on the PATM scores:

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

The results indicate a very strong improvement for *QuickSmart* students. This improvement is greater than those recorded for the comparison group of their average-achieving peers.

The 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 ($p = 0.137$).

For Indigenous students, the results also report very strong improvements from those who participated in *QuickSmart*. This improvement is slightly smaller than that of the overall *QuickSmart* group.

Overall in all analyses, the quantitative data aspects of the program report a narrowing of the achievement gap between *QuickSmart* students and their average-performing comparison group peers. Impressive Effect Sizes as well as highly significant gains on the part of individual students.

1.5 Findings – Qualitative Data

Once again, as has been recorded in each year of the *QuickSmart* program, substantial qualitative data (reported in school presentations during professional workshops 2 and 3) indicate that *QuickSmart* students gained a new confidence in Mathematics as a consequence of their involvement on the program. Many stories, within the corpus of qualitative data, document improvements for *QuickSmart* students in relation to their

(i) academic performance and participation in class,
(ii) attitudes to school and learning,
(iii) positive attendance rates, and
(iv) levels of academic confidence both inside and outside the classroom that manifest in a personal belief that with effort and persistence they can improve.

The data collected to date from many tens of thousands of *QuickSmar*t students indicate that

(i) *QuickSmart* has narrowed the achievement gap between *QuickSmart* and comparison students,
(ii) low-achieving students undertaking *QuickSmart* proceed with their studies more successfully by learning to 'trust their heads' in the same ways that effective learners do, and
(iii) *QuickSmart* students can maintain the gains made during the program for years after they completed the program,

1.6 Conclusion

Each year in analyses of the QuickSmart program, results consistently identify 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 themselves.

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. The students targeted by the *QuickSmart* Program typically experience

(i) significant and sustained difficulties in basic mathematics and/or literacy,
(ii) have a profile of low progress in learning despite (often many) attempts to overcome their learning difficulties,
(iii) few, if any, 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:

(i) professional learning and support for working in a small-class instructional setting with two students, and
(ii) 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 and applied nationally through the SiMERR National Research Centre 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 over more than 20 years of operation.

The intervention is called *QuickSmart* to encourage students to become:

(i) *quick* in their response time, and
(ii) *smart* in their understanding and the strategic use of mental and other resources.

The aims of *QuickSmart* are to:

(i) improve students' information retrieval times and accuracy to appropriate levels that enable students to attain and demonstrate proficiency in classroom interactions,
(ii) free working-memory capacity from an excessive focus on mundane or routine tasks, and, as a result

(iii) engage in more meaningful tasks associated with more demanding cognitive activities.

In these interventions the words 'Quick' and 'Smart' are operationalised respectively by:

- fostering automaticity of basic and fundamental skills and knowledge, and
- time, accuracy and understanding are incorporated as key dimensions of learning.

Other implications for *QuickSmart* students, and for Schools that conduct the full program, include:

(i) students' ability to remain on-task is enhanced, resulting in an improvement to persist and maintain concentration in the material provided,

(ii) students become more knowledgeable about the way their brain learns, such as
   - the value of deliberately practice certain basic aspects,
   - the positive importance of mistakes and learning from them,
   - the benefits of persevering and how crucial it is to exert effort.

(iii) students practice the skill of setting realistic goals for themselves and using this idea to help them monitor their own academic learning and progress.

(iv) All the above skills can be transferred for use within the classroom with consistent application.

3 *QuickSmart* Tests — 2023

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 Basic Skills assessment using either the Cognitive Aptitude Assessment System, Australian version (OZCAAS) or the QuickSmart Basic Skills Assessor (QBSA);
(ii) on standardised test measures, specifically the Progressive Achievement Tests in Mathematics (ACER, 2005); and
(iii) in terms of student gender and participating Indigenous students.

The first set of analyses examine data of response time and accuracy in recalling the basic number facts from either OZCAAS or QBSA, related to the four arithmetic operations. These data are 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 are employed to measure students' response time and accuracy both before *QuickSmart* began and at the end of the program. The tests available are:

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 specific target of *QuickSmart* instruction.

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

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

3.2 Background to Test Interpretation

For all tests in this study (Basic Skills and PATM) the comparison group represents average-achieving students selected from the same class (or Year/Grade) as *QuickSmart* students. The comparison students are expected to undertake the pre-intervention and post-intervention tests, but did not receive any *QuickSmart* small-class instruction. The initial difference in the two groups, comparison and QuickSmart students, 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.

Note: The comparison students do not represent a 'true' control group because they do not share the same achievement starting points with the *QuickSmart* students. Typically, the comparison students are average-achieving students, while the *QuickSmart* students are low-achieving students. This clarification is not to say that some/many comparison students might benefit (some greatly) from the *QuickSmart* program themselves. Data from schools confirm that when these middle-performing students are given access to the *QuickSmart* program they make substantive gains, often in a shorter timeframe of less than 30 weeks. However, with limited resources available in schools, it is clearly the lower-achieving students who are most in need. The good news is that the benefits of *QuickSmart* thinking and practise is not limited to the lower-achieving students.

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 than of our traditional 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 share *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-three years.

While this attests to the impact that *QuickSmart* is having in schools, it does not allow a straightforward interpretation of comparison students and *QuickSmart* student 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 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 change to probability levels 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. The implication of the change 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 (as opposed to a 5% chance) that the result was obtained by chance.

4 Results on the Basic Skills Assessments

4.1 Introduction

In 2023, the *QuickSmart* team at the SiMERR National Research Centre at the University of New England received matched data from 1,939 students who participated in *QuickSmart* Numeracy lessons and 466 'average-achieving' comparison peers. These students were drawn from schools from across Australia.

To assist with interpretation of Basic Skills 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 in the pre-test and this does not leave much room for improvement.

The Basic Skills results recorded for average-achieving comparison students should also be interpreted with the knowledge that many of these students' results may have been constrained by a ceiling effect.

The results of our analyses of data related to Basic Skills 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.

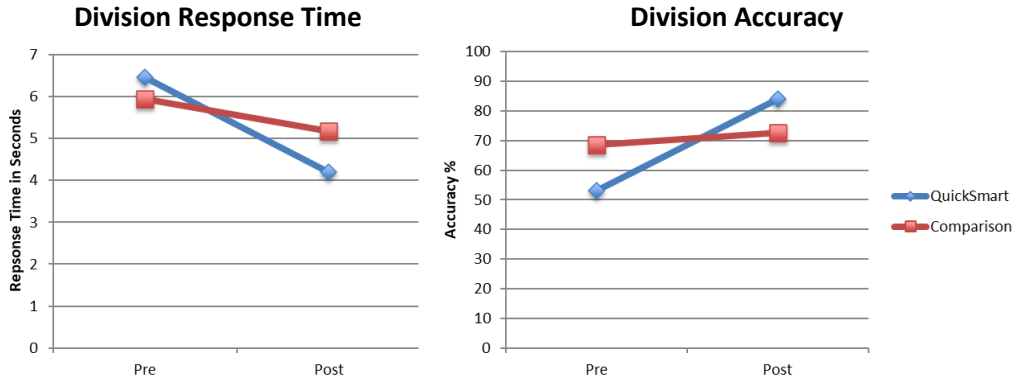
4.2 Combined Basic Skills Analysis

4.2.1 Division

Table 1 below summarises the data submitted for the division assessment.

