A Study of the Instructional Effectiveness of CARS & STARS ©2010

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Executive Summary

This study was designed to determine whether the ***Comprehensive Assessment of Reading Strategies and Strategies to Achieve Reading Success (CARS & STARS)*** program published in Australia by Hawker Brownlow Publishing improves students' reading strategies. The program was designed to identify and provide instruction for students on identified reading strategies.

The study evaluated the efficacy of two levels of the program – year 3 and year 7. Twenty teachers from eight different schools across three different states – New York, California and Florida – participated in the study. The schools included relatively high percentages of minority students and students enrolled in free and reduced lunch programs. All of the participating classes were designed to provide reading instruction for struggling readers. A total of 306 students were able to be matched with SAT-10 pretest and post test scores and 264 students were able to be matched with CARS pretest and post test scores for the data analyses.

The pretests and post tests used in the study included both the Stanford Achievement Test, Tenth Edition (SAT-10) and pretests and post tests included in the CARS & STARS program. At year 3, the post tests of the CARS & STARS treatment group were compared with those of a control group that did not utilise the CARS & STARS program. Control groups were also recruited for year 7 and were to be included. However, weather problems and conflicts with state test administration schedules caused the control groups for year 7 to withdraw from the study at the end of the year. Results showed that all the tests were of reasonably high reliability to conduct analyses.

The year 3 results showed that the students in the CARS & STARS treatment group scored significantly higher on the post tests of both the SAT-10 and the CARS assessments than did the students in the control group. When the CARS & STARS treatment group's scores were compared from pretest to post test on both the SAT-10 and CARS assessments, their scores increased statistically significantly. In addition, students in the year 3 CARS & STARS treatment group who scored below the 50th percentile on the pretests increased their scores to a greater extent than did students who scored at the 50th percentile and above on the pretests.

The results at year 7 paralleled those at year 3 for the pretest/post test gains on both the SAT-10 and the CARS assessments. The lack of a control group at year 7 prevented those comparisons. However, as was the result at year 3, the year 7 students who scored lower on the pretests increased their scores to a greater extent than did students who scored higher on the pretests.

Overview of the Study

This report describes a study designed to determine the educational efficacy of a program developed to increase students' reading strategies. The program, entitled Comprehensive Assessment of Reading Strategies and Strategies to Achieve Reading Success, is published in Australia by Hawker Brownlow Publishing and is commonly referred to as CARS & STARS.

The Comprehensive Assessment of Reading Strategies and Strategies to Achieve Reading Success program is designed for students enrolled in foundation to year 8. Each level of the program includes practice tests to guide instruction (CARS) and a set of student lessons that provide targeted instruction to help students increase specific reading strategies (STARS).

The study was conducted with students enrolled in years 3 and 7, and the corresponding program levels were used in the study. The classes included in the study were from eight different schools across three different US states, California, Florida and New York. The demographic data for the schools indicates that the schools enrolled large percentages of minority students and students in free and reduced lunch programs. The participating classes were designed for struggling readers. School administrators and teachers volunteered their classes to become participants in the study.

At year 3, both a CARS & STARS treatment group and a control group were included. At year 7, a control group was enrolled in the study, but the participants dropped out at the end of the year due to scheduling problems caused by inclement weather and conflicts with state testing schedules.

The tests used in the study included a nationally standardised test, the Stanford Achievement Test Series, Abbreviated Version, Tenth Edition (SAT-10) and the CARS & STARS program pretests and post tests. The Stanford Achievement Test Series is used to measure academic knowledge of primary and secondary school students. The reports include narrative summaries, process and cluster summaries, and graphic displays to clarify the student's performance and guide planning and analysis.

SAT-10 pretest and post test matched scores were available for a total of 192 year 3 students and 114 year 7 students. CARS pretest and post test matched scores were available for a total of 185 year 3 students and 79 year 7 students. A greater number of students participated in the program; however, only those students for whom a pretest and a post test match was available were included in the data analyses.

Study Background

Great interest has been expressed by both teachers and administrators in providing focused instruction that helps students develop the reading strategies they need for success in school, life and work. A growing body of research over several decades has supported the idea that explicit and focused instruction on reading strategies improves students' use of these strategies – and, as a result, improves reading comprehension and performance on assessments of reading comprehension.

The current focus on reading comprehension strategies is exemplified by the recent release of the Common Core State Standards developed under the direction of the National Governors Association (NGA) and the Council of Chief State School Officers (CCSSO).

The standards have been approved by most states, which have agreed to adopt the standards. The reading strategies in the CARS & STARS program are a close match to the strategies delineated in the Common Core State Standards for English & Literacy in History/Social Studies, Science and Technical Subjects. Both CARS & STARS and the Common Core State Standards emphasise the comprehension strategies that are at the heart of reading and that many students seem to lack.

This study is focused on reading skills and strategy improvement as measured by the pretest to post test gains of students with whom the program is used. The CARS & STARS program focuses on a unique set of 12 reading comprehension strategies. The CARS part of CARS & STARS is primarily a testing program designed to identify the reading strategies with which students seem to need help. The CARS program includes both pretests and post tests. Teachers use the CARS pretests to identify the strategies on which students score low and need targeted instructional support. The STARS program provides instruction in 12 lessons, each focusing on a different reading strategy. After identifying students' weakest reading comprehension strategies with the CARS pretest, teachers can use the appropriate lessons from the STARS program to teach those strategies.

Research Questions

The following questions guided the design of the study and the data analyses:

1. Does the Comprehensive Assessment of Reading Strategies and Strategies to Achieve Reading Success program improve the reading comprehension strategies of students at years 3 and 7?

2. Is the Comprehensive Assessment of Reading Strategies and Strategies to Achieve Reading Success program equally effective in improving the reading comprehension strategies of lower-performing students as well as higher-performing students at years 3 and 7?

