THE ALMADINA/READING FOUNDATION DISCOVER READING©

PROJECT

YEAR ONE

(2013-2014 SCHOOL YEAR)

COMPILATION OF RESULTS

PREPARED BY

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EXECUTIVE SUMMARY

The Reading Foundation, a private clinic in Calgary founded by Dr. Steve Truch in 1990. The clinic offers one-to-one remedial programs for students or all ages and also trains teachers in the use of their proprietary programs. The programs are Discover Reading,© Discover Meaning,© Discover Writing,© and Discover Math.™ The clinic primarily provides one-to-one intensive remediation to students of all ages. Very recently two of the clinic's four programs have been programmed to be used on SMART Boards. SMART Board usage allows far greater scalability of the Discover Reading Program; from essentially a one-to-one or small group service to one that could be used in entire classrooms.

The Discover Reading Program (DR) uses teaching methods supported by extensive scientific research on how children should be taught to read. That research was published in The Report of the National Reading Panel in 1999. The Panel was commissioned by US Congress to review the literature on reading instruction and provide recommendations as to how reading should best be taught. The Panel, after conducting the most extensive review of reading research in history, concluded that the teaching of reading should include (1) explicit instruction in phonemic processing (2) explicit instruction in letter/sound connections (3) explicit instruction in decoding and spelling words (4) development of fluency and (5) development of comprehension. The screening battery used at Almadina in last year's (2012-2013) pilot project and again in this year's project, sampled, of practical necessity, only some of these variables.

The first pilot project at Almadina School using DR was conducted in the 2012-2013 school year under the auspices of Merton Palmer. That project showed the DR Program was very effective in helping students with reading difficulties. Teacher aides were trained in DR and worked one-to-one with students over the course of the school year in basic reading and spelling skills. Pre and post-test results showed that all students made strong gains in the core reading processes of phonemic segmenting, phonemic blending and word attack ability. Some of the grade 1, 2 and 3 teachers also used the program in their classrooms with SMART Boards and in most cases, the post-test outcomes appeared to favor the DR classrooms. However, the data from 2012-2013 provided pre and post-test averages only with no statistical analyses.

The pilot project was expanded this school year to include more students, teachers and an expanded pre and post-testing regime as well as statistical analyses. For the 2013-2014 school year, The Reading Foundation provided all teacher training in DR and consistent follow-up support from an experienced consultant to help staff implement the DR Program in the classrooms and with the one-to-one students. The project was given Board approval for a three year expansion in the use of DR at both the elementary and junior high campuses run by the Almadina Society. A *minimum* of 80 hours of instructional time was recommended as a target for use of DR either in the one-to-one setting or in the classroom, with 100 hours being far more preferable. That target, with only a few exceptions, was not met, due in part to its late start in the school year. As a consequence, some of the expected outcomes with DR usage, in terms of post-test results, are only suggestive at this point, rather than definitive.

All 934 students in both Almadina campuses were administered a brief screening battery in early September of 2013. Results of the screening helped identify those students who needed one-to-

one remedial services, which the students (except for those in ECS, who received SMART Board DR only), then received over the course of the school year from the trained teacher aides. What can be stated about the 2013-2014 results is this:

1. The ECS teachers, who used the DR SMART Board Program (on average, for 200 hours per classroom) achieved very strong pre and post-test results. Because of the students' young age, only a few variables could be tested. These students will be followed closely over the next two years to determine if their early reading gains are maintained. It was the observation of the ECS teachers that they had never, in their prior experience, seen so many children reading at such an early point in the school year.

2. Students who received one-to-one assistance from trained DR aides also made very strong gains on all the testing variables even though those students still were well short of the minimum 80 hours of intervention that was recommended. Students who needed DR intervention all had, on average, pre-test scores that were below average. Their post-test scores, on average, all reached the average range. At Mountain View School, 24 students received an average of 46 hours of DR intervention; at Ogden, 58 students received an average of just 21 hours.

3. Direct instruction of important teaching variables using either DR SMART Board in ECS or DR one-to-one intervention clearly demonstrates the power of the DR Program. Because DR was part of the teaching day for all ECS teachers and because they used it so extensively, it is difficult to argue that anything else produced the observed outcomes. In the one-to-one situation, the teaching method was also controlled, since no other intervention methods were being employed by the teacher aides.

4. The classroom teachers who used DR SMART Board as opposed to those who did not, in general showed stronger gains on many, if not most, of the post-test variables, especially Code Knowledge, which is critical. Analyses of variance and covariance (where possible) favored the DR group in every case, but not on every variable.

    The lack of instructional DR time in the classrooms is seen as the most important reason why results for many of the classrooms still remain strongly suggestive at this point, rather than totally definitive, in favor of DR.

5. Also evident is the fact that Almadina teachers in general are strong teachers. The current classroom teaching methods they employ produced significant reading gains, in many cases, for their students over the course of the school year. Classroom observations of those teachers never occurred, so their teaching methods could not be directly compared to the DR methodology. Likely though, they used an eclectic approach. (What was observed incidentally over the course of the school years were students who were practicing oral reading fluency a great deal of the time.)

For next school year, the project will be extended even further and more classroom teachers will be trained and participate in the project. There should be a starting date that is much sooner this coming school year, which will help teachers reach the *minimum* of 80 hours of DR SMART Board instructional time. One-to-one intervention will continue and will include those students from last year who need continued individual intervention and any new students who require it.

Pre and post-testing will again occur but with some modifications to help overcome some of the challenges faced during 2013-2014 in that regard.

Detailed analyses and pre and post-test tables are presented next in the body of this report.

A DESCRIPTION AND SUMMARY OF THE ALMADINA/READING FOUNDATION DISCOVER READING© PROJECT – YEAR ONE (September, 2013 to June, 2014)

The Reading Foundation, directed by psychologist and educator Dr. Steve Truch, is a private clinic in Calgary that was started in 1990. For the last 24 years, the clinic has offered intensive one-to-one interventions for students of all ages in basic reading/spelling; comprehension; written language and math. The programs used at the clinic were all written by Dr. Truch and his staff and are based on research findings for each of the four core literacy areas. The Discover Reading© program was written for teaching basic reading and spelling skills; the Discover Meaning© program was developed to teach comprehension; Discover Math™ for math and Discover Writing© for written expression. In each of the programs, the teaching strategies and processes taught to the students are ones supported by extensive research. For example, The Report of the National Reading Panel, released in 2000, (the most extensive review of reading research ever undertaken) recommended several very specific teaching methods for the teaching of basic reading and spelling skills. All the teaching methods recommended by the Panel (as well as other research-based strategies) are incorporated into the Discover Reading Program, which is the subject of this report.

The one-to-one delivery method used when students come to the clinic for individual help makes the Discover Reading program difficult to implement in the classroom. However, in the last two years, The Reading Foundation began programming the Discover Reading Program into a SMART Board format, so that Discover Reading could be used by Language Arts teachers as a program for all students.

Almadina Charter School aims at providing a quality education to English language learners. Students from over 50 different countries of origin attend this school, which currently has classes from Kindergarten to grade 9 inclusive. The school will expand to cover all high school grades in the near future. Total current enrollment is close to 900 students in two campuses. Students from ECS to grade 3 inclusive attend the Mountain View campus and those from grade 4 to 9 attend the Ogden campus. For the 2013/2014 school year, there were 25 certified teachers at the Mountain View campus, and two of them were new to the school. At the Ogden campus, there were 29 certified teachers, with 9 of them new to the school. Of those 9, 2 teachers with previous experience at Mountain View, transferred to Ogden because the grade 4 classes were transferred to that campus. Overall then, Almadina has a stable teaching group.