Table 1: Division assessment – all students 2023

Division	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Res Time (secs) QS	1316	6.451	3.051	4.199	2.356	-2.252	<0.001*	0.826
Res Time (secs) Comp	415	5.936	3.014	5.181	2.608	-0.755	<0.001*	0.268
Accuracy (%) QS	1316	53.172	25.219	83.946	21.201	30.774	<0.001*	1.321
Accuracy (%) Comp	415	68.496	22.921	72.617	21.525	4.121	<0.001*	0.185



The desired criterion for response time on the Basic Skills assessments is between 1 and 2 seconds as an indication of automaticity. The decrease in time for *QuickSmart* students is 2.252 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. This result is the desired pattern of improvement. The effect size for this result is 0.826, 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; Hattie, J. 2023. Visible Learning: The Sequel: *A synthesis of over 2,100 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 1.321, which indicates substantial improvement for the *QuickSmart* group.

Division is typically (but not always) the final focus operation of the *QuickSmart* program for students. As a result, a number of students may not reach the lessons that focus on division facts. This may have occurred because the school was slow to implement the program and there were not sufficient lessons available, or students required more deliberate practice on other operations before they could move forward.

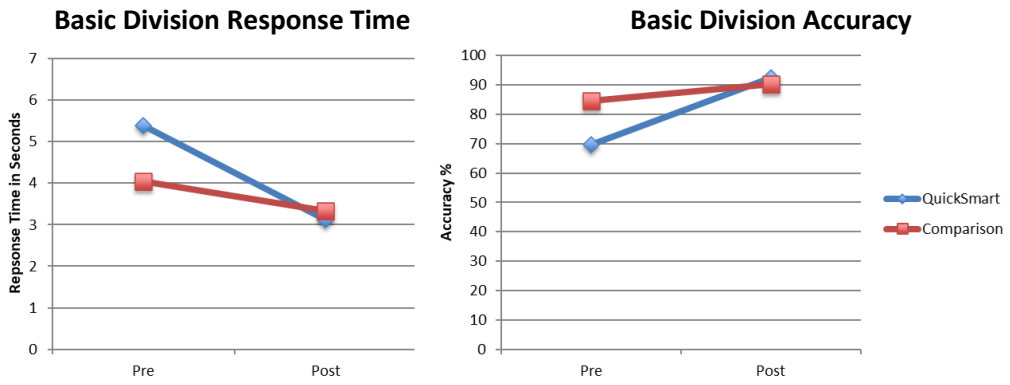
Interestingly, students still appear to make important gains even if lessons on division had not been undertaken. SiMERR has noted over time that there is some residual benefit from work on automaticity with understanding on other operations and certain aspects of *QuickSmar*t learning has been transferred.

In summary, Table 1 shows that when compared to the scores of the comparison students, *QuickSmart* student scores indicate substantial improvement in 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: Basic division assessment – all students 2023

Basic Division	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Res Time (secs) QS	495	5.386	3.235	3.115	2.008	-2.271	<0.001*	0.843
Res Time (secs) Comp	99	4.04	2.333	3.339	1.366	-0.701	0.001	0.367
Accuracy (%) QS	495	69.564	26.578	92.35	13.354	22.786	<0.001*	1.083
Accuracy (%) Comp	99	84.612	16.834	90.201	10.509	5.589	<0.001*	0.398

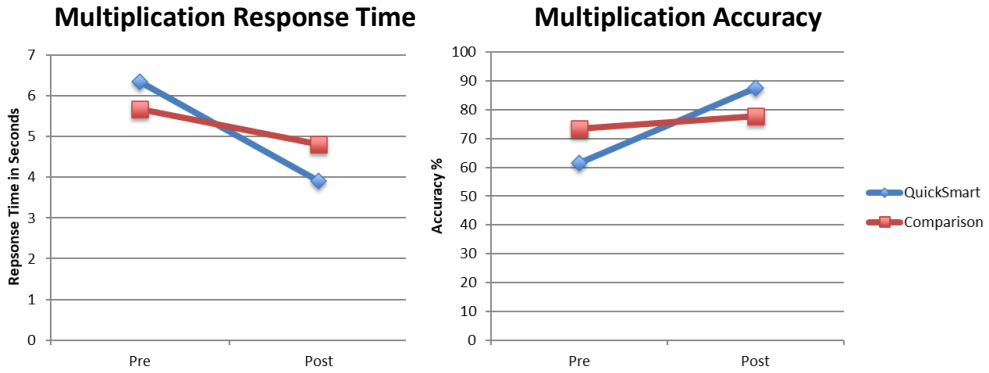


In summary, the results for basic division indicate a substantial improvement for the *QuickSmart* students in both response time and accuracy. The diagrams illustrate that in both response time and accuracy the *QuickSmart* students improved to reach a slightly better level of performance than the comparison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

4.2.3 Multiplication

Table 3: Multiplication assessment – all students 2023

Multiplication	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Res Time (secs) QS	1498	6.339	3.113	3.909	2.195	-2.43	<0.001*	0.903
Res Time (secs) Comp	425	5.672	3.012	4.802	2.339	-0.87	<0.001*	0.323
Accuracy (%) QS	1498	61.477	20.696	87.511	17.511	26.034	<0.001*	1.358
Accuracy (%) Comp	425	73.364	18.414	77.741	17.285	4.377	<0.001*	0.245

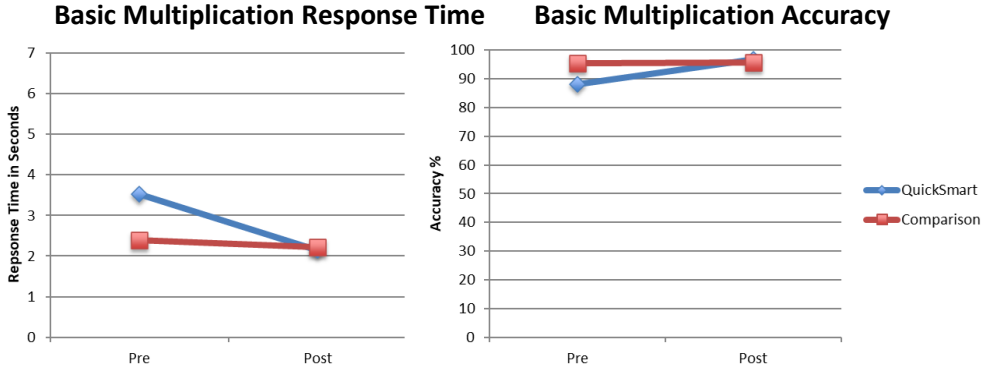


In summary, the results for multiplication indicate a substantial improvement in both response time and accuracy. The diagrams illustrate that the *QuickSmart* students improved to reach a better level of performance than the comparison students.

4.2.4 Basic Multiplication

Table 4: Basic multiplication assessment – all students 2023

Basic Multiplication	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Res Time (secs) QS	473	3.519	2.165	2.14	1.025	-1.379	<0.001*	0.814
Res Time (secs) Comp	93	2.4	1.102	2.221	0.919	-0.179	0.129	0.176
Accuracy (%) QS	473	88.038	15.79	96.81	9.852	8.771	<0.001*	0.666
Accuracy (%) Comp	93	95.489	6.414	95.743	7.89	0.254	0.764	0.035