This report provides the study results in four major sections as follows:

• Year 3 SAT-10 Assessment Comparisons

• Year 3 CARS Assessment Comparisons

• Year 7 SAT-10 Assessment Comparisons

• Year 7 CARS Assessment Comparisons

Description of the Research Sample

The study was conducted with students enrolled in years 3 and 7. The students were drawn from a convenience sample of eight different schools across three different US states, California, Florida and New York. Approximately 192 year 3 students and 114 year 7 students participated in the study over the course of the academic year.

The study was planned to have CARS & STARS treatment group classes and control group classes at both years 3 and 7. However, due to scheduling problems, it was not possible to include a control group at year 7.

Table 1 provides a summary of the demographic characteristics of the schools included in the study. The data for the four schools in the year 3 CARS & STARS treatment group indicates that these four schools are comparable to the control school in terms of percentage of students on free and reduced lunch programs, which is typically a strong indicator of socio-economic status. The three schools in the year 7 CARS & STARS treatment group also have the same general demographic characteristics as the year 3 schools, with similar percentages of the student population in the identified demographic strata.

Overall, the demographics of the participating schools show a high percentage of students enrolled in free and reduced lunch programs and a high percentage of minority students. It is important to note that the school data does not provide a description of the make-up of each class that participated in the study. However, the school data does provide general descriptions of the school and thereby reasonable estimates of the demographic characteristics of the classes included in the study.

Table 1
Demographic Characteristics of the Participating Schools

Location	Year	Students Enrolled	Students in Free/ Reduced Lunch Programs	Minority Students	Special Education Students
CARS & STARS **Schools Year 3**					
Large Central City	F to 5	657	15%	70%	9%
Large Central City	F to 6	403	65%	99%	12%
Large Central City	P to 5	519	96%	88%	11%
Large Central City	F to 5	1006	79%	88%	8%
Average		646	64%	86%	10%
Control School Year 3					
Large Central City	F to 8	1645	63%	61%	8%
Average		1645	63%	61%	8%
CARS & STARS **Schools Year 3**					
Large Central City	6 to 8	729	64%	84%	10%
Mid-Size Central City	7 to 8	950	73%	86%	12%
Large Central City	6 to 8	273	95%	99%	10%
Average		651	77%	90%	11%

Description and Evaluation of Program Use

The total instructional time for the program was about 18 weeks and was to last just one semester. Teachers administered the pretests in late September of 2010. The post tests were to have been administered about 15 February. However, due to a long period of inclement weather and then conflicts with other assessment testing, several schools were not able to administer the post tests until late March. Despite the uneven test administration periods, the teachers all reported that the program was used for approximately 18 weeks.

Description of the CARS & STARS Program

The program publisher provided the following description of the CARS & STARS program:

The CARS® & STARS® Series is a comprehensive resource that allows you to identify and teach essential reading comprehension strategies. The CARS Series is the assessment component and the STARS Series is the instruction component.

CARS® Series

The CARS Series is a diagnostic reading series that allows you to identify and assess a student's level of mastery for each of 12 reading strategies. It contains Pretests, Benchmarks and Post Tests. This ten-level series is designed for students in years P to 8. The CARS Series helps teachers place students in the companion STARS Series for reading instruction and remediation.

STARS® Series

The STARS Series is a prescriptive reading series that provides essential instruction in the same 12 reading strategies as the diagnostic CARS Series. This ten-level series is also designated for students in years P to 8. The STARS Series provides precise instruction in and practice with the strategies students need to master in order to achieve reading success.

Description of the Assessments

Stanford Achievement Test, Tenth Edition

The Stanford Achievement Test Series, Tenth Edition (SAT-10) includes thirteen battery levels that assess students from kindergarten to year 12. The Stanford Abbreviated version was used in this study. At year 3, the Primary 2 Level of the test was used. This test is designed for students in years 2.5 to 3.5. The subtests included 20 Reading Vocabulary questions and 30 Reading Comprehension questions for a total of 50 test questions. At year 7, the Intermediate 3 Level of the test was used. The subtests included 20 Reading Vocabulary and 30 Reading Comprehension questions for a total of 50 test questions. The test items on both tests were multiple-choice format items. The comprehension questions followed a short reading selection.

Program Assessment

The CARS pretest and post test assessments each include a total of 60 multiple-choice test items. The pretest and post test are each made up of five reading selections of about 200 words or more for each.

The following test description is provided in the CARS Teacher Guide:

> *The Pretest and the Post Test1 are designed to assess mastery. The length of the reading passages and the number of questions are the same in each of these tests. Each of the passages in the Pretest and Post Test are one page, followed by one question for each strategy. Since each part of each test contains only one strategy-specific question, it is important to administer the entire Pretest in order to assess a student's overall performance and the entire Post Test to determine a student's overall progress. Administering the Pretest and the Post Test, and compiling the results, provides reliable information about each strategy.*

The 12 strategies included in the pretest and post test are:

1. Finding Main Idea
2. Recalling Facts and Details
3. Understanding Sequence
4. Recognising Cause and Effect
5. Comparing and Contrasting
6. Making Predictions
7. Finding Word Meaning in Context
8. Drawing Conclusions and Making Inferences
9. Distinguishing between Fact and Opinion
10. Identifying Author 's Purpose
11. Interpreting Figurative Language
12. Distinguishing between Real and Make Believe (Year 3) and Summarising (Year 7)

Description of Implementation and Data Collection Procedures

Schools in the CARS & STARS treatment group had purchased copies of the CARS & STARS program for the 2010–2011 school year. Schools in the CARS & STARS treatment group were asked to implement the CARS assessments and to use the STARS program for instruction throughout the school year as outlined in the CARS & STARS implementation guidelines. Schools in the CARS & STARS treatment group were asked to implement the pretests and post tests for both CARS and the SAT-10 at the beginning and end of the school year. The school in the control group was asked to implement the CARS post test and the SAT-10 assessment at the end of the school year. No extra instructional materials were provided for the control group.

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[1] The program refers to a Pretest and a Post Test, each of which includes 60 items.