Part of the mandate of the Almadina Charter includes forming partnerships and conducting research with appropriate agencies. As a result, last school year (2012-2013), the SMART Board version of the Discover Reading Program was introduced into several elementary classrooms at Almadina and was also used as a remedial program for small group and individual intervention with students who were struggling with reading. That project was supervised by Merton Palmer, an independent consultant hired by Almadina to oversee the project. The pre and post-testing that was conducted was encouraging, though limited in scope. As a result, the Almadina Board approved an expansion of the project to cover the next three school years.

This school year (2013/2014), the program was greatly expanded and the following activities were carried out:

1. Fifteen teachers and teaching assistants were provided with four days of training in the Discover Reading Program near the beginning of the school year by experienced trainers from The Reading Foundation. Whereas last year's project involved one ECS teacher and selected teachers from grades 1 to 3, this year's project involved all three ECS teachers and selected teachers from grades 1 to 7 inclusive. No teachers in grade 8 or 9 were trained in Discover Reading. However, some students in these classrooms still received one-to-one assistance.

2. *All* of the 934 students (877 from grade 1 to 9 and 57 at the ECS level) on both Almadina campuses were administered a brief screening assessment in early September by Dr. Truch, two of his staff and trained assistants from Almadina. The results were scored and tabulated and students were selected for remedial work in Discover Reading based on the screening results and teacher input.

    The aides were first trained in the testing procedures for the TOWRE and the other tests used in this project. Analysis of the pre-test and the post-test data showed no significant differences among testers, indicating a high level of inter-rater reliability. Standard scores were calculated by Dr. Truch and two staff members from the Reading Foundation.

3. Teachers who were trained in SMART Board Discover Reading started implementing the program with all students in their classes. Simultaneously, those students who required individual intervention received it from the trained Educational Assistants at both campuses. Based on the cut-off scores from the testing, approximately 7% of the entire student population at Almadina required individual remedial work and **all** those students received it. (In a few cases, students received remedial help in dyads). Additionally, some students at the Ogden campus had SMART Board Discover Reading incorporated into their English Smart Language (ELO) classes. Some students at the Ogden campus then, had (a) SMART Board Discover Reading in their classrooms (b) SMART Board Discover Reading in their ELO classes and (c) One-to-one Discover Reading remedial work. Students in Mountain View received one-to-one assistance if they needed it (grades 1 to 3) and some classrooms also used Discover Reading SMART Board version in their classrooms.

4. Teachers and trained Educational Assistants received regular consulting support and feedback from an experienced member of The Reading Foundation. Almadina staff was guided as to the appropriate use of the program in both the regular class and with the individual students. This guidance included everything from modeling the lessons in the Discover Reading Program for classroom teachers and educational assistants, to demonstrations on how to "trouble-shoot" for students receiving the one-to-one assistance. There were many challenges for this portion of the project from a scheduling

point of view and other sources. These were dealt with as expeditiously as possible, so in the end, all students got at least some Discover Reading exposure.

5. Post-testing occurred in April at the Ogden campus and late May at the Mountain View campus. The results have now been tabulated and analyzed and are the subject of this report. (Should the project show strong results for use of the Discover Reading Program, then a continuation of it over the next two school years has already been approved.) Over the next two years, more classroom teachers at Almadina will be trained in the SMART Board version of Discover Reading Program and the project will be carried on in large part as in the original proposal, but modified to some extent at both campuses based on experiences gained from the previous years.

As it stands, the partnership project with Almadina and The Reading Foundation is both unique and comprehensive. It follows the "Response to Intervention (RTI) model advocated by reading experts (and enshrined in law in the United States). The RTI model ensures that, first, **all** students are taught to read in the regular classroom using a strong research-based program. Next, **all** students are assessed to determine their reading status and finally from there, **all** students who need additional support and intervention for reading receive it in a timely fashion with the results continuously monitored and evaluated. This model is in stark contrast with the delivery and intervention system that exists in most North American classrooms where systematic screening and interventions of this nature rarely take place.

Achieving the number of instructional hours in SMART Board Discover Reading in each classroom was challenging. The minimum hours recommended per classroom was 80 over the course of the school year. This was not achieved in any of the classrooms or even with the one-to-one delivery, due mainly to the late start in getting the entire project implemented and some reluctance on the part of several teachers to implement the program at all. The main reason for the latter was the purported conflict with expectations for curriculum instruction and time spent on Discover Reading. However, the underlying reason to that resistance was more likely implementing a new and unfamiliar program (fear of failure). In several instances, when the assistant from The Reading Foundation provided classroom modelling, there was greater "buy-in" from the classroom teacher. In the end, the objections were in the minority. Many teachers, over the course of the school year, began to appreciate the value of the Discover Reading Program.

TESTS USED

The assessment tools used for this project were limited, given that screening involved nearly 900 students and a very stringent budget. The tests used were:

1. The Test of Word Reading Efficiency or TOWRE (Torgesen, Wagner, & Rashotte, 1999). This test has two subtests: (1) one where students read a list of real words under timed conditions and (2) one where students read a list of non-words under timed conditions. This is a well-standardized test that is useful in research projects as the scores on the TOWRE correlate well with overall reading, including comprehension. It has been used as a tool to (a) monitor student progress over time and (b) identify students who

require extra assistance for their reading development. The TOWRE was used both ways in this project. The test was normed on American students, but the average standard score for the 900 Almadina students was close to 100, suggesting no difference in the two populations (American vs. Almadina). A standard score of 100 on this test is the 50th percentile and standard scores from 90 (percentile 25) to 110 (percentile 75) are considered to be in the average range. For the statistical analysis for this project, only standard scores were used.

All students who were pre-tested in September who fell below a standard score of 90 on *both* portions of the TOWRE were provided with one-to-one remedial assistance in Discover Reading with an Education Assistant (EA) who had been trained in the program.

The mid-point of the distribution of scores on almost all standardized tests is 100 (percentile 50), which is also the theoretical grade-equivalent line. Standard scores are adjusted by age, so to put these scores in perspective, if a student achieves a standard score of 100 in September and achieves a standard score of 100 in May, that student has *gained* on the test over the course of the year (because it has been adjusted for his older age) despite the fact that the standard score itself has remained the same.

2. An informal measure of "code knowledge." Code knowledge is the ability to orally produce the appropriate sound for the letter or combination of letters presented to the student. For example, if the student is shown the letter "t," he should be able to say /t/. A total of 50 letter and letter combinations were presented to the students. For older students, an additional test of suffix knowledge was also used. Students were asked to produce the syllables for 11 different suffix endings. The code knowledge score was calculated as a percentage, except for the suffix endings, which were calculated as number correct out of 11.

    Code knowledge is an important component of efficient word identification and spelling. As recommended in the Report of the National Reading Panel, explicit knowledge of letters and sounds needs to be taught to students of any age, if they lack such knowledge. The Discover Reading Program provides students with explicit instruction in the "code," and in different teaching sequences, thus allowing for a high degree of individualization. Students in lower grades are typically taught less complex letter/sound combinations than students in upper grades.

    Expectations of code knowledge differ from grade to grade as follows:

    By end-grade 1 – 70%
    By end-grade 2 – 90%
    By end-grade 3 – 90%+ and knowledge of at least 2 of 11 common suffix endings
    By end-grade 4 – 90%+ and knowledge of at least 4 of 11 common suffix endings
    By end grade 5 – 90%+ and knowledge of at least 6 of 11 common suffix endings
    By end grade 6 – 90%+ and knowledge of at least 6 of 11 common suffix endings
    By end grade 7 – 90%+ and knowledge of at least 7 of 11 common suffix endings

By end grade 8 – 90%+ and knowledge of at least 9 of 11 common suffix endings
By end grade 9 – 90%+ and knowledge of all 11 common suffix endings

It should also be noted that all students in Almadina completed the *easier* version of the Code Knowledge test used at The Reading Foundation. This was done primarily for ease of administration and consistency in scoring. Had the more Advanced Level of the test been used (usually the Advanced Level is administered to students in grade 6 and above) then the results for the Code Knowledge variable in this report would have been lower, likely by a significant amount.