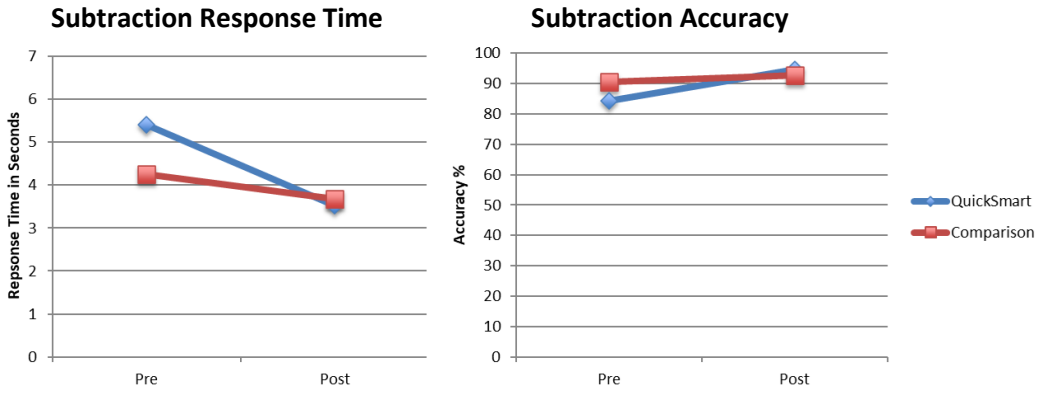


In summary, the results for basic multiplication indicate a substantial improvement for the *QuickSmart* students in response time and a very strong improvement in accuracy. The diagrams illustrate that in both response time and accuracy the *QuickSmart* students improved to such an extent that there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

4.2.5 Subtraction

Table 5: Subtraction assessment – all students 2023

Subtraction	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Res Time (secs) QS	1563	5.409	2.917	3.529	1.912	-1.88	<0.001*	0.762
Res Time (secs) Comp	432	4.247	2.41	3.686	1.961	-0.561	<0.001*	0.256
Accuracy (%) QS	1563	84.296	15.925	94.682	10.256	10.386	<0.001*	0.775
Accuracy (%) Comp	432	90.583	9.976	92.758	8.668	2.175	<0.001*	0.233

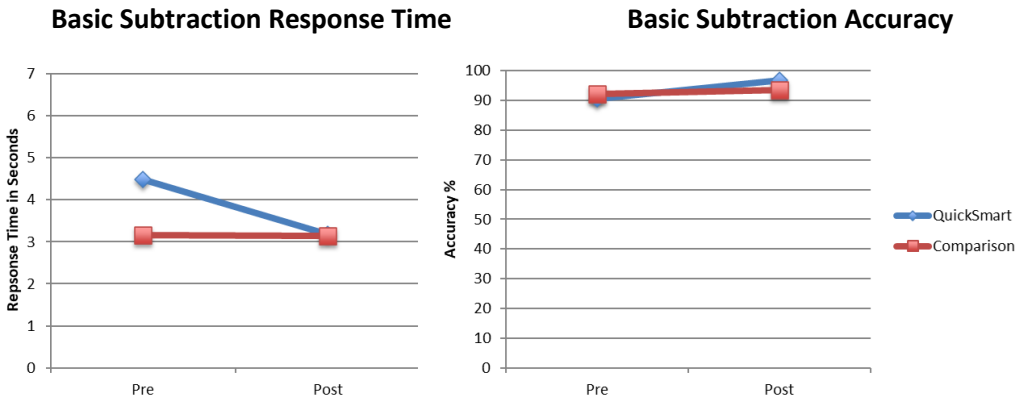


In summary, the results for subtraction indicate a very strong improvement for the *QuickSmart* students in both response time and accuracy. The diagrams illustrate that in response time the *QuickSmart* students improved to such an extent that there was no substantial difference between them and the comparison students. In accuracy the *QuickSmart* students improved to reach a slightly better level of performance than the comparison students.

4.2.6 Basic Subtraction

Table 6: Basic subtraction assessment – all students 2023

Basic Subtraction	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Res Time (secs) QS	320	4.491	2.284	3.183	2.138	-1.308	<0.001*	0.591
Res Time (secs) Comp	37	3.165	1.571	3.146	1.34	-0.019	0.923	0.013
Accuracy (%) QS	320	90.471	12.929	96.836	8.079	6.365	<0.001*	0.59
Accuracy (%) Comp	37	92.097	7.989	93.503	6.583	1.406	0.301	0.192

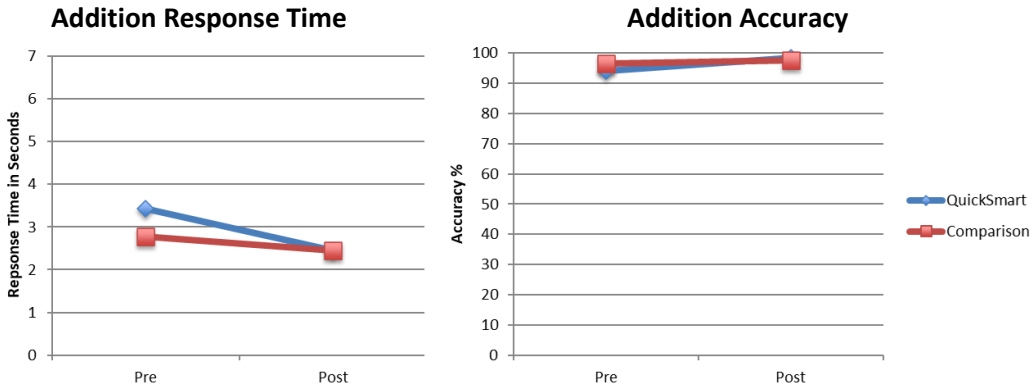


In summary, the results for basic subtraction indicate a strong improvement for the *QuickSmart* students in response time and accuracy. The diagrams illustrate that in response time the *QuickSmart* students improved to such an extent that there was no substantial difference between them and the comparison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

4.2.7 Addition

Table 7: Addition assessment – all students 2023

Addition	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Res Time (secs) QS	1611	3.424	1.689	2.454	1.223	-0.97	<0.001*	0.658
Res Time (secs) Comp	433	2.777	1.397	2.441	1.163	-0.336	<0.001*	0.261
Accuracy (%) QS	1611	93.959	9.354	98.486	4.984	4.527	<0.001*	0.604
Accuracy (%) Comp	433	96.603	5.866	97.732	4.563	1.129	<0.001*	0.215

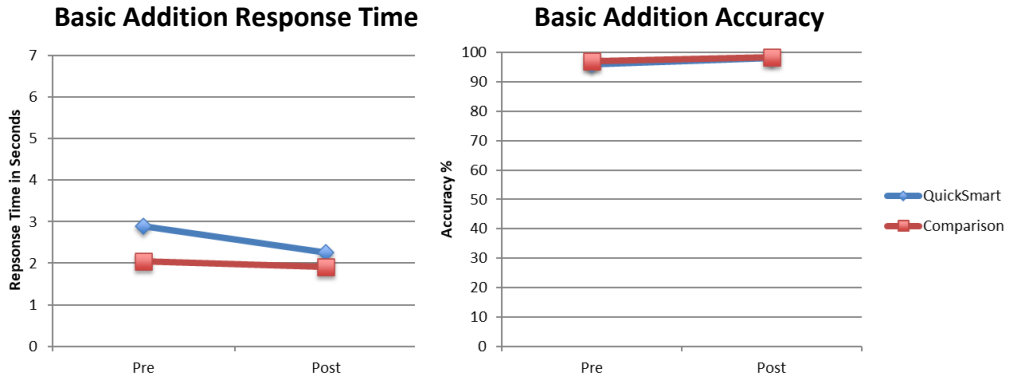


In summary, the results for addition indicate a very strong improvement for the *QuickSmart* students in response time and accuracy. The diagrams illustrate that the *QuickSmart* students improved to reach a similar level of performance as the comparison students in both response time and accuracy. In accuracy, both *QuickSmart* and comparison students exhibit a strong ceiling effect.