Due to the inter-state nature of the sample, implementation dates varied from site to site. Pretests were generally administered in September 2010, and post tests were generally administered in March 2011. Schools in the treatment group used the program about four times per week, and each administration ranged from 20–40 minutes.

At the end of the school year, schools returned their assessment results via mail to ERIA. These results were subsequently entered into a spread sheet for analysis. All unique student and site identifiers were removed for anonymity purposes.

Test Statistics

Table 2 provides the statistical analysis for the year 3 post test results for both the SAT-10 and CARS assessments. Reliabilities were calculated using the Kidder-Richardson Formula 20 (KR-20). The results show that the reliabilities of the tests were all above .85, indicating the tests provide reliable data for statistical analyses.

Table 2
Year 3 Post Test
SAT-10 and CARS Statistics

Test	Mean % Score	Standard Deviation (SD)	KR-20*	SEM**
CARS & STARS Treatment Group				
SAT-10	76%	7.59	.89	2.5
CARS	58%	11.47	.91	3.4
Control Group				
SAT-10	68%	7.05	.85	2.7
CARS	51%	11.44	.92	3.2

*Reliabilities were calculated using the Kuder-Richardson Formula 20 (KR-20). KR-20, first published in 1937, is a measure of internal consistency reliability for measures with dichotomous choices.

**SEM stands for Standard Error of Measurement

Table 3 provides the statistical analysis for the year 7 post test results for both the SAT-10 and CARS assessments. The results show that the reliabilities of the tests were all above .84, indicating the tests provide reliable data for statistical analyses.

Table 3
Year 7 Post Test
SAT-10 and CARS Statistics

Test	Mean % Score	Standard Deviation (SD)	KR-20*	SEM**
SAT-10	62%	7.70	.84	3.1
CARS	42%	11.55	.91	3.5

*Reliabilities were calculated using the Kuder-Richardson Formula 20 (KR-20). KR-20, first published in 1937, is a measure of internal consistency reliability for measures with dichotomous choices.

**SEM stands for Standard Error of Measurement

Data Analyses

The two assessments used for this study included a nationally standardised assessment, the Stanford Achievement Test, Tenth Edition, Abbreviated Version (SAT-10), published by Pearson Assessment. The SAT-10 Primary 2 Level was used with the year 3 students. At year 7, the Intermediate 3 Level was used. The second test was the CARS assessment that is included as part of the CARS & STARS program.

After the teachers administered the tests, the answer documents were returned to ERIA for analysis. Data analyses and descriptive statistics were computed for each of the sets of pretests and post tests. Standard scores provided in the SAT-10 National Norms booklets were used for analyses. For the CARS assessments, standard scores were computed, since standard scores provide a more normal distribution than raw scores.

At year 3, independent sample t-tests were used to compare the post tests of the CARS & STARS treatment group to the control group. Paired sample t-tests were used to compare the pretest and post test scores of the CARS & STARS treatment group using both the SAT-10 and CARS assessment. The ≤.05 level of significance was used as the level at which increases would be considered statistically significant for all of the statistical tests.

At year 7, paired sample t-tests were used to compare the pretest and post test scores using both the SAT-10 and CARS assessment.

For each year level tested, the total matched set of pretest/post test student scores was split into two groups – high and low scorers – based on pretest scores. Paired sample t-tests were used to compare pretest to post test performance to determine if the program is equally effective with lower pretest scorers and higher pretest scorers.

An effect-size analysis was computed for the independent sample t-test at year 3 as well as for each of the paired sample t-tests. Cohen's d statistic was used to determine the effect size. This statistic provides an indication of the strength of the effect of the treatment regardless of the statistical significance. Cohen's d statistic is interpreted as follows:

.2 = small effect

.5 = medium effect

.8 = large effect

Year 3 SAT-10 Assessment Comparisons

CARS & STARS and Control Group

Post test scores on the SAT-10 for the CARS & STARS treatment group and the control group were compared using an independent sample t-test. Table 4 provides the results showing that the CARS & STARS treatment group scored statistically significantly higher than the control group (≤.0001) on the post tests. The effect size was medium.

Table 4
Year 3 CARS & STARS Treatment Group and Control Group
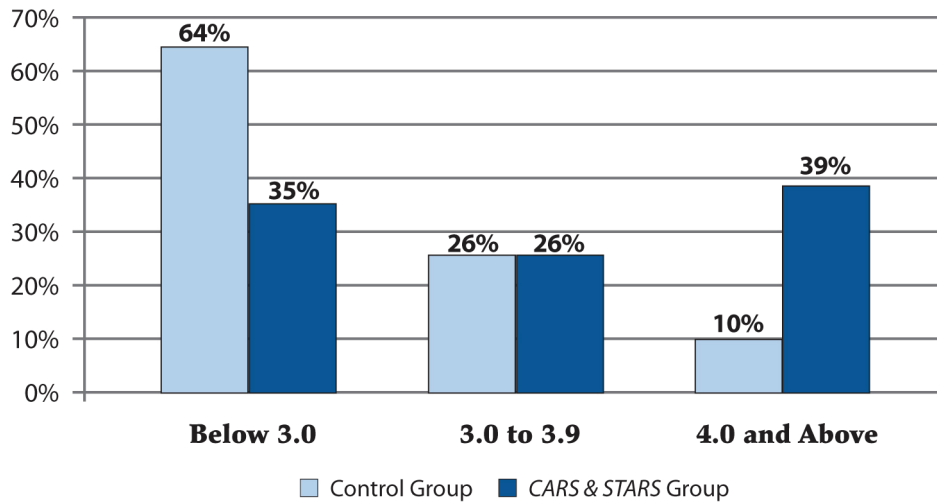**SAT-10 Post Test**
Independent Sample t-Test Comparisons

Group	Number of Students	Mean Standard Score	SD	t-Test	Significance	Effect Size
CARS & STARS	192	608	36.4	4.664	≤.0001	.67
Control	80	586	29.2			

The average year equivalent score from the SAT-10 post test was 3.8 for the CARS & STARS treatment group and 2.7 for the control group. Figure 1 on page 13 provides a comparison of the year equivalent post test scores for the CARS & STARS treatment group and the control group, showing the percentage of students in each group scoring:

- below a year equivalent score of 3.0

- from 3.0 to 3.9

- 4.0 and above

The control group had almost twice as many students scoring below year level when compared to the CARS & STARS treatment group. At the highest category, which included students scoring at a year level of 4.0 or higher, the CARS & STARS treatment group had almost four times as many students as did the control group.