3. Wide Range Achievement Test (WRAT 4) Spelling subtest (Wilkinson, G.S and Robertson, G.J., 2006). This widely used spelling test asks students to spell a list of words that become increasingly difficult. The test is normed so that a standard score of 100 is the 50th percentile and standard scores from 90 (percentile 25) to 110 (percentile 75) are considered as the average range.

This test was administered by classroom teachers. The overall reliability and validity of the spelling outcomes is unknown, and results are presented here as they were found, again for the sake of consistency. All pre and post-test words on the WRAT 4 were scored by classroom teachers and then checked for accuracy by Dr. Truch and other experienced members of his staff. For next year's project, the assessment will be conducted in a different manner in an attempt to control for this year's challenges.

The data for this project were analyzed and tabulated in several ways, each of which will be described and presented sequentially, first for the school as a whole, then grade by grade and then for the students who received one-to-one assistance.

Statistical methods were used to determine if results were significant or not, and a probability level of $p<0.05$ was set as the minimum for each variable. If a result is significant at the $p<0.05$ level, then it means that the probability of getting the differences in average scores between the pre and the post-test is just 5 in 100. That is a low probability and therefore considered "statistically significant." In other words, the results can likely be attributed to the Discover Reading teaching itself and not to other variables such as "maturity" or "regular teaching". This project is however, "quasi-experimental" in nature. There were some control groups in those classrooms where teachers used Discover Reading SMART Board were compared to a "no-treatment" condition of regular classroom instruction. However, there was no random assignment of students to treatment or no treatment conditions and no third control to test Discover Reading against other programs that may have produced similar results.

In all cases, *parametric t-tests* were used to compare the pre and post-test scores. Parametric analysis is very powerful and valid when scores are normally distributed, which was the case for all the Almadina data. On occasion, a non-parametric test was used and in some cases, no analysis at all could be done because the number of students was too small to provide a

meaningful comparison. There were also times where pre and post-test scores were significantly different from each other to begin with, so an *analysis of covariance* was conducted, to determine whether any pre and post-test outcomes remained statistically significant. Such occasions are noted in this report. (An analysis of covariance is not always possible because the data do not meet the homogeneity of regressions assumption.)

Rationale for Tests Used and Test Results

The tests used for this project were chosen to be as parsimonious as possible and still provide some meaningful data. The tests used in this project are part of the battery of tests used at The Reading Foundation clinic whenever a student is referred for an individual assessment.

The tests are chosen to reflect current scientific knowledge on how students best learn to read. According to the results of The Report of the National Reading Panel, which is a summary of the most extensive review of reading research ever undertaken, students must be taught the following skills:

1. Phonemic processing
2. Letter/sound connections
3. Decoding and spelling words
4. Reading fluency
5. Comprehension

In last year's pilot project, the phonemic processing skills of segmenting and blending were tested using the informal measurements from The Discover Reading Program. The pre and post-test results clearly indicated positive changes for students in these variables so they were not assessed as part of this year's project.

Letter and sound connections were not assessed last year so these assessments were included this year. Decoding using the Woodcock Word Attack subtest was measured last year. This year, decoding was measured using a different and well-standardized measurement tool (the TOWRE). Spelling was not measured last year so became part of this year's project. Reading fluency was not measured last year but was measured in part using the two subtests from the TOWRE. Finally, overall reading comprehension was not measured either year because of the practical difficulties in doing so with the entire population of students.

The tests and the sequence presented above reflect the teaching sequence of The Discover Reading Program. Interim assessment at the clinic for students on some of these tests typically occur after 20 hours of one-to-one instruction; 40 hours of remedial work and at the post-testing. Gains after 20 and 40 hours are typically seen sequentially. First, the phonemic variables change rapidly and next, the student's knowledge of letters and sounds changes. Finally, gains in word identification, spelling and overall fluency occur last (though not always so). Comprehension changes typically occur for students but do not surface until the post-test, which takes place after a minimum of 80 hours of remedial work.

Since virtually no students in this year's project reached 80 hours of instruction, then it is unrealistic to expect changes on all variables. However, such changes did occur, often with no instruction in Discover Reading. The teaching methods of teachers not using Discover Reading was never observed. It is possible all the teachers were using appropriate methods or they may have been over-using "sight" words methods. While this produces gains for students on test scores, it may not be the best way to teach students how to read, since the essential element of sounding out a word is bypassed. In the end, the best way to learn to read the English language's words (there are now over 1,000,000 words in the Oxford English Dictionary, which is twice that of any other language) is to learn how 26 visual symbols can be used to represent the 44 sounds of English. This is a very powerful alphabet system, so "learning the code" is the best long-term way for student to learn to read those 1,000,000 words. Additionally, English is a language where the written word provides some clues as to the meaning of the word. Knowledge of prefixes, suffixes and other aspects of English morphology help students to at least get some clues as to the possible meaning of the word. Such in-depth advanced code knowledge is not typically taught in schools, but it has an important and appropriate place, particularly in upper elementary and junior high school, to further develop students' overall reading.

Last year's project clearly showed the Discover Reading Program develops phonemic awareness and basic decoding skills. This year's project clearly shows that "code knowledge" changes with instruction in Discover Reading, more than when such direct instruction is not present. Those results are consistent with clinical experience and the students instructed in Discover Reading. The remaining variables used in the test battery also show changes, with and without Discover Reading, but in many (but not all) cases, the results are greater when Discover Reading is used.

With further instructional hours in Discover Reading more likely in the project for this upcoming school year, then it is very possible that much stronger gains will become apparent.

This year, the project had a form of control group in that some classrooms had teachers using Discover Reading and some did not. However, what was not controlled or possible to know, were the instructional methods used by teachers not trained in Discover Reading. As mentioned previously, there may have been a preponderance of sheer memorization in those classes that could have produced results. This is not to fault the teachers, but simply a confounding variable in this natural-setting project.

RESULTS FOR ALMADINA CAMPUS AS A WHOLE

The first analysis of the data was undertaken with the following rationale: Almadina teachers are experienced and have used similar teaching methods in their classrooms over the years. There is also very little staff turnover, so it would therefore seem reasonable to conclude that no radically new instructional element was used in most classrooms this year apart from Discover Reading (DR) in those classrooms using SMART Board DR and some of the students receiving one-to-one remedial assistance in DR.

It is therefore reasonable to speculate that if direct instruction makes a difference to overall reading, then, the post-test results for the school as a whole could change in a positive direction.

We therefore compared the pre and post-test scores for the entire population of 877 students (Grades 1 to 9) on the two standardized subtests of the TOWRE.

For all the analyses presented in the following tables, * means the probability level is p<0.05 and * means the probability level is p<0.001. A probability value of p<0.05 means one would expect such an outcome by "chance" only 5 times in 100. A p value of p<0.001 means the outcome would occur by "chance" or other factors only 1 time in 1,000. For social science research, a p value of p<0.05 is the generally accepted standard.**
Here are the results:

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ALMADINA CAMPUS AS A WHOLE

N = 877

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	Pre	Post
TOWRE Real Word	102.43	108.47***
TOWRE Nonsense Word	104.49	108.68***

The difference between the pre and post-test averages is highly significant (p<0.001), and would occur by chance less than one in 1,000 times. It is possible then, that the addition of the DR Program into several classrooms as well as providing remedial assistance in DR to students who needed it, made a positive difference to the *overall* outcomes in the school. The change in percentiles from pre to post-testing was percentile 55 to percentile 70 which is another way to illustrate the nature of the positive shift in scores. It is apparent then, that a positive overall change in reading scores occurred for the school as a whole on these two important variables, but it is not possible to be definitive about *why* it occurred since many classrooms showed gains even without DR instruction.