4.2.8 Basic Addition

Table 8: Basic addition assessment results – all students 2023

Basic Addition	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Res Time (secs) QS	330	2.892	1.809	2.253	1.794	-0.639	<0.001*	0.355
Res Time (secs) Comp	37	2.05	0.612	1.92	0.525	-0.13	0.132	0.228
Accuracy (%) QS	330	96.038	7.446	98.218	8.408	2.18	<0.001*	0.274
Accuracy (%) Comp	37	97.184	4.793	98.422	3.27	1.238	0.11	0.302



In summary, the results for basic addition indicate an appropriate improvement for the *QuickSmart* students in accuracy and 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 Basic Skills By Demographics

4.3.1 Division by Gender

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

Table 9: Division assessment results – all students by gender 2023

Group	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Response Time (seconds)								
Male *QuickSmart*	541	6.29	2.929	4.05	2.355	-2.24	<0.001*	0.843
Male Comparison	170	5.541	2.799	4.863	2.515	-0.678	<0.001*	0.255
Female *QuickSmart*	703	6.596	3.098	4.229	2.35	-2.367	<0.001*	0.861
Female Comparison	225	6.257	3.2	5.358	2.706	-0.899	<0.001*	0.304
Unknown *QuickSmart*	72	6.244	3.442	5.03	2.258	-1.214	0.022	0.417
Unknown Comparison	20	5.675	2.189	5.884	1.949	0.209		NI*
Accuracy (%)								
Male *QuickSmart*	541	55.487	24.691	84.385	21.204	28.898	<0.001*	1.256
Male Comparison	170	69.94	23.414	74.54	22.55	4.6	0.001*	0.2
Female *QuickSmart*	703	52.303	25.124	83.894	21.088	31.591	<0.001*	1.362
Female Comparison	225	68.788	21.509	71.984	20.408	3.196	0.004	0.152
Unknown *QuickSmart*	72	44.255	27.786	81.152	22.338	36.897	<0.001*	1.464
Unknown Comparison	20	52.935	29.024	63.39	23.138	10.455	0.109	0.398

*NI – No improvement

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 these differences are not statistically significant at the 0.01 significance level ($p = 0.510$ for response time and 0.051 for accuracy).

4.3.2 Basic Division by Gender

Table 10: Basic division assessment results – all students by gender 2023

Group	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Response Time (seconds)								
Male *QuickSmart*	182	4.925	2.598	3.033	1.673	-1.892	<0.001*	0.866
Male Comparison	25	3.332	1.809	3.024	1.514	-0.308	0.222	0.185
Female *QuickSmart*	304	5.602	3.536	3.057	1.749	-2.545	<0.001*	0.912
Female Comparison	69	4.046	2.125	3.465	1.296	-0.581	0.016	0.33
Unknown *QuickSmart*	9	7.406	2.914	6.741	7.394	-0.665	0.711	0.118
Unknown Comparison	5	7.5	4.35	3.174	1.574	-4.326	0.089	1.323
Accuracy (%)								
Male *QuickSmart*	182	73.035	25.245	93.54	11.15	20.505	<0.001*	1.051
Male Comparison	25	85.413	22.706	93.556	7.749	8.143	0.036	0.48
Female *QuickSmart*	304	68.342	27.035	92.359	13.259	24.017	<0.001*	1.128
Female Comparison	69	85.868	12.779	89.419	10.879	3.551	0.026	0.299
Unknown *QuickSmart*	9	40.679	15.835	68.002	29.001	27.323	0.006	1.169
Unknown Comparison	5	63.275	21.744	84.22	14.408	20.945	0.059	1.136

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 ($p = 0.126$), but they are significant in speed of response ($p = 0.011$). However, the small effect size for accuracy (Cohen's $d = 0.229$) indicates that this statistical finding is not meaningful for practical purposes.

4.3.3 Multiplication by Gender

Table 11: Multiplication assessment results – all students by gender 2023

Group	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Response Time (seconds)								
Male *QuickSmart*	604	6.133	2.987	3.724	2.139	-2.409	<0.001*	0.927
Male Comparison	172	5.461	2.949	4.685	2.55	-0.776	<0.001*	0.281
Female *QuickSmart*	806	6.488	3.226	3.949	2.168	-2.539	<0.001*	0.924
Female Comparison	228	5.782	3.115	4.876	2.176	-0.906	<0.001*	0.337
Unknown *QuickSmart*	88	6.396	2.848	4.803	2.576	-1.593	<0.001*	0.587
Unknown Comparison	25	6.113	2.431	4.922	2.318	-1.191	0.091	0.501
Accuracy (%)								
Male *QuickSmart*	604	62.489	20.964	88.32	17.392	25.831	<0.001*	1.341
Male Comparison	172	73.873	19.587	78.981	17.303	5.108	<0.001*	0.276
Female *QuickSmart*	806	60.704	20.708	87.252	17.633	26.548	<0.001*	1.38
Female Comparison	228	73.612	17.675	77.26	17.25	3.648	<0.001*	0.209
Unknown *QuickSmart*	88	61.62	18.534	84.339	16.955	22.719	<0.001*	1.279
Unknown Comparison	25	67.6	16.283	73.592	17.301	5.992	0.021	0.357

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 these differences are not statistically significant at the 0.01 significance level ($p = 0.434$ for response time and 0.493 for accuracy).

4.3.4 Basic Multiplication by Gender

Table 12: Basic multiplication assessment results – all students by gender 2023

Group	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Response Time (seconds)								
Male *QuickSmart*	177	3.14	1.695	2.051	1.003	-1.089	<0.001*	0.782
Male Comparison	26	2.204	1.377	1.887	0.817	-0.317	0.225	0.281
Female *QuickSmart*	291	3.7	2.351	2.177	1.024	-1.523	<0.001*	0.84
Female Comparison	67	2.476	0.977	2.351	0.929	-0.125	0.337	0.131
Unknown *QuickSmart*	5	6.45	2.599	3.181	1.323	-3.269	0.021	1.585
Accuracy (%)								
Male *QuickSmart*	177	88.961	15.339	97.005	9.461	8.044	<0.001*	0.631
Male Comparison	26	95.788	6.658	97.743	4.342	1.955	0.132	0.348
Female *QuickSmart*	291	87.793	15.981	96.836	9.83	9.043	<0.001*	0.682
Female Comparison	67	95.374	6.364	94.967	8.8	-0.407		NI*
Unknown *QuickSmart*	5	69.684	9.381	88.4	20.501	18.716	0.125	1.174

*NI – No improvement

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 = 0.525) but they are significant in speed of response time (p = 0.006). However, the small effect size for accuracy (Cohen's d = 0.252) indicates that this statistical finding is not meaningful for practical purposes.

4.3.5 Subtraction by Gender

Table 13: Subtraction assessment results – all students by gender 2023

Group	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Response Time (seconds)								
Male *QuickSmart*	627	4.776	2.388	3.113	1.431	-1.663	<0.001*	0.845
Male Comparison	176	3.866	2.269	3.336	1.778	-0.53	<0.001*	0.26
Female *QuickSmart*	844	5.825	3.107	3.764	2.105	-2.061	<0.001*	0.776
Female Comparison	232	4.526	2.538	3.944	2.101	-0.582	<0.001*	0.25
Unknown *QuickSmart*	92	5.917	3.579	4.204	2.34	-1.713	<0.001*	0.566
Unknown Comparison	24	4.357	1.752	3.75	1.431	-0.607	0.006	0.38
Accuracy (%)								
Male *QuickSmart*	627	86.022	14.504	95.547	9.296	9.525	<0.001*	0.782
Male Comparison	176	91.09	9.596	93.61	7.857	2.52	<0.001*	0.287
Female *QuickSmart*	844	83.161	16.514	93.99	11.123	10.829	<0.001*	0.769
Female Comparison	232	90.071	10.461	92.215	9.151	2.144	0.004	0.218
Unknown *QuickSmart*	92	82.946	18.583	95.126	7.426	12.18	<0.001*	0.861
Unknown Comparison	24	91.813	7.677	91.754	9.364	-0.059		NI*

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 = 0.08) but they are significant in response time (p = 0.001). However, the small effect size for response time (Cohen's d = 0.165) indicates that this statistical finding is not meaningful for practical purposes.