Figure 1
Year 3 CARS & STARS Treatment Group and Control Group
SAT-10 Post Test
Year Equivalent Score Comparisons

CARS & STARS Group Pretest/Post Test Scores

A paired sample t-test was then used to compare the pretest and post test scores for the CARS & STARS treatment group. The SAT-10 mean standard scores were used for the comparison. Table 5 shows that the gain in mean standard score from pretest to post test was statistically significant (≤.0001) and the effect size was medium.

Table 5
Year 3 CARS & STARS Treatment Group
SAT-10 Pretest and Post Test
Paired Sample t-Test Comparisons

Test	Number of Students	Mean Standard Score	SD	t-Test	Significance	Effect Size
Pretest	192	588	38.0	9.701	≤.0001	.51
Post Test	192	608	36.4			

Figure 2 provides a comparison of the year equivalent scores for the CARS & STARS treatment group from pretest to post test. The figure shows the percentage of students in each group scoring:

- below a year equivalent score of 3.0

- from 3.0 to 3.9

- 4.0 and above

More than half of the students scored below 3.0 in the pretest, compared to about a third in the post test. On the other hand, the percentage of students scoring above year level more than doubled from pretest to post test.

Figure 2
Year 3 CARS & STARS Treatment Group
SAT-10 Pretest and Post Test
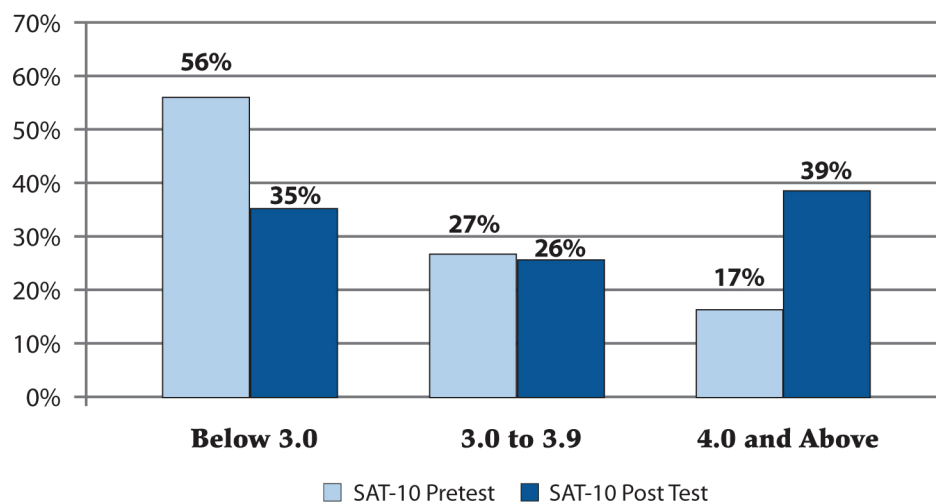**Year Equivalent Score Comparisons**

Figure 3 provides a comparison of the pretest and post test year equivalent scores for the year 3 students. The figure shows that the average year equivalent score on the pretest was 3.0 and the average year equivalent score on the post test was 3.8.

Figure 3
Year 3 CARS & STARS Treatment Group
SAT-10 Pretest and Post Test
Year Equivalent Score Comparisons

Year Equivalent Scores

☐ SAT-10 Pretest ■ SAT-10 Post Test
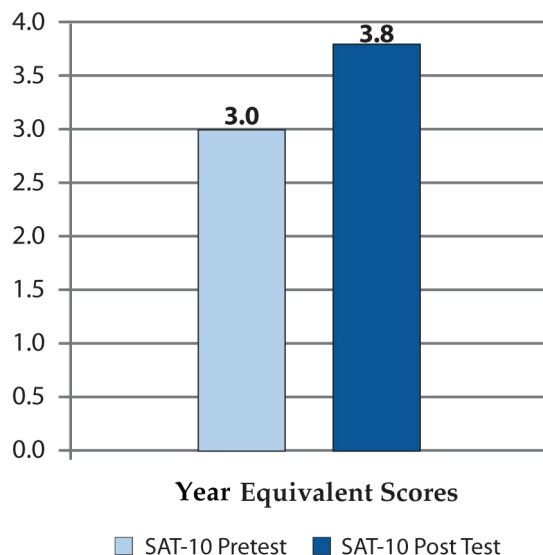
CARS & STARS Lower/Higher Pretest Groups

The final analysis for the SAT-10 results was to compare the students who scored lower on the pretests to those who scored higher on the pretests to determine if the lower scoring students made gains as great as the higher scoring students. The total group of 192 year 3 students in the CARS & STARS treatment group was divided into two equal groups of 96 students based on their pretest scores on the SAT-10 assessment. The lower scoring group had a mean score of 558 and scores ranged from 481 to 592. The higher scoring group had a mean of 619 and their scores ranged from 592 to 681.

A paired sample means t-test was used to compare each group's pretest scores to their post test scores. SAT-10 standard scores were used for the comparison. Table 6 shows that the gain from pretest to post test was statistically significant ($\leq.0001$) for both groups. The effect size for the lower scoring group was large, while the effect size for the higher scoring group was medium.