Next, we compared the average scores on the variables for *all* the students, regardless of grade level, who received some form of DR instruction, whether in classrooms via SMART Board or one-to-one, or in option classes, or any of these, versus those who did not. Those results were:

ALL STUDENTS AT BOTH CAMPUSES WHO RECEIVED ANY DR VERSUS THOSE WHO DID NOT (Grades 1-9)

	DR N = 294		No DR N = 583	
	Pre	Post	Pre	Post
Code Knowledge	63.63	79.81***	72.89	76.66***
Suffix endings	1.50	4.72***	2.60	4.21***
Basic Vowels	2.98	3.35***	3.19	2.83 (declined)
TOWRE Real Word	100.27	107.23***	103.52	109.10***
Percentile	50	67	61	73
TOWRE Nonsense	102.79	108.29***	105.35	108.37
Percentile	58	70	64	70
WRAT Spelling	103.12	110.93***	110.23	114.73***

The average number of hours of Discover Reading was 47.38 (classroom and ELO combined), which is well short of the minimum of 80 hours recommended for classroom alone.

These results indicate that both groups made significant gains over the course of the year on most variables. However, the Discover Reading (DR) group made gains in vowel sound knowledge, whereas the No DR group actually *declined* over the course of the school year on this variable.

As well, the starting points were significantly different from each other in several cases, so an analysis of covariance (ANCOVA) was conducted, where possible, to determine if there were any differences between the two groups in one direction or the other.

ANCOVA analysis was not possible, for statistical reasons, for the Code Knowledge test or for WRAT Spelling, but was possible for suffix endings, where the DR group was stronger ($p<0.001$); Basic Vowels, which again favored the DR group ($p<0.001$) and TOWRE Nonsense, favoring the DR group ($p<0.05$). The ANCOVA results for TOWRE Real Word was not significant ($p<0.44$).

The overall results of this analysis favor the DR group.

We next compared *all* the students (Grades 1-9) in both campuses separately who received DR versus those who did not, with the following results:

ALL STUDENTS AT MOUNTAIN VIEW WHO RECEIVED ANY DR VERSUS THOSE
WHO DID NOT (Grades 1-3)

| | DR | | No DR | |
| | N = 108 | | N = 238 | |
	Pre	Post	Pre	Post
Code Knowledge	45.91	72.28***	61.76	71.29***
Basic vowels	2.59	3.49***	2.96	3.12ns
TOWRE Real	97.06	109.29***	102.17	109.96***
Percentile	42	73	55	75
TOWRE Nonsense	101.17	109.37***	102.48	108.61***
Percentile	52	73	55	73
WRAT Spelling	97.46	114.15***	106.74	115.44***

The average number of Discover Reading hours (classroom and ELO combined) was 68.16, which is still short of the minimum of 80 hours recommended for classroom alone.

All students in both groups made significant gains over the course of the school year. The starting point for the DR students was typically lower, but they either surpassed or matched the post-test scores of the No DR group, suggesting strongly that DR made the difference.

An analysis of covariance showed more favorable results for the DR group on Basic Code ($p < 0.001$); Basic vowels ($p < 0.001$) and TOWRE Real ($p < 0.05$). A significant difference was not found for TOWRE Nonsense ($p < 0.33$) and an ANCOVA was not possible, for statistical reasons, on WRAT Spelling.

The overall results of this analysis favor the DR group. Students in the Mountain View campus overall received about twice the number of DR hours of instruction than students at Ogden.

We analyzed all the Ogden students next.

ALL STUDENTS AT OGDEN WHO RECEIVED ANY DR VERSUS THOSE WHO DID
NOT (Grades 4-9)

	DR		No DR	
	N = 186		N = 345	
	Pre	Post	Pre	Post
Code Knowledge	73.92	84.18***	80.57	80.36ns
Basic Vowels	3.20	3.27 ns	3.34	2.63 (score declined)
Suffix endings	1.50	4.72***	3.26	4.98***
TOWRE Real	102.13	106.03***	104.44	108.51***
Percentile	55	66	61	73
TOWRE Nonsense	103.73	107.66***	107.33	109.05*
Percentile	61	70	57	73
WRAT Spelling	106.40	109.06***	112.64	114.24*

The average number of Discover Reading hours (classroom and ELO combined) was just 35.31, which is well short of the minimum 80 hours recommended for classroom alone.

These results indicate that both groups made gains over the course of the school year on most variables with an edge to the DR group on Code knowledge and TOWRE scores. While the gains for Basic Vowels were not significant for the DR group, they were much worse for the No DR group, as their scores declined overall. However, the groups had averages that were different from each other on the pre-tests in several cases.

An analysis of covariance, designed to control for such differences, showed that students in the DR group were stronger in the end on Code Knowledge ($p<0.001$) and Basic Vowels ($p<0.001$) –here the No DR group actually declined on the post-test. ANCOVA's on the remaining variables did not favor either group.

The results of this analysis are completely in line with the expectations of possible results presented earlier. Students who received DR instruction first made gains on variables where such gains would first appear. Although the DR students made significant gains on all the other variables, those gains still did not surpass those of the No DR group, *very* likely due to a lack of instructional time in DR.

Next, we compared the results grade level by grade level of students who received SMART Board DR from their classroom teacher, against those who used their normal instructional methods and no Discover Reading. Keep in mind however, that virtually none of the teachers, except those in ECS, were able to provide the *minimum* 80 hours of instructional time that was recommended.

For grades 1, 2 and 3, further calculations on the Code Knowledge test are presented classroom by classroom, comparing DR classrooms with No DR classrooms. Because Code Knowledge is a

fundamental building block for good decoding and spelling, this analysis provides more insight into its delivery in those classrooms that used DR and those that did not.

Keeping track of the instructional hours of each teacher was a challenge, so the reported hours should be seen as approximations.

MOUNTAIN VIEW SCHOOL (DR classrooms vs No DR classrooms Grade by Grade)

ECS STUDENTS

All three ECS teachers used SMART Board Discover Reading (Beginner Level) with their students. One teacher of the three had used Discover Reading SMART Board in the previous year's pilot project. The other two were new to using the SMART Board DR Program this school year. None of the ECS students received any one-to-one DR assistance.

The average number of DR SMART Board hours was 183.70 across the three classrooms. These instructional hours in DR hours were the most for the DR Program compared to any other grade level or even for students receiving one-to-one DR remedial work. We would therefore expect that overall gains would be strong. They most certainly were, judging by the very positive teacher and parent comments. Unfortunately, only a limited number of variables were used with these young children, so testing data is even more limited for this group.

They were too young to be pre and post-tested on the TOWRE, so results on code knowledge (Kindergarten Level) and WRAT 4 Spelling only are available.

The results for all 57 ECS children were as follows:

	Pre	Post
Code Knowledge	18.39	94.32***
WRAT	93.14	113.44***

The scores are statistically different from each other to a high degree. The probability for these results to have occurred by chance or other factors is $p<0.001$ or about 1 in 1,000. Most likely then, the difference occurred because of DR instruction.

All ECS students as a group made very strong gains on the basic variables needed to become strong readers and spellers. Since a number of variables contribute to reading development, it is possible that some of these students will still require remedial assistance in future years.

Next year, these students will continue in classrooms where DR SMART Board will be used, as all grade 1 teachers will use DR SMART Board.