4.3.6 Basic Subtraction by Gender

Table 14: Basic subtraction assessment results – all students by gender 2023

Group	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Response Time (seconds)								
Male *QuickSmart*	147	4.153	1.89	2.935	1.519	-1.218	<0.001*	0.71
Male Comparison	20	2.705	0.922	3.074	1.444	0.369		NI*
Female *QuickSmart*	173	4.778	2.543	3.394	2.534	-1.384	<0.001*	0.545
Female Comparison	17	3.706	1.991	3.231	1.245	-0.475	0.127	0.286
Accuracy (%)								
Male *QuickSmart*	147	91.152	9.113	97.326	5.458	6.174	<0.001*	0.822
Male Comparison	20	91.625	8.58	92.415	7.026	0.79	0.665	0.101
Female *QuickSmart*	173	89.892	15.453	96.418	9.766	6.526	<0.001*	0.505
Female Comparison	17	92.654	7.454	94.782	5.972	2.128	0.314	0.315

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 these differences are not statistically significant at the 0.01 significance level ($p = 0.500$ in response time and 0.815 in accuracy).

4.3.7 Addition by Gender

Table 15: Addition assessment results – all students by gender 2023

Group	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Response Time (seconds)								
Male *QuickSmart*	644	3.174	1.554	2.299	0.936	-0.875	<0.001*	0.682
Male Comparison	176	2.564	1.191	2.231	0.987	-0.333	<0.001*	0.304
Female *QuickSmart*	871	3.579	1.755	2.536	1.401	-1.043	<0.001*	0.657
Female Comparison	233	2.941	1.563	2.589	1.281	-0.352	<0.001*	0.246
Unknown *QuickSmart*	95	3.7	1.771	2.745	1.078	-0.955	<0.001*	0.652
Unknown Comparison	24	2.757	0.777	2.547	0.933	-0.21	0.229	0.244
Accuracy (%)								
Male *QuickSmart*	644	94.187	9.385	98.747	3.39	4.56	<0.001*	0.646
Male Comparison	176	96.79	4.913	97.892	4.359	1.102	0.01	0.237
Female *QuickSmart*	871	93.851	9.238	98.3	6.004	4.449	<0.001*	0.571
Female Comparison	233	96.321	6.672	97.645	4.676	1.324	0.004	0.23
Unknown *QuickSmart*	95	93.511	10.216	98.507	3.412	4.996	<0.001*	0.656
Unknown Comparison	24	97.979	3.263	97.4	5.061	-0.579		NI*

These results indicate that females did better than males in response time and males did better than females in 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 ($p = 0.826$) but they are significant in response time ($p = 0.040$). However, the small effect size for response time (Cohen's $d = 0.109$) indicates that this statistical finding is not meaningful for practical purposes.

4.3.8 Basic Addition by Gender

Table 16: Basic addition assessment results – all students by gender 2023

Group	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Response Time (seconds)								
Male *QuickSmart*	156	2.89	2.232	2.14	1.031	-0.75	<0.001*	0.431
Male Comparison	21	1.893	0.626	1.903	0.576	0.01		NI*
Female *QuickSmart*	174	2.894	1.326	2.354	2.269	-0.54	0.003	0.291
Female Comparison	16	2.256	0.544	1.943	0.466	-0.313	0.003	0.617
Accuracy (%)								
Male *QuickSmart*	156	95.928	8.076	98.721	4.018	2.793	<0.001*	0.438
Male Comparison	21	97.553	4.971	98.467	3.466	0.914	0.319	0.213
Female *QuickSmart*	174	96.137	6.854	97.766	10.934	1.629	0.088	0.179
Female Comparison	16	96.7	4.663	98.363	3.105	1.663	0.226	0.42

These results indicate that males did 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 = 0.380 for response time and 0.326 for accuracy).

4.3.9 Indigenous Students

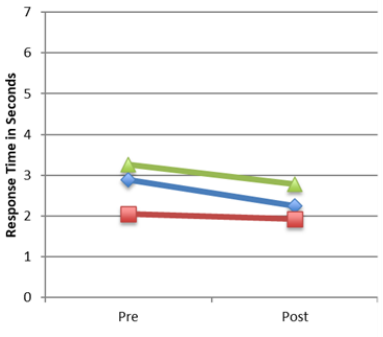
Table 17: Basic Skills results – Indigenous students 2023

Test	N	Pre-Mean	Pre-SD	Post-Mean	Post-SD	Gain	*p*	Effect size
Basic Addition								
Response time (seconds)	68	3.268	1.497	2.779	3.413	-0.489	0.275	0.185
Accuracy (%)	68	95.443	7.331	97.176	12.174	1.733	0.305	0.172
Addition								
Response time (seconds)	187	3.583	1.751	2.701	2.232	-0.882	<0.001*	0.44
Accuracy (%)	187	93.126	11.289	97.888	7.917	4.762	<0.001*	0.488
Basic Subtraction								
Response time (seconds)	58	5.084	2.343	3.672	3.698	-1.412	0.009	0.456
Accuracy (%)	58	87.734	13.857	94.679	13.865	6.945	0.011	0.501
Subtraction								
Response time (seconds)	180	5.525	2.62	3.866	2.611	-1.659	<0.001*	0.634
Accuracy (%)	180	85.216	15.425	93.706	13.609	8.49	<0.001*	0.584
Basic Multiplication								
Response time (seconds)	73	3.924	2.143	2.286	1.038	-1.638	<0.001*	0.973
Accuracy (%)	73	87.925	13.8	97.187	5.857	9.262	<0.001*	0.874
Multiplication								
Response time (seconds)	172	6.825	3.268	4.201	2.336	-2.624	<0.001*	0.924
Accuracy (%)	172	61.708	19.758	86.332	19.16	24.624	<0.001*	1.265
Basic Division								
Response time (seconds)	70	6.091	3.72	3.386	1.836	-2.705	<0.001*	0.922
Accuracy (%)	70	70.081	25.862	93.077	9.62	22.996	<0.001*	1.179
Division								
Response time (seconds)	145	6.682	3.071	4.528	2.706	-2.154	<0.001*	0.744
Accuracy (%)	145	55.886	23.524	83.192	20.7	27.306	<0.001*	1.232

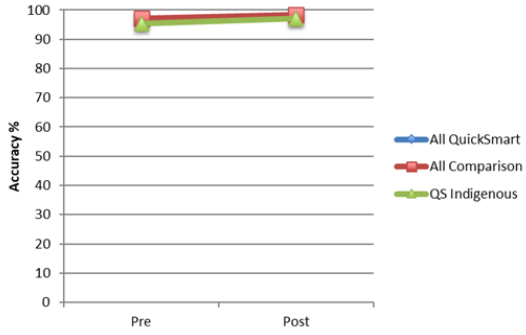
These results indicate that in most instances the Indigenous students' improvement was very similar to that of the overall *QuickSmart* group. For basic addition and addition the accuracy results exhibit the ceiling effect (the pre-intervention scores were so high that the students did not have much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