Table 6
Year 3 CARS & STARS Lower Scoring Group and Higher Scoring Group
SAT-10 Pretest and Post Test
Paired Sample t-Test Comparisons

Group	Number of Students	Mean Standard Score	SD	t-Test	Significance	Effect Size
Lower Scoring Group						
Pretest	96	558	26.6	10.046	≤.0001	.93
Post Test	96	586	33.1			
Higher Scoring Group						
Pretest	96	619	19.0	4.143	≤.0001	.52
Post Test	96	629	25.0			

Figure 4 provides a comparison of the standard score increases for the lower and higher pretest scoring groups. The figure shows that the increase in mean standard scores for the lower scoring group was 28 standard score points, while the increase for the higher scoring group was 10 standard score points. While both groups made statistically significant gains, the lower scoring group increased their total standard score by more than twice that of the higher scoring group. This is reflected by the fact that the lower scoring group had a large effect size, and the effect size for the higher scoring group was medium.

Figure 4
Year 3 CARS & STARS Lower Scoring Group and Higher Scoring Group
SAT-10 Pretest and Post Test
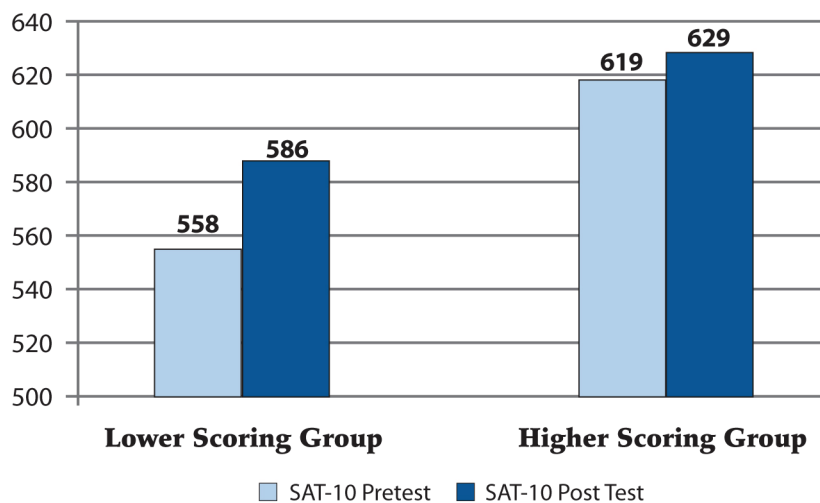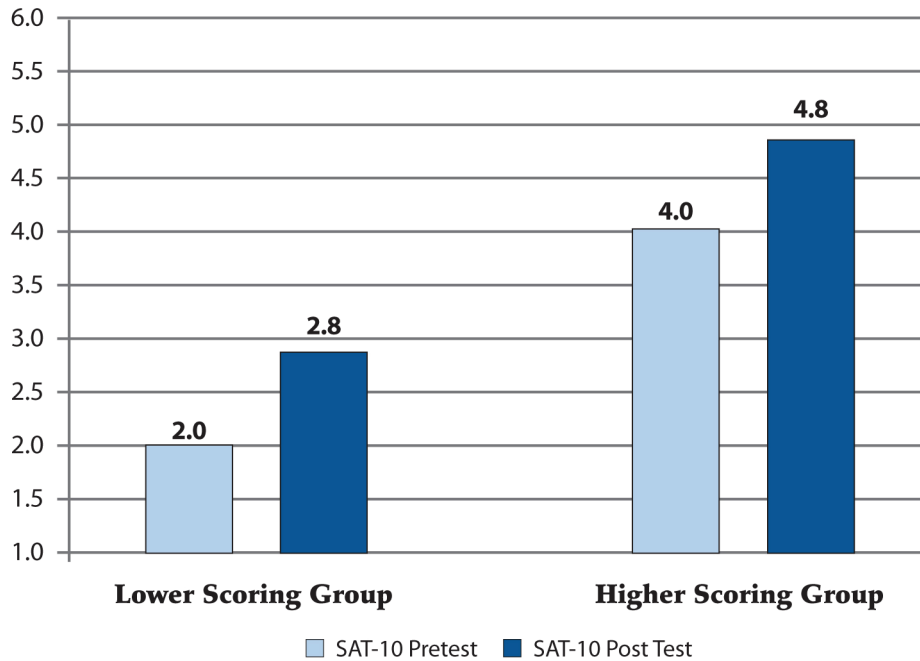**Standard Score Comparisons**

Figure 5 provides a comparison of the pretest and post test year equivalent scores for the year 3 lower and higher scoring students. The figure shows that for the lower scoring group the average year equivalent score on the pretest was 2.0 and the average year equivalent score on the post test was 2.8. For the higher scoring group the pretest average year equivalent score was 4.0 and the post test average year equivalent score was 4.8.

Figure 5
Year 3 CARS & STARS Lower Scoring Group and Higher Scoring Group
SAT-10 Pretest and Post Test
Year Equivalent Score Comparison

Year 3 CARS Assessment Comparisons

CARS & STARS and Control Group

The statistical significance of the difference between the post test mean standard score on the CARS assessment for both the CARS & STARS treatment group and the control group were compared using an independent sample t-test. Table 7 provides the results showing that the CARS & STARS group scored statistically significantly higher than the control group ($\leq$.0001) on the post tests. The effect size was medium.

Table 7
Year 3 CARS & STARS Treatment Group and Control Group
CARS Post Test
Independent Sample t-Test Comparisons

Group	Number of Students	Mean Standard Score	SD	t-Test	Significance	Effect Size
CARS & STARS	185	311	50.8	3.656	$\leq$.0001	.51
Control	84	287	49.2			

CARS & STARS Group Pretest/Post Test Scores

A paired sample means t-test was used to compare the pretest scores for the CARS & STARS group to their post test scores using the CARS assessments. CARS standard scores were used for the comparison. Table 8 shows that the gain from pretest to post test was statistically significant ($\leq$.0001) and the effect size was medium.