These students will be followed over the next two years to determine if their initial gains remain and possibly even grow by end-grade 3.

TEACHER BY TEACHER AT ECS LEVEL

(N =18) DR hours = 225.50

	Pre	Post
Code Knowledge	25.78	93.33 ***
WRAT Spelling	96	114 ***

(N=19) DR hours = 158

	Pre	Post
Code Knowledge	19.79	93.26 ***
WRAT Spelling	91	116 ***

(N=20) DR hours = 170.50

	Pre	Post
Code Knowledge	10.4	96.20 ***
WRAT Spelling	93	111 ***

Average Gains in Code Knowledge in ECS

DR Teachers	No DR Teachers
Post minus Pre	
93-26 = 67%	-
93-20 = 73%	-
96-10 = 86%	-

Post-test code knowledge scores are all 90% plus, with 90% as the minimum recommended. All classrooms achieved this as might be expected, given the number of instructional hours. Average *gain* over the school year is 75%.

These results clearly demonstrate the effectiveness of teaching basic letter/sound connections at the ECS level. The average post-test score was 94%. These students clearly responded to the aims of the DR program at the ECS Level.

Based on the positive results from last year's pilot project, the ECS teachers this year and all three ECS teachers embraced DR and made it an integral part of their instructional days. This is

very evident by the number of instructional hours they used the program; the highest number of hours in any of the Almadina classrooms.

Though there is a paucity of data, due to the limited number of variables tested at this age, perhaps the experience of the ECS teachers with DR SMART Board is best expressed by this teacher's words:

"We are all given little pieces of the puzzle on how to teach reading. We do our best and have some success. Taking the training and using the Discover Reading Program made teaching reading so easy and the success has been phenomenal. I have been teaching ECS for many years, and I believe I had developed an excellent program. However, the addition of Discover Reading to my program of instruction has shown me there is a better way and it is not 'hit and miss.' I have never before seen such growth with so many children actually reading so early in the school year."

GRADE 1 STUDENTS (N=126) (Average amount of DR time in the classrooms in grade 1 was 63.5 hours.)

Total number of grade 1 students who received SMART Board DR = 75
Total number of grade 1 students who received regular classroom instruction = 51

	DR		No DR	
	Pre	Post	Pre	Post
Code Knowledge	38.29	66.85***	37.61	56.27***
TOWRE Real Word	94.33	106.11***	92.35	102.12***
Percentile	35	66	29	55
TOWRE Nonsense	101.12	109.64***	98.71	102.92*
Percentile	52	75	48	58
WRAT Spelling	94.76	112.49***	97.12	106.90***

All students gained in their scores, on all variables, regardless of whether or not they received DR instruction. However, the difference in average scores between the students who received DR versus those who did not is significant on the post-tests for all variables (ANCOVA's were conducted where pre or post-test scores differed).

Overall then, these results clearly show that using DR in regular grade 1 classrooms provides overall stronger outcomes for the students. Still, the minimum score for Code Knowledge by the end of grade 1 should be 70% which means that more DR instructional hours are needed to achieve that goal.

TEACHER BY TEACHER RESULTS AT GRADE 1

(N =15; DR hours = 0)

	Pre	Post
Code Knowledge	34.93	59.07***
TOWRE Real	93	102***
TOWRE Nonsense	99	100 ns
WRAT Spelling	97	110***

(N = 19; DR hours = 56)

	Pre	Post
Code Knowledge	33.05	62.00***
TOWRE Real	93	105***
TOWRE Nonsense	101	106***
WRAT Spelling	90	108**

(N =19; DR hours = 40)

	Pre	Post
Code Knowledge	47.26	72.84***
TOWRE Real	100	114***
TOWRE Nonsense	104	115***
WRAT Spelling	97	115***

(N = 20; DR hours = 0)

	Pre	Post
Code Knowledge	36.60	53.60***
TOWRE Real	92	98*
TOWRE Nonsense	99	100ns
WRAT Spelling	92	102***

(N =16; DR hours = 0)

	Pre	Post
Code Knowledge	41.38	57.00***
TOWRE Real	93	107***
TOWRE Nonsense	98	109*
WRAT Spelling	104	111***

(N = 20; DR hours = 88)

	Pre	Post
Code Knowledge	35.90	64.50***
TOWRE Real	92	104***
TOWRE Nonsense	99	108***
WRAT Spelling	100	113***

(N =17; DR hours = 69.50)

	Pre	Post
Code Knowledge	36.94	68.35***
TOWRE Real	92	108***
TOWRE Nonsense	100	109***
WRAT Spelling	93	113***

Average Gains in Code Knowledge in Grade 1

DR Teachers	No DR Teachers
Post minus Pre	Post minus Pre
	59-35 = 24%
62-33 = 29%	
73-47 = 26%	
	54-37 = 17%
	57-31 = 26%
65-36 = 29%	
68-37 = 31%	
Average gain = 29%	Average gain = 22%

The Post-test Code Knowledge scores for the DR teachers are all in the 60%+ range, but only one classroom reached the 70% that is considered minimally acceptable. The No DR group post-test scores are all in the 50%+ range and no classroom reached the 70% level.

Obviously, some letter/sound connections are being taught in the No DR classrooms though there appears to still be some advantage for the DR group; which, with more instructional time, should become more obvious. Overall, all grade 1 teachers are to be commended for doing an excellent job with their students.

GRADE 2 STUDENTS (N = 107) (Average amount of DR time in the classrooms in grades 2 was 78.65)

	DR		No DR	
	N = 33		N = 74	
	Pre	Post	Pre	Post
Code Knowledge	63.21	84.61***	62.59	70.59***
TOWRE Real Word	103.27	112.91***	102.73	110.34***
Percentile	58	80	58	75
TOWRE Nonsense	101.27	108.76***	101.86	107.66***
Percentile	52	73	55	70
WRAT Spelling	103.61	117.91***	105.24	117.82***

All students gained in their scores, on all variables, regardless of whether or not they received DR instruction. Those who received DR instruction did, however, show a stronger gain in code knowledge. Gains in code knowledge could result in higher gains in the future for these students on other variables.

The students in the DR group had average scores to begin with that were somewhat higher than the students in the No DR group. However, that difference was not statistically significant (p<0.80) so no further analysis, such as a covariance test, was needed.

TEACHER BY TEACHER RESULTS AT GRADE 2

(N = 19; DR hours = 0)

	Pre	Post
Code Knowledge	64.42	68.42 ns
TOWRE Real	102	108 ns
TOWRE Nonsense	100	106*
WRAT Spelling	103	117***

(N = 17; DR hours = 0)

	Pre	Post
Code Knowledge	60.47	71.65*
TOWRE Real	100	110***
TOWRE Nonsense	101	108*
WRAT Spelling	103	110*

(N = 19; DR hours = 0)

	Pre	Post
Code Knowledge	59.16	67.37 ns
TOWRE Real	105	113***
TOWRE Nonsense	102	107*
WRAT Spelling	108	120***

(N =19; DR hours = 0)

	Pre	Post
Code Knowledge	66.11	75.05*
TOWRE Real	104	110*
TOWRE Nonsense	104	109*
WRAT Spelling	106	122***

(N =17; DR hours = 59.50)

	Pre	Post
Code Knowledge	66.35	88.00***
TOWRE Real	106	117***
TOWRE Nonsense	104	112*
WRAT Spelling	106	118***

(N =16; DR hours = 99)

	Pre	Post
Code Knowledge	59.88	81.00***
TOWRE Real	100	109***
TOWRE Nonsense	99	105*
WRAT Spelling	101	118*

The minimum Code Knowledge score by the end of grade 2 should be 90%.