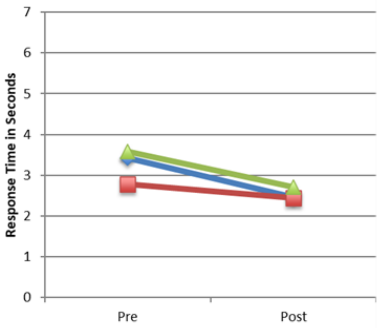
Basic Addition Response Time



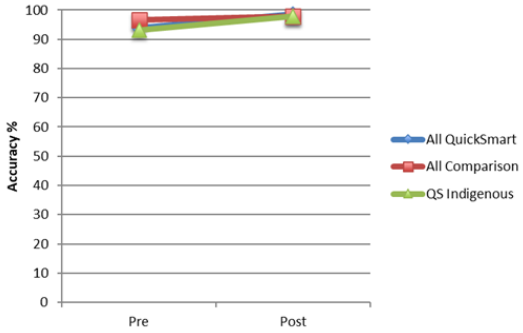
Basic Addition Accuracy



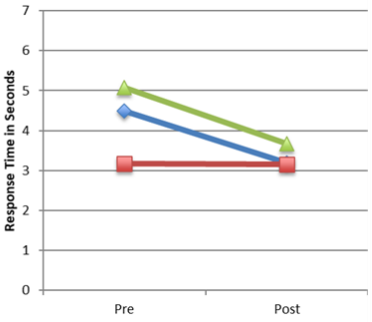
Addition Response Time



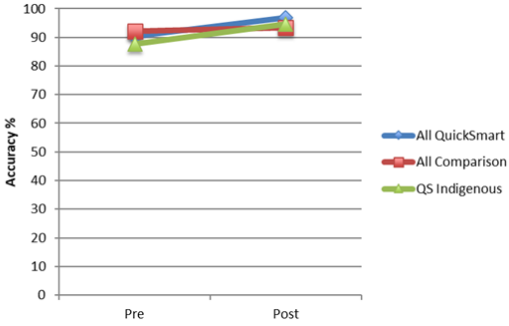
Addition Accuracy



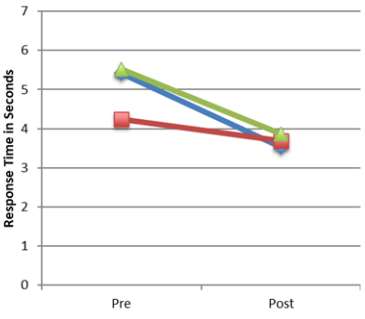
Basic Subtraction Response Time



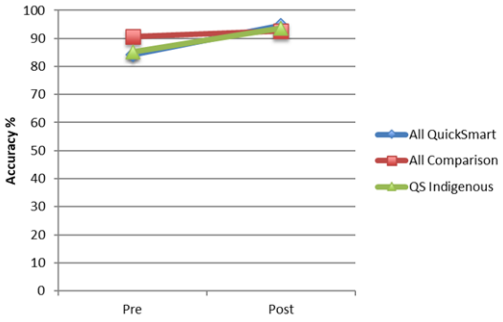
Basic Subtraction Accuracy



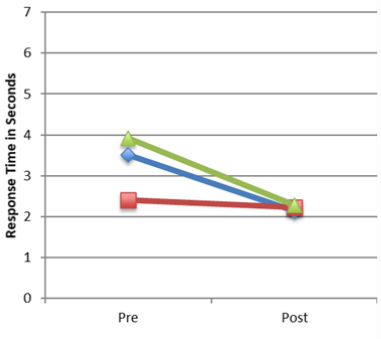
Subtraction Response Time



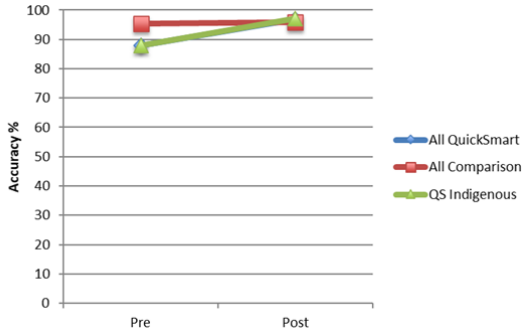
Subtraction Accuracy



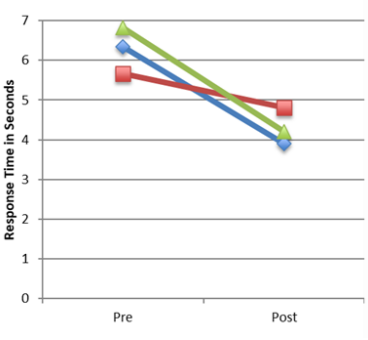
Basic Multiplication Response Time



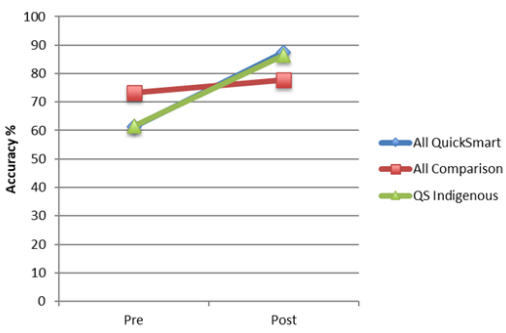
Basic Multiplication Accuracy



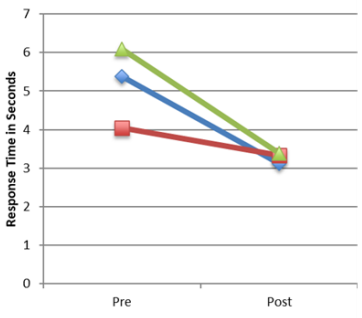
Multiplication Response Time



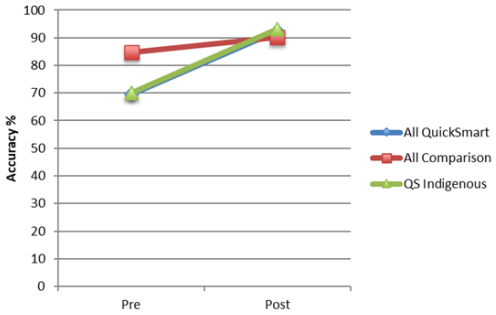
Multiplication Accuracy



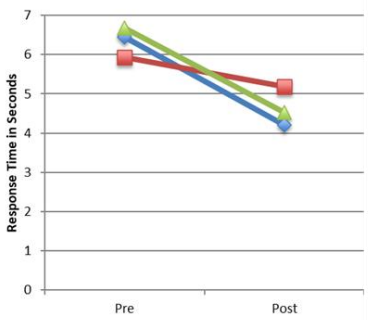
Basic Division Response Time



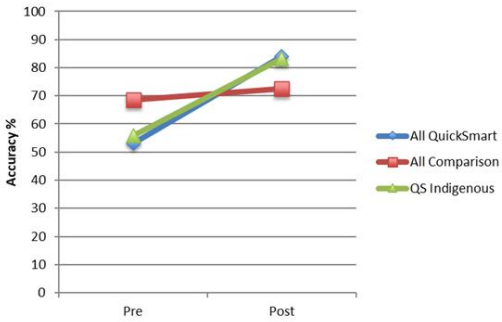
Basic Division Accuracy



Division Response Time



Division Accuracy



4.4 Students Who Were Unable to Complete the Pre-Intervention Test

There were students who instructors confirmed were not able to complete Basic Skills pre-tests. Our advice is not to continue collecting data as doing so would confront 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 **did** complete all Basic Skills 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: Basic Skills results where no pre-test data was available – 2023