Table 8
Year 3 CARS & STARS Treatment Group
CARS Pretest and Post Test
Paired Sample t-Test Comparisons

| Test	Number of Students	Mean Standard Score	SD	t-Test	Significance	Effect Size
Pretest	185	289	46.7	6.948	$\leq$.0001	.51
Post Test	185	311	50.8			

CARS & STARS Lower/Higher Pretest Groups

The final analysis for the CARS assessment results was to compare the students who scored highest on the pretests to those who scored lowest on the pretests. The total group of 185 year 3 students in the CARS & STARS treatment group was divided into two groups – one group of 93 students and another group of 92 students – based on student pretest scores on the CARS assessment. The lower scoring group had a mean standard score of 249 and scores ranged from 179 to 290. The higher scoring group had a mean of 329 and their scores ranged from 294 to 396. A paired sample t-test was used to compare the pretest scores for both groups to their post test scores. Table 9 shows that the gain from pretest to post test for the lower scoring group was statistically significant ($\leq.0001$). The effect size for the lower scoring group was large. For students in the higher scoring group, the increase from pretest to post test was not statistically significant. This non-significance is most likely due to the fact that the CARS & STARS tests are criterion-referenced tests, as the higher scoring group scored very high on the pretests and larger gains were therefore not possible.

Table 9
Year 3 CARS & STARS Lower Scoring Group and Higher Scoring Group
CARS Pretest and Post Test
Paired Sample t-Test Comparisons

Group	Number of Students	Mean Standard Score	SD	t-Test	Significance	Effect Size
Lower Scoring Group						
Pretest	93	249	24.1	8.889	≤.0001	.93
Post Test	93	287	45.7			
Higher Scoring Group						
Pretest	92	329	25.3	1.710	Non-Significant	—
Post Test	92	336	43.2			

Figure 6 provides a comparison of the standard score increases for the lower and higher pretest scoring groups. The figure shows that the increase in mean standard score for the lower scoring group was 38 standard score points, while the increase for the higher scoring group was only 7 standard score points. While both groups made gains, students in the lower scoring group increased their total standard score by more than four times that of the higher scoring group. This is shown by the large effect size for the lower scoring group and the lack of any effect size for the higher scoring group.

Figure 6
Year 3 CARS & STARS Lower Scoring Group and Higher Scoring Group CARS Pretest and Post Test Standard Score Comparisons
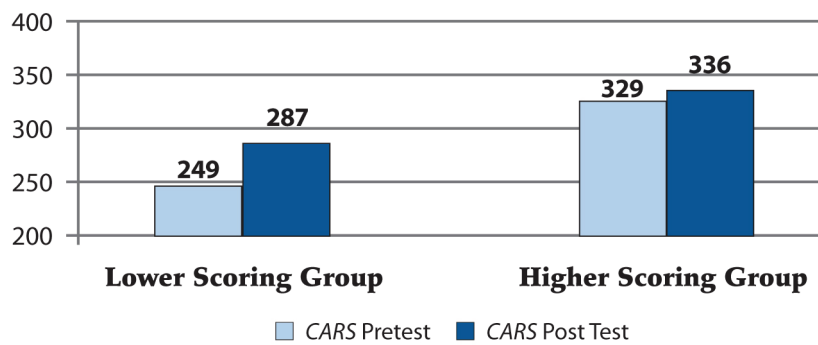
Year 7 SAT-10 Assessment Comparisons

CARS & STARS Group Pretest/Post Test Scores

A paired sample t-test was used to compare the pretest and post test scores for the CARS & STARS treatment group. The SAT-10 mean standard scores were used for the comparison. Table 10 shows that the gain in mean standard score from pretest to post test was statistically significant (≤.0001) and the effect size was large.

Table 10
Year 7 CARS & STARS Treatment Group
SAT-10 Pretest and Post Test
Paired Sample t-Test Comparisons

Test	Number of Students	Mean Standard Score	SD	t-Test	Significance	Effect Size
Pretest	114	626	26.3	10.626	≤.0001	1.07
Post Test	114	654	26.3			

Figure 7 provides a comparison of the percentage of students scoring above and below 70% correct on the SAT-10. On the pretest, 90% of the students scored below 70% correct, and on the post test that dropped to 47%. The percentage of students scoring 70% or higher went from 10% to 53%.

Figure 7
Year 7 CARS & STARS Treatment Group
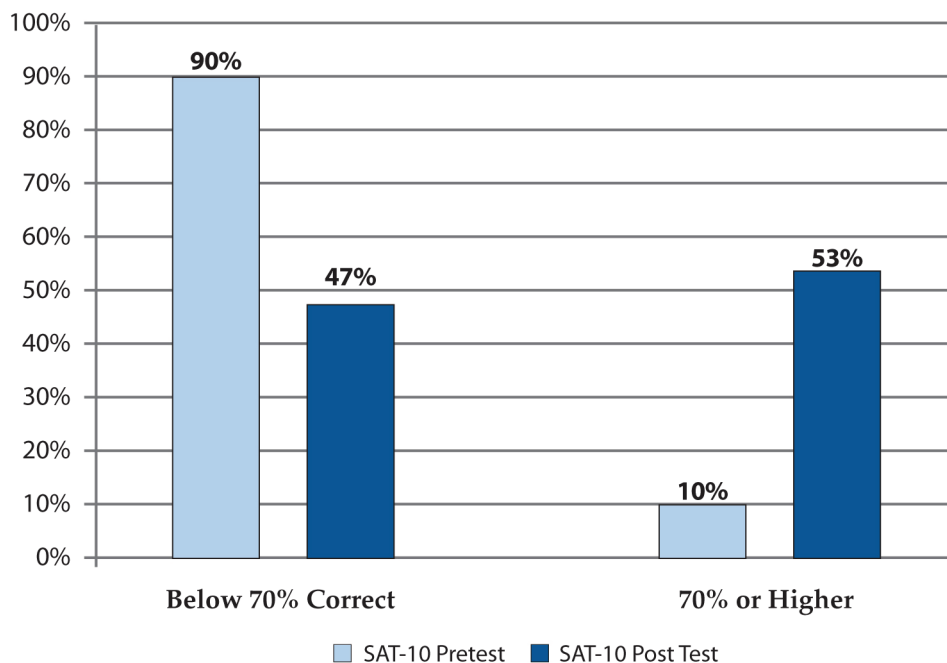**SAT-10 Pretest and Post Test Comparisons**

Figure 8 provides a comparison of the pretest and post test year equivalent scores for the year 7 students. The figure shows that the average year equivalent score on the pretest was 4.6 and the average year equivalent score on the post test was 6.5.