Average Gains in Code Knowledge in Grade 2

DR Teachers	No DR Teachers
Post minus Pre	Post minus Pre

	68-64 = 4%
	72-60 = 12%
	67-59 = 8%
	75-66 = 9%
88-66 = 22%	
81-60 = 21%	
Average gain = 21.5%	Average gain = 8.25%

The Post-test Code Knowledge scores for the DR two teachers are clearly stronger than for the teachers who did not use the DR Program. By the end of grade 2, students should have Code Knowledge in the 90%+ range. No teacher achieved that level, but certainly the two DR teachers came much closer.

Obviously, some letter/sound connections are being taught in the No DR classrooms though there is much less "code" being taught in those classrooms in grade 2 than in grade 1 and much more being taught if DR is implemented.

Grade 2 scores are generally strong on the other variables for all teachers, which is commendable for the group as a whole.

GRADE 3 STUDENTS

No students at the grade 3 level (N=113) received DR SMART Board classroom instruction, so no analysis was conducted between DR and No DR groups. All students however, gained in their overall scores as follows:

	Pre	Post
Code Knowledge	72.12	78.53***
TOWRE Real Word	106.24	113.26***
Percentile	66	80
TOWRE Nonsense	104.59	111.81***
Percentile	64	79
WRAT Spelling	112.05	117.74***

The minimum Code Knowledge score for end-grade 3 is 90% plus some knowledge of suffix endings. That goal was not attained with regular classroom instruction.

TEACHER BY TEACHER RESULTS AT GRADE 3

(N =19; DR hours = 0)

	Pre	Post
Code Knowledge	74.95	76.63 ns
TOWRE Real	103	109*
TOWRE Nonsense	102	106 ns
WRAT Spelling	112	114 ns

(N =19; DR hours = 0)

	Pre	Post
Code Knowledge	74.11	79.26 ns
TOWRE Real	109	118***
TOWRE Nonsense	108	118***
WRAT Spelling	119	120 ns

(N = 18; DR hours = 0)

	Pre	Post
Code Knowledge	69.78	79.00*
TOWRE Real	105	116***
TOWRE Nonsense	107	113*
WRAT Spelling	112	119***

(N =18; DR hours = 0)

	Pre	Post
Code Knowledge	71.67	80.89*
TOWRE Real	101	108*
TOWRE Nonsense	101	110***
WRAT Spelling	108	112 ns

(N = 20; DR hours = 0)

	Pre	Post
Code Knowledge	72.80	80.40*
TOWRE Real	110	113 ns
TOWRE Nonsense	106	111*
WRAT Spelling	111	120***

(N =19; DR hours = 0)

	Pre	Post
Code Knowledge	69.26	75.05*
TOWRE Real	108	115***
TOWRE Nonsense	103	113***
WRAT Spelling	110	121***

The minimum Code Knowledge score by the end of grade 3 should be 90% plus some knowledge of basic suffix endings (not included in this analysis)

Average Gains in Code Knowledge in Grade 3

DR Teachers   No DR Teachers

Post minus Pre

77-75 = 2%
79-74 = 5%
79-70 = 9%
81-72 = 9%
80-73 = 7%
75-69 = 6%

None of the students in these classrooms achieved a 90% post-test score in Code Knowledge. Overall gains on this variable over the school year were very small, averaging just 6.33%.

There is definitely a case to be made for using the DR Program at the grade 3 level to enhance the student's foundation for subsequent reading and spelling.

Grade 3 scores are still generally strong on the other variables for all six teachers, which is commendable.

OGDEN SCHOOL (DR classrooms vs No DR classrooms Grade by Grade)

Students at this campus received either DR SMART Board in their classrooms, DR SMART Board in their ELO Classes, or both. The total number of DR hours for each homeroom class was combined for these analyses, regardless of their source. Therefore, some of the homerooms did not have any DR SMART Board instruction in class, yet exhibit an average number of DR Program hours as represented in this report. This is because a portion of the students in these homerooms received DR SMART Board instruction in their ELO classes only, ultimately affecting the total number of DR SMART Board hours for each homeroom.

GRADE 4 STUDENTS (N = 95)

Total number of grade 4 students who received SMART Board DR = 58
Total number of grade 4 student who received No DR = 37
Average number of DR hours was 56.14

	DR		No DR	
	Pre	Post	Pre	Post
Code Knowledge	73.55	84.91***	78.22	75.30ns
TOWRE Real Word	106.71	111.10***	108.81	112.95***
Percentile	67	77	73	80
TOWRE Nonsense	107.98	113.00*	110.92	114.43*
Percentile	70	80	77	82
WRAT Spelling	110.52	113.38*	116.30	116.24ns

Significant gains on all variables were made from pre to post-test by the DR students. Significant gains were made on the TOWRE subtests by the non-DR students, but those students did not gain on Code Knowledge (in fact, their post-test scores *declined* from the pre-test) or WRAT Spelling from pre to post-test.

Significant differences between the DR and No DR groups occurred only for Code Knowledge. The minimum Code Knowledge score for grade 4 should be 90% plus some knowledge of suffix endings, which was not achieved in any classroom.

TEACHER BY TEACHER RESULTS AT GRADE 4

(N = 22; DR hours = 75.18)

	Pre	Post
Code Knowledge	75.18	86.45***
TOWRE Real	107	112*
TOWRE Nonsense	109	118***
WRAT Spelling	111	116*

(N =19; DR hours = 10.53)

	Pre	Post
Code Knowledge	69.47	73.21 ns
TOWRE Real	105	110*
TOWRE Nonsense	105	111*
WRAT Spelling	109	109 ns

(N =19; DR hours = 47.11)

	Pre	Post
Code Knowledge	75.68	86.53*
TOWRE Real	108	115***
TOWRE Nonsense	112	112 ns
WRAT Spelling	114	116 ns

(N =18; DR hours = 5.11)

	Pre	Post
Code Knowledge	79.44	81.67 ns
TOWRE Real	109	111 ns
TOWRE Nonsense	111	115*
WRAT Spelling	116	114 ns (score declined)

(N = 17; DR hours = 5.35)

	Pre	Post
Code Knowledge	77.53	76.71 ns (score declined)
TOWRE Real	110	112 ns
TOWRE Nonsense	109	111 ns
WRAT Spelling	114	117 ns

All classrooms in grade 4 had an average of at least some DR Program hours (either from classroom instruction or ELO instruction), but there were very minimal DR hours in three classrooms. Their scores are compared to the two teachers who made more instructional use of the DR Program.

The minimum Code Knowledge score by the end of grade 4 should be 90% plus some knowledge of basic suffix endings (not included in this analysis).

Average Gains in Code Knowledge in Grade 4

DR Teachers	No DR/Minimal Teachers	
Post minus Pre	Post minus Pre	
86-75 = 11%		(75 hours)
	73-69 = 4%	(10.5 hours)
87-76 = 11%		(47 hours)
	82-79 = 3%	(5 hours)
	77-78 = -1%	(5 hours)

None of the students in these classrooms achieved a 90% score in Code Knowledge though the two DR classrooms are both close. The average gain for the No DR/Minimal DR group is 2% with one classroom showing a decline over the course of the school year.

There is definitely a case to be made for using the DR Program at the grade 4 level to enhance the student's foundation for subsequent reading and spelling. Suffix endings in particular require more attention at this grade level and are easily taught as part of the DR Program.

Grade 4 scores are still generally strong on the other variables for all five teachers, which is commendable.