	N	Mean	Std. Deviation
Basic Addition			
Response time (seconds)			
Accuracy (%)			
Addition			
Response time (seconds)	7	3.987	0.776
Accuracy (%)	7	94.841	6.610
Basic Subtraction			
Response time (seconds)	3	3.541	1.295
Accuracy (%)	3	94.912	5.002
Subtraction			
Response time (seconds)	18	4.358	2.367
Accuracy (%)	18	94.263	6.907
Basic Multiplication			
Response time (seconds)	3	3.294	1.801
Accuracy (%)	3	63.633	54.329
Multiplication			
Response time (seconds)	28	3.974	2.182
Accuracy (%)	28	78.178	22.067
Basic Division			
Response time (seconds)	18	5.381	2.547
Accuracy (%)	18	86.089	17.073
Division			
Response time (seconds)	68	4.965	2.478
Accuracy (%)	68	75.828	24.021

The results in Table 18 are impressive given that these students did not have the skills or confidence to complete the Basic Skills pre-tests. In addition and subtraction, the average response rates were below 4.4 seconds and above 94% accuracy. In multiplication and division, the average response times were below 5.4 seconds and accuracy over 63% 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 since:

(i) there has been some mutually beneficial development of the common areas of the brain that process the four operations;

(ii) 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;

(iii) students have increased their ability to benefit from classroom instruction.

4.5 Conclusion on Basic Skills 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 in their progress in Mathematics as number facts are a vital skill underpinning mathematics functioning in general.

The improvement identified provides the necessary foundation for students to improve in other areas of Mathematics that are not specifically taught in *QuickSmart*. This is because of both direct and indirect aspects of *QuickSmart* lessons.

(i) The direct benefits of automating with understanding the basic arithmetic operations which can be found explicitly or implicitly in many topics in school Mathematics.

(ii) The indirect benefits of deliberate practice in persistence, concentrating on a particular area, working with a peer, clear attainable goals that can be achieved through demonstrated effort, recognising the power and usefulness of learning from mistakes, and the nurturing of an adult who cares and believes in the student and has appropriate high expectations that the student can succeed.

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-assessments include use of independent tests to demonstrate whether the students can 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) 2023

	Students with paired data	Average Gain score	Significance	Effect size
All *QuickSmart*	1198	5.556	<0.001*	0.625
All comparison	344	3.975	<0.001*	0.426

The results indicate a very strong improvement for *QuickSmart* students. This improvement is greater than that 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) 2023

Gender	Students with paired data	Average Gain score	Significance	Effect size
Male				
QuickSmart Students	478	5.924	<0.001*	0.661
Comparison Students	133	4.502	<0.001*	0.481
Female				
QuickSmart Students	664	5.294	<0.001*	0.594
Comparison Students	187	3.803	<0.001*	0.393
Unknown				
QuickSmart Students	56	5.527	<0.001*	0.684
Comparison Students	24	2.392	0.110	0.433

These results indicate that QuickSmart males did slightly better than females in PATM assessment. 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 ($p = 0.137$).

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) 2023

Indigenous students	Students with paired data	Average Gain score	Significance	Effect size
Indigenous *QuickSmart*	150	5.106	<0.001*	0.609
All *QuickSmart*	1198	5.556	<0.001*	0.625

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.

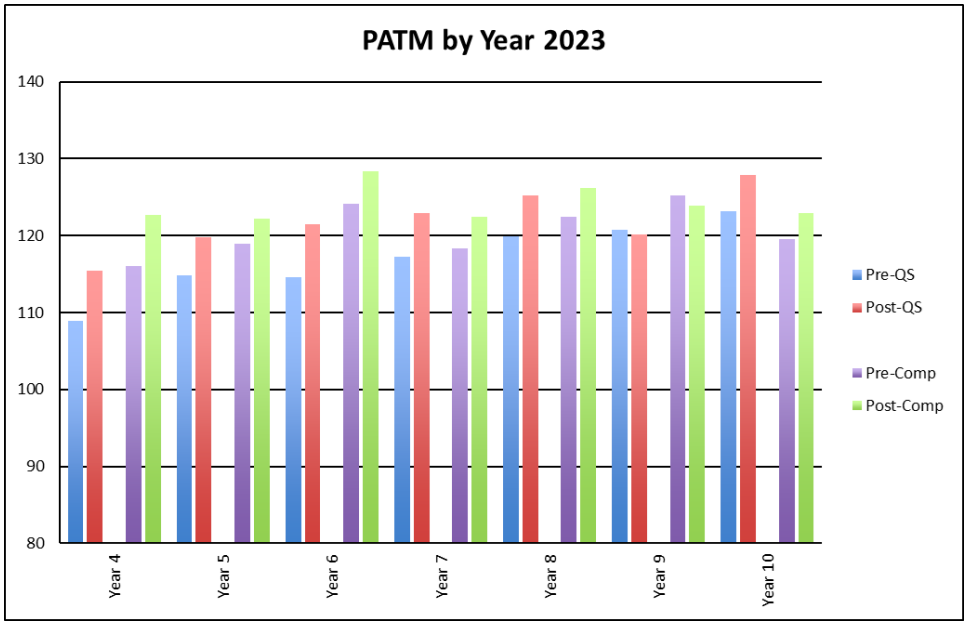


Figure 1: PAT by Year

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	887	1190	74.5
Indigenous *QuickSmart*	110	149	73.8
Comparison	243	344	70.6

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 Schools and Clusters of Schools has been critical in making more positive the hopes and aspirations of students participating in the *QuickSmart* program. This report has focused on both the quantitative and qualitative aspects of the program. In all quantitative 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 with highly significant gains by individual students.

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 and learning. Many stories within the corpus of qualitative data document improvements for *QuickSmart* students not only in relation to their performance in class, but also about students' attitudes to their attendance and levels of academic confidence both inside and outside the classroom.

The data collected to date from many thousands of *QuickSmar*t students indicate that the narrowing of the achievement gap between *QuickSmart* and comparison students is more than possible and results record 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 https://simerr.une.edu.au/quicksmart/publications/) demonstrate that *QuickSmart* students can maintain the gains made during the program for years after they completed the program, especially if ideas are reinforced in the classroom. Analyses have consistently identified impressive statistically significant end-of-program and longitudinal gains in terms of probability measures and effect sizes that mirror qualitative improvements reported by teachers, paraprofessionals, parents and *QuickSmart* students.

If you have any questions concerning this report or the *QuickSmart* Program please contact us at the SiMERR National Centre at UNE on (02) 6773 5067 or by email on QuickSmart@une.edu.au.

Professor John Pegg

7 APPENDIX A: Independent Assessment Results

7.1 PAT Results by Region (Scale Scores) 2023

** not included as most students do not have a region defined.

7.2 PAT Results by Demographic (Scale Scores) 2023

Demographic		Pre-Intervention		Post-Intervention				
	N	Mean	SD	Mean	SD	Gain	*p*	Effect size
All QS Students	**1198**	**116.392**	**8.685**	**121.948**	**9.098**	**5.556**	**<0.001***	**0.625**
All comparison students	**344**	**120.066**	**9.34**	**124.041**	**9.332**	**3.975**	**<0.001***	**0.426**
Indigenous QS Students	150	115.019	8.406	120.125	8.352	5.106	<0.001*	0.609
Male QS Students	478	116.647	8.96	122.571	8.952	5.924	<0.001*	0.661
Male comparison students	133	120.697	8.98	125.199	9.707	4.502	<0.001*	0.481
Female QS Students	664	116.29	8.609	121.584	9.198	5.294	<0.001*	0.594
Female comparison Students	187	119.753	9.964	123.556	9.377	3.803	<0.001*	0.393
Unknown Gender QS Students	56	115.43	7.079	120.957	8.961	5.527	<0.001*	0.684
Unknown Gender comparison Students	24	119.008	5.573	121.4	5.467	2.392	0.110	0.433
Male Indigenous QS Students	72	115.249	9.033	121.211	9.062	5.962	<0.001*	0.659
Female Indigenous QS Students	77	114.857	7.874	119.104	7.606	4.247	<0.001*	0.549