Figure 8
Year 7 CARS & STARS Treatment Group
SAT-10 Pretest and Post Test
Year Equivalent Score Comparisons
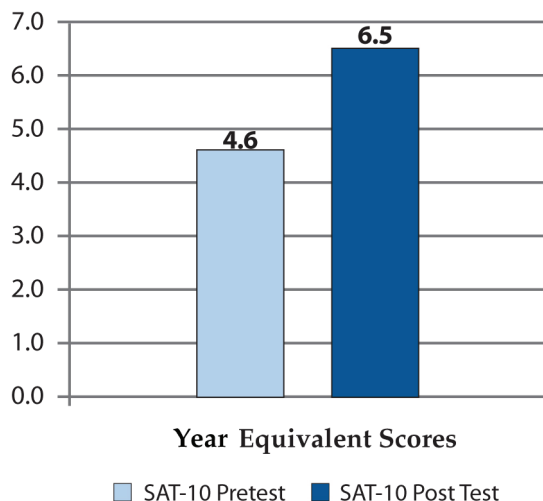
CARS & STARS Lower/Higher Pretest Groups

To determine if lower performing students made increases as great as those of higher performing students, an analysis for the SAT-10 results was conducted to compare the pretest scores to the post test scores for students who scored highest on the pretests and those who scored lowest on the pretests. The total group of 114 year 7 CARS & STARS students was divided into two equal groups of 57 students based on their pretest scores on the SAT-10 assessment. The lower scoring group had a mean score of 606 and scores ranged from 553 to 627. The higher scoring group had a mean score of 646 and their scores ranged from 627 to 683.
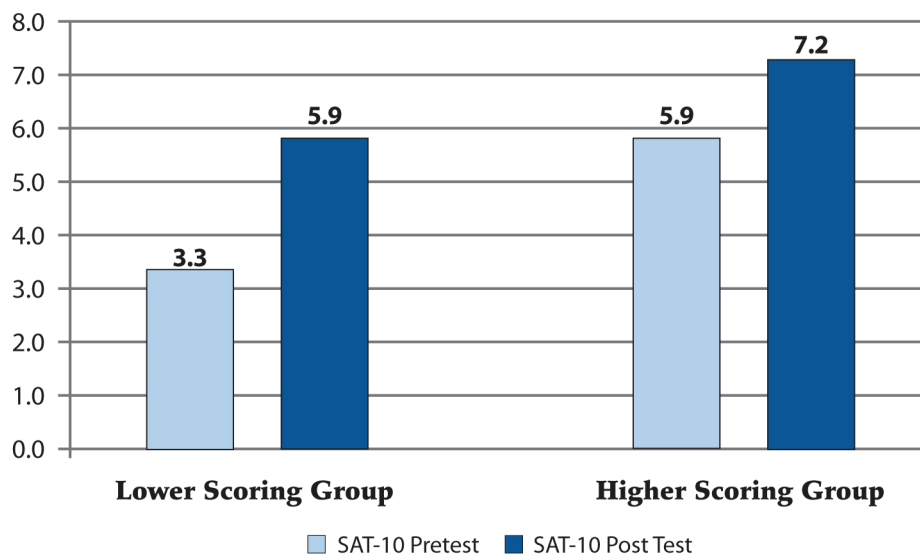
A paired sample t-test was used to compare the pretest scores for both groups to their post test scores. SAT-10 standard scores were used for the comparison. Table 11 on page 23 shows that the gain from pretest to post test was statistically significant ($\leq$.0001). The effect size for both the lower scoring and higher scoring groups was large.

Table 11
Year 7 CARS & STARS Lower Scoring Group and Higher Scoring Group
SAT-10 Pretest and Post Test
Paired Sample t-Test Comparisons

Group	Number of Students	Mean Standard Score	SD	t-Test	Significance	Effect Size
Lower Scoring Group						
Pretest	57	606	19	9.760	≤.0001	1.67
Post Test	57	645	27			
Higher Scoring Group						
Pretest	57	646	14.2	6.049	≤.0001	.92
Post Test	57	663	22.4			

Figure 9 provides a comparison of the pretest and post test year equivalent scores for the year 7 lower and higher scoring students. The figure shows that for the lower scoring group the average year equivalent score on the pretest was 3.3 and the average year equivalent score on the post test was 5.9. For the higher scoring group the pretest average year equivalent score was 5.9 and the post test average year equivalent score was 7.2.

Figure 9
Year 7 CARS & STARS Lower Scoring Group and Higher Scoring Group
SAT-10 Pretest and Post Test
Year Equivalent Score Comparisons

Year 7 CARS Assessment Comparisons

CARS & STARS Group Pretest/Post Test Scores

A paired sample t-test was then used to compare the pretest scores for the CARS & STARS group to their post test scores using the CARS assessment. The sample size was smaller than for the pretest to post test comparison as one teacher was unable to administer the post test due to scheduling problems caused by inclement weather. The total test standard scores were used for the comparison. Table 12 shows that the gain from pretest to post test was statistically significant (≤.0001) and the effect size was large.

Table 12
Year 7 CARS & STARS Treatment Group
CARS Pretest and Post Test
Paired Sample t-Test Comparisons

Test	Number of Students	Mean Standard Score	SD	*t*-Test	Significance	Effect Size
Pretest	79	280	38.5	8.053	≤.0001	.89
Post Test	79	320	52.4			

CARS & STARS Lower/Higher Pretest Groups

The final analysis for the CARS assessment results was to compare the students who scored highest on the pretests to those who scored lowest on the pretests. The total group of 79 year 7 students in the CARS & STARS treatment group was divided into two groups – one group of 39 students and another group of 40 students – based on their pretest scores on the CARS assessment. The lower scoring group had a mean score of 248 and scores ranged from 197 to 267. The higher scoring group had a mean score of 312 and their scores ranged from 272 to 373.