GRADE 5 STUDENTS (N = 107)

Total number of grade 5 students who received SMART Board DR = 60
Total number of grade 5 student who received no DR = 47
Average number of DR hours was 41.35

	DR		No DR	
	Pre	Post	Pre	Post
Code Knowledge	72.00	82.67***	79.53	79.57ns
TOWRE Real Word	99.78	102.47*	106.68	110.32*
Percentile	50	55	67	75
TOWRE Nonsense	102.45	106.67***	112.15	113.34ns
Percentile	55	67	74	83
WRAT Spelling	103.78	105.58*	113.15	115.32ns

Significant gains on all variables were made from pre to post-test by the DR students. Significant gains were made on only one TOWRE subtest by the non-DR students. Those students did not gain on Code Knowledge, TOWRE Nonsense or WRAT Spelling from pre to post-test. Note also that the No DR group was much higher on the Pre-test on some of the variables. ANCOVA's on Code Knowledge and TOWRE Real favored the DR group; ANCOVA on TOWRE Nonsense was not significant and an ANCOVA on the WRAT Spelling was not possible for statistical reasons.

The minimum Code Knowledge score for grade 5 should be 90% plus some knowledge of suffix endings.

TEACHER BY TEACHER RESULTS AT GRADE 5

(N =21; DR hours = 5)

	Pre	Post
Code Knowledge	74.95	76.95 ns
TOWRE Real	104	110*
TOWRE Nonsense	108	112*
WRAT Spelling	109	107 ns (score declined)

(N = 22; DR hours = 5.57)

	Pre	Post
Code Knowledge	74.45	79.27 ns
TOWRE Real	102	106*
TOWRE Nonsense	108	111 ns
WRAT Spelling	111	115*

(N = 22; DR hours = 46.30)

	Pre	Post
Code Knowledge	72.00	80.36*
TOWRE Real	103	104 ns
TOWRE Nonsense	104	107 ns
WRAT Spelling	105	107 ns

(N = 22; DR hours = 43.18)

	Pre	Post
Code Knowledge	76.09	87.36***
TOWRE Real	101	103 ns
TOWRE Nonsense	104	110*
WRAT Spelling	105	107 ns

(N = 20; DR hours = 2.63)

	Pre	Post
Code Knowledge	79.40	82.50 ns
TOWRE Real	104	107 ns
TOWRE Nonsense	109	108 ns (score declined)
WRAT Spelling	109	114***

The minimum Code Knowledge score by the end of grade 5 should be 90% plus some further knowledge of basic suffix endings (not included in this analysis). DR teachers are compared to those with No DR or Minimal DR.

Average Gains in Code Knowledge in Grade 5

DR Teachers	No/Minimal DR Teachers	
Post minus Pre	Post minus Pre	
	77-75 = 2%	(5 hours)
	79-74 = 5%	(5.5 hours)
80-72 = 8%		(46 hours)
87-76 = 11%		(43 hours)
	83-79 = 4%	(2.6 hours)
Average gain = 9.5%	Average gain = 3.67%	

None of the students in these classrooms achieved a 90% score in Code Knowledge. Overall gains on this variable over the school year were small for both groups, though stronger in the DR group.

There is definitely a case to be made for using the DR Program at the grade 5 level to enhance the student's foundation for subsequent reading and spelling.

Grade 5 scores are still generally strong on the other variables for all five teachers, which is commendable.

GRADE 6 STUDENTS (N = 99)

Total number of grade 6 students who received SMART Board DR =
31 Total number of grade 6 students who received no DR = 68 Average
number of DR hours was just 12 (in the ELO Class)

	DR		No DR	
	Pre	Post	Pre	Post
Code Knowledge	78.39	81.74ns	79.65	80.32ns
Suffix endings	1.87	5.19***	2.76	4.76***
TOWRE Real Word	101.39	105.19*	103.16	108.87***
Percentile	52	64	58	73
TOWRE Nonsense	103.74	105.94ns	108	110.97*
Percentile	61	66	70	77
WRAT Spelling	107.42	110.9*	110.37	111.31ns

Significant gains on all variables were made from pre to post-test by both the DR students and those not receiving DR. There was no significant post score differences between the two groups on any of the variables, indicating both groups gained about the same over the course of the year. However, with just 12 hours of DR time for the DR group, no significant differences could be expected in the first place.

The minimum Code Knowledge score for grade 6 should be 90% plus some further development of knowledge of suffix endings (not included in this analysis).

TEACHER BY TEACHER RESULTS AT GRADE 6

(N = 25; DR hours = 2.40)

	Pre	Post
Code Knowledge	78.96	79.76 ns
TOWRE Real	102	109*
TOWRE Nonsense	107	110*
WRAT Spelling	107	110*

(N = 24; DR hours = 2.5)

	Pre	Post
Code Knowledge	75.33	77.58 ns
TOWRE Real	106	108 ns
TOWRE Nonsense	109	111 ns
WRAT Spelling	112	108 ns (score declined)

(N = 25; DR hours = 4.8)

	Pre	Post
Code Knowledge	79.92	83.68 ns
TOWRE Real	100	106***
TOWRE Nonsense	104	107*
WRAT Spelling	110	112 ns

(N = 25; DR hours = 5.28)

	Pre	Post
Code Knowledge	82.64	81.92 ns (score declined)
TOWRE Real	102	108***
TOWRE Nonsense	107	109 ns
WRAT Spelling	110	113 ns

The minimum Code Knowledge score by the end of grade 6 should be 90% plus some substantial knowledge of basic suffix endings (not included in this analysis). There were no DR teachers at grade 6 using the DR Program in anything other than a minimal way. Students in grade 6 received cursory instruction in DR through the ELO class.

Average Gains in Code Knowledge in Grade 6

DR Teachers   No/Minimal DR Teachers

                                   Post minus Pre

                                   80-79 = 1%   (2.4 hours)
                                   78-75 = 3%   (2.5 hours)
                                   84-80 = 4%   (4.8 hours)
                                   82-83 = -1%   (5.28 hours)

None of the students in these classrooms achieved a 90% score in Code Knowledge. Overall gains on this variable over the school year were very small, averaging just 1.75%, but instruction in DR was minimal, which suggests very strongly that instruction using DR is needed.

There is definitely a case to be made for using the DR Program at the grade 6 level to enhance the student's foundation for subsequent reading and spelling.

Grade 6 scores are still generally strong for all four teachers on the other variables, which is commendable.

GRADE 7 STUDENTS (N = 89)

Total number of grade 7 students who received SMART Board DR = 37
Total number of grade 7 student who received no DR = 52
Average number of DR hours was just 21.14 hours

	DR		No DR	
	Pre	Post	Pre	Post
Code Knowledge	73.89	87.54***	78.73	79.42ns
Suffixes	2.73	7.51***	3.10	5.27***
TOWRE Real Word	99.38	104.57***	105.37	109.69***
Percentile	48	64	64	75
TOWRE Nonsense	99.11	102.35*	108.46	110.88*
Percentile	48	55	70	77
WRAT Spelling	103.35	106.38*	111.83	115.33*

Significant gains on all variables were made from pre to post-test by the DR students. Significant gains were made on all but one subtest by the No DR students. Note also that the No DR group was much higher on the Pre-tests on all of the variables.

The minimum Code Knowledge score for grade 7 should be 90% plus some furthering knowledge of suffix endings.

TEACHER BY TEACHER RESULTS AT GRADE 7

(N = 22; DR hours = 4.73)

	Pre	Post
Code Knowledge	73.55	81.09*
TOWRE Real	98	103*
TOWRE Nonsense	96	99 ns
WRAT Spelling	106	105 ns (score decreased)

(N = 23; DR hours = 36.26)

	Pre	Post
Code Knowledge	76.87	88.91*
TOWRE Real	102	107*
TOWRE Nonsense	103	106*
WRAT Spelling	108	111*

(N = 21; DR hours = 1.24)

	Pre	Post
Code Knowledge	79.71	80.67 ns
TOWRE Real	106	110*
TOWRE Nonsense	108	110 ns
WRAT Spelling	111	116 ns

(N = 23; DR hours = 2.26)

	Pre	Post
Code Knowledge	76.87	80.26 ns
TOWRE Real	106	110*
TOWRE Nonsense	111	114 ns
WRAT Spelling	109	114*

The minimum Code Knowledge score by the end of grade 7 should be 90% plus extensive knowledge of basic suffix endings (not included in this analysis). In grade 7, only one teacher used the DR Program to any appreciable degree. For the other three, the DR hours were minimal.

Average Gains in Code Knowledge in Grade 7

DR Teacher	No DR Teachers
Post minus Pre	Post minus Pre
	81-74 = 7% (4.7 hours)
89-77 = 12%	(36 hours)
	81-80 = 1% (1.2 hours)
	80-77 = 3% (2.2 hours)

None of the students in these classrooms achieved a 90% score in Code Knowledge. Overall gains on this variable over the school year were very small, averaging just 3.67% for the minimal DR group and 12% for the DR teacher.

There is definitely a case to be made for using the DR Program at the grade 7 level to enhance the student's foundation for subsequent reading and spelling.

Grade 7 scores are still generally strong on the other variables all four teachers, which is commendable.

GRADE 8 AND 9 STUDENTS

No students in these grades received any DR training in their classrooms or in options classes. Pre and post-test analyses were conducted for the grade 8 and 9 students to see if any significant changes occurred over the course of the year on any of the variables.

GRADE 8 STUDENTS (n=79)

Total number of grade 8 students who received SMART Board DR = 0 Average number of DR hours = 0 hours

	Pre	Post
Code Knowledge	82.20	82.85 ns
Suffixes	4.20	5.87***
Basic Vowels	3.27	2.82 (score declined)*
TOWRE Real Word	104.84	107.16*
Percentile	65	67
TOWRE Nonsense	104.99	105.28 ns
Percentile	65	65
WRAT Spelling	111.91	114.65*

Significant gains on TOWRE Real Word and WRAT Spelling occurred. Students also gained significantly on suffix knowledge but still fell well short of the 11 suffix endings they should know by this grade level. Significant gains appear to come from the regular methods of instruction and/or a high degree of repetition and memorization of real words as the TOWRE Nonsense score did not change. Little to no instruction in Code Knowledge occurred during the course of the year as is evident on the Code Knowledge score and the *lower* score ($p<0.05$) on Basic Vowels. However, gains on suffix endings did occur, which is commendable even though weaker than the ideal score of 11/11.

GRADE 9 STUDENTS (N = 62)

Total number of grade 9 students who received SMART Board DR =
0 Average number of DR hours = 0 hours

	Pre	Post
Code Knowledge	83.24	81.65 ns (score declined)
Suffixes	5.06	6.19*
Basic Vowels	3.27	2.79 (score declined)*
TOWRE Real Word	100.27	104.81***
Percentile	50	66
TOWRE Nonsense	102.82	103.76 ns
Percentile	58	61
WRAT Spelling	114.18	114.00 ns (score declined)

As a group, the grade 9 students did not achieve the 90% level of code knowledge that is considered minimally acceptable and despite their significant gains in suffix knowledge, they are still well short of where they should be.

The results of the grade 8 and 9 classes, where no DR instruction occurred at all, suggest that there is still good reason for DR instruction to be added to some of the daily instructional routines in those classrooms.

TEACHER BY TEACHER RESULTS AT GRADE 9

(Grade 8 teacher by teacher analysis was not possible because of the large number of students who switched classes during the school year.)

(N =19; DR hours = 0)

	Pre	Post
Code Knowledge	86.53	82.54 ns (score declined)
TOWRE Real	100.11	106.32*
TOWRE Nonsense	104.42	105.79 ns
WRAT Spelling	114.89	114.05 ns (score declined)

(N = 21; DR hours = 0)

	Pre	Post
Code Knowledge	81.52	83.43 ns
TOWRE Real	101.29	108.14***
TOWRE Nonsense	106.14	108.81 ns
WRAT Spelling	120.43	118.71 ns (score declined)

(N = 22; DR hours = 0)

	Pre	Post
Code Knowledge	82.05	79.18 ns (score declined)
TOWRE Real	99.45	100.32 ns
TOWRE Nonsense	98.27	97.18 ns (score declined)
WRAT Spelling	107.59	109.45 ns

RESULTS FOR STUDENTS RECEIVING ONE-TO-ONE ASSISTANCE

Students were selected for one-to-one remedial work based on TOWRE results (described next) and teacher nomination. In most cases, these two methods were consistent with each other. In terms of TOWRE results, if a student had a standard score of <90 on *both* of the TOWRE subtests, they were selected for one-to-one assistance. These students have neither real word nor phonemic efficiency for their reading and were deemed worse off than students with a standard score of <90 on either subtest. By using this method, about 7% of the entire student body at either campus was selected for intervention. (That number would have been much greater if a cut-off score of <90 on either subtest was used as the criterion.) A total of 58 students at the Ogden campus and 24 students at the Mountain View campus for a grand total of 82 students received one-to-one intervention over the course of the school year. The suggested number of hours each student was to receive one-to-one assistance was 80 hours. However, that target was never achieved due to a number of factors, so the average number of hours of one-to-one across the project was 28 hours. Some of these same students did, however, receive some Discover Reading teaching if their classroom teacher was also using SMART Board Discover Reading and some of the same students also received SMART Board Discover Reading in their ELO class. So, in the best case scenarios, a student requiring one-to-one assistance received perhaps 30 hours of one-to-one; 70 hours of SMART Board Discover Reading in the classroom and an additional 15 hours of SMART Board Discover Reading in their ELO class. This resulted in some redundancy and overlap of instructional hours but in these cases, the extra reinforcement was always needed.

Because statistically significant results were obtained on all variables even with the limited hours over the year, next year's gains should prove even stronger as the program will get an earlier start at both campuses and more instructional hours will be provided to the students.

RESULTS FOR ALL 82 STUDENTS RECEIVING ONE-TO-ONE ASSISTANCE IN DISCOVER READING AT BOTH CAMPUSES

The average amount of one-to-one time at Mountain View in DR = 46 hours.
The average amount of one-to-one time at Ogden in DR = 21 hours

N = 82

	Pre	Post
Code Knowledge	58.88	79.60***
TOWRE Real	88.43	95.44***
Suffix endings	0.87	4.87*** (x/11)
Percentile	21	37
TOWRE Nonsense	88.96	94.87***
Percentile	23	37
WRAT Spelling	92.02	99.79***
Percentile	30	47

All these results are highly significant ($p<0.001$). The probability of getting these results by "chance" or "other factors" is 1 in 1,000. It should also be noted that students' scores on the TOWRE on average went from the 21st percentile (below average) to the 37th percentile (average). A standard score of 90 and above is considered the average range. Strong gains were also made in spelling and knowledge of suffix endings (grades 1 and 2 excluded). There is room for further growth on all the tests, but these results are encouraging.

MOUNTAIN VIEW CAMPUS RESULTS FOR ONE-TO-ONE STUDENTS

(All 24 students) (Average of 46 hours of 1 to 1 hours remedial work)

	Pre	Post
Code Knowledge	41.17	72.92***
TOWRE Real	84.71	98.79***
Percentile	16	48
TOWRE Nonsense	88.00	98.67***
Percentile	21	48
WRAT Spelling	87.33	105.29***
Percentile	19	63

All these results are highly significant ($p<0.001$). The probability of getting these results by "chance" or "other factors" is 1 in 1,000.

The grade by grade scores for Mountain View students receiving one-to-one remedial work are presented next. In some cases, a statistical