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

7.3 PAT Results by State (Scale Scores) 2023

State		Pre-Intervention		Post-Intervention				
	N	Mean	SD	Mean	SD	Gain	*p*	Effect size
All *QuickSmart* Students	**1198**	**116.392**	**8.685**	**121.948**	**9.098**	**5.556**	**<0.001***	**0.625**
All comparison students	**344**	**120.066**	**9.34**	**124.041**	**9.332**	**3.975**	**<0.001***	**0.426**
Australian Capital Territory								
QuickSmart	0							
Indigenous *QuickSmart*	0							
Comparison	0							
New South Wales								
QuickSmart	597	115.465	8.876	121.653	9.268	6.188	<0.001*	0.682
Indigenous *QuickSmart*	100	113.998	8.352	119.634	8.942	5.636	<0.001*	0.651
Comparison	131	118.304	10.357	123.244	9.604	4.94	<0.001*	0.495
Northern Territory								
QuickSmart	14	115.864	5.85	122.864	6.344	7.0	0.008	1.147
Indigenous *QuickSmart*								
Comparison								
Queensland								
QuickSmart	93	117.254	6.25	122.874	8.207	5.62	<0.001*	0.77
Indigenous *QuickSmart*	9	118.067	5.315	120.078	5.364	2.011	0.277	0.377
Comparison	40	120.76	6.365	121.13	8.169	0.37	0.782	0.051
South Australia								
QuickSmart	133	111.752	8.847	117.908	8.604	6.156	<0.001*	0.705
Indigenous *QuickSmart*	9	112.0	3.628	115.478	6.378	3.478	0.173	0.67
Comparison	25	120.76	5.949	126.352	6.674	5.592	<0.001*	0.885
Tasmania								
QuickSmart	23	116.496	8.601	120.009	7.292	3.513	0.027	0.441
Indigenous *QuickSmart*	4	117.725	8.153	123.85	3.95	6.125	0.174	0.956
Comparison	10	117.99	5.736	115.96	7.375	-2.03		No Improvement
Victoria								
QuickSmart	338	119.633	7.767	123.899	8.873	4.266	<0.001*	0.512
Indigenous *QuickSmart*	28	118.271	9.614	122.857	7.18	4.586	0.005	0.54
Comparison	137	121.566	9.573	125.75	9.399	4.184	<0.001*	0.441
Western Australia								
QuickSmart	0							
Indigenous *QuickSmart*	0							
Comparison	0							

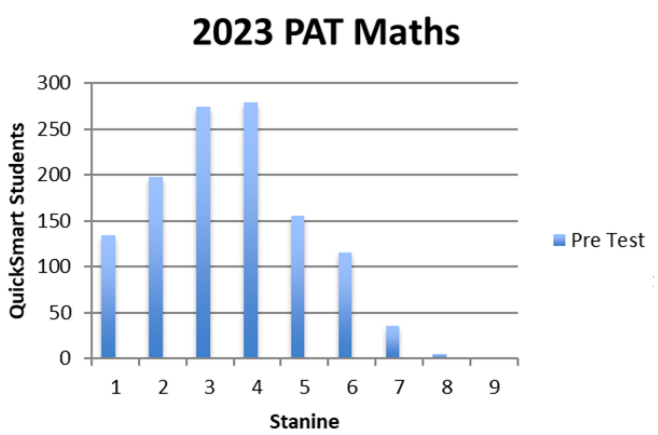
Note: only students who did both 'pre' and 'post' test are included in the table.

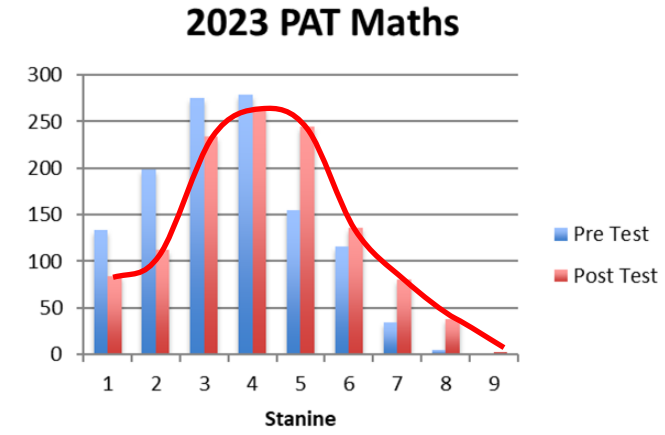
7.4 *QuickSmart* Students by Year (Scale Scores) 2023

Year		Pre-Intervention		Post-Intervention				
	N	Mean	SD	Mean	SD	Gain	*p*	Effect size
Year 4								
QuickSmart	154	108.922	8.117	115.48	8.521	6.558	<0.001*	0.788
Indigenous *QuickSmart*	27	109.948	6.723	116.107	9.304	6.159	0.001	0.759
Comparison	19	116.053	4.105	122.663	6.044	6.61	<0.001*	1.28
Year 5								
QuickSmart	227	114.826	7.173	119.78	7.859	4.954	<0.001*	0.658
Indigenous *QuickSmart*	31	113.848	6.955	117.597	7.08	3.749	0.002	0.534
Comparison	64	118.942	10.538	122.192	11.16	3.25	0.003	0.299
Year 6								
QuickSmart	96	114.615	6.888	121.453	8.031	6.838	<0.001*	0.914
Indigenous *QuickSmart*	13	114.615	5.446	120.538	7.197	5.923	0.003	0.928
Comparison	43	124.114	8.681	128.414	9.06	4.3	<0.001*	0.485
Year 7								
QuickSmart	308	117.246	9.173	122.921	8.759	5.675	<0.001*	0.633
Indigenous *QuickSmart*	23	115.187	9.265	120.461	6.336	5.274	0.003	0.665
Comparison	129	118.384	10.164	122.405	9.538	4.021	<0.001*	0.408
Year 8								
QuickSmart	371	119.901	7.404	125.267	8.8	5.366	<0.001*	0.66
Indigenous *QuickSmart*	49	118.714	7.492	123.857	7.705	5.143	<0.001*	0.677
Comparison	77	122.386	7.154	126.153	7.557	3.767	<0.001*	0.512
Year 9								
QuickSmart	25	120.696	8.025	120.192	8.494	-0.504		No Improvement
Indigenous *QuickSmart*	4	121.475	10.081	120.775	2.546	-0.7		No Improvement
Comparison	6	125.183	6.206	123.933	4.188	-1.25		No Improvement
Year 10								
QuickSmart	6	123.217	4.14	127.883	8.782	4.666	0.199	0.68
Indigenous *QuickSmart**								
Comparison*								
All Schools								
QuickSmart	**1198**	**116.392**	**8.685**	**121.948**	**9.098**	**5.556**	**<0.001***	**0.625**
Indigenous *QuickSmart*	**150**	**115.019**	**8.406**	**120.125**	**8.352**	**5.106**	**<0.001***	**0.609**
Comparison	**344**	**120.066**	**9.34**	**124.041**	**9.332**	**3.975**	**<0.001***	**0.426**

*Insufficient data reported

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 5-11% of the population
3 represents performance in the lower 12-23% of the population
4 represents performance in the lower 24-40% of the population
5 represents performance in middle 41-60% of the population
6 represents performance in the higher 61-77% of the population
7 represents performance in the higher 78-88% 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.