A paired sample t-test was used to compare the pretest scores to post test scores for both groups. Table 13 on page 25 shows that the gain from pretest to post test was statistically significant (≤.0001). The effect size was large for both the lower scoring group and the higher scoring group.

Table 13
Year 7 CARS & STARS Lower Scoring Group and Higher Scoring Group
CARS Pretest and Post Test
Paired Sample t-Test Comparisons

Group	Number of Students	Mean Standard Score	SD	t-Test	Significance	Effect Size
Lower Scoring Group						
Pretest	39	248	14.3	5.694	≤.0001	1.17
Post Test	39	293	51.2			
Higher Scoring Group						
Pretest	40	312	27.4	5.769	≤.0001	1.06
Post Test	40	346	38.5			

Figure 10 provides a comparison of the standard score increases for the lower and higher pretest scoring groups. The figure shows that the increase in mean standard score for the lower scoring group was 45 standard score points, while the increase for the higher scoring group was 35 standard score points. While both groups made statistically significant gains, the lower scoring group increased their total standard score by 10 more standard score points than the higher scoring group.

Figure 10
Year 7 CARS & STARS Lower Scoring Group and Higher Scoring Group
CARS Pretest and Post Test
Standard Score Comparisons

Test	Number of Students	Mean Standard Score	SD	t-Test	Significance	Effect Size
Pretest	114	626	26.3	10.626	≤.0001	1.07
Post Test	114	654	26.3			

Conclusions

The study sought to determine the educational efficacy of a program developed to increase students' reading strategies. The program, entitled Comprehensive Assessment of Reading Strategies and Strategies to Achieve Reading Success, is published in Australia by Hawker Brownlow Publishing and is commonly referred to as CARS & STARS.

Two research questions guided the study:

1. Does the Comprehensive Assessment of Reading Strategies and Strategies to Achieve Reading Success program improve the reading comprehension strategies of students at years 3 and 7?

2. Is the Comprehensive Assessment of Reading Strategies and Strategies to Achieve Reading Success program equally effective in improving the reading comprehension strategies of lower-performing students as well as higher-performing students at years 3 and 7?

Question 1: Does the Comprehensive Assessment of Reading Strategies and Strategies to Achieve Reading Success program improve the reading comprehension strategies of students at years 3 and 7?

Pretest and post test comparisons for the total group of students on both the SAT-10 and CARS assessments were analysed for year 3 and year 7 students. A summary of those results is provided in Tables 14 and 15.

For year 3, Table 14 shows that the pretest/post test differences for both the SAT-10 and CARS assessments were statistically significant when the CARS & STARS treatment group was compared with the control group and when they were compared from pretest to post test. The effect sizes were medium.

For year 7, the results in Table 15 show that the pretest/post test differences on both the SAT-10 and the CARS assessments were statistically significant when the CARS & STARS students were compared from pretest to post test. The effect sizes were large.

Table 14
Summary of Year 3 Comparisons

	Differences Statistically Significant?	Effect Size of Difference
Year 3 —SAT-10 Assessment		
CARS & STARS Treatment Group Pretest to Post Test	Yes	Medium
CARS & STARS Treatment Group Post Test to Control Group Post Test	Yes	Medium
Year 3 —CARS Assessment		
CARS & STARS Treatment Group Pretest to Post Test	Yes	Medium
CARS & STARS Treatment Group Post Test to Control Group Post Test	Yes	Medium

Table 15
Summary of Year 7 Comparisons

	Differences Statistically Significant?	Effect Size of Difference
Year 7 —SAT-10 Assessment		
CARS & STARS Treatment Group Pretest to Post Test	Yes	Large
Year 7 —CARS Assessment		
CARS & STARS Treatment Group Pretest to Post Test	Yes	Large

Question 2: Is the Comprehensive Assessment of Reading Strategies and Strategies to Achieve Reading Success program equally effective in improving the reading comprehension strategies of lower-performing students as well as higher-performing students at years 3 and 7?

Pretest and post test comparisons were analysed for year 3 and year 7 lower and higher pretest scoring students, and a summary of those results is provided in Table 16. The results show that the pretest/post test differences were all statistically significant with the exception of the higher pretest scoring group on the CARS assessments. This may have been the result of the year 3 higher scoring group scoring quite high on the pretests, and as a result there was not as great an opportunity for increasing scores on the post tests because of a ceiling effect on this criterion-referenced test. The effect sizes for all of the statistically significant comparisons were large, with the exception of the year 3 higher scoring group on the SAT-10.

Table 16
Summary of Year 3 and Year 7
Lower Scoring Group and Higher Scoring Group
Pretest and Post Test Comparisons

Students	Differences Statistically Significant?	Effect Size of Difference
Year 3 (Lower Scoring Group)		
SAT-10	Yes	Large
CARS	Yes	Large
Year 3 (Higher Scoring Group)		
SAT-10	Yes	Medium
CARS	No	--
Year 7 (Lower Scoring Group)		
SAT-10	Yes	Large
CARS	Yes	Large
Year 7 (Higher Scoring Group)		
SAT-10	Yes	Large
CARS	Yes	Large

The conclusion, substantiated by the data, is that students using the Comprehensive Assessment of Reading Strategies and Strategies to Achieve Reading Success made significant gains from pretest to post test. These gains can, of course, in part be attributed to other external variables such as classroom instruction.

On the basis of this study, both research questions can be answered positively.

1. The Comprehensive Assessment of Reading Strategies and Strategies to Achieve Reading Success program does improve the reading comprehension strategies of students at years 3 and 7.

2. The Comprehensive Assessment of Reading Strategies and Strategies to Achieve Reading Success program is effective in improving the reading comprehension strategies of both lower-performing students and higher-performing students at years 3 and 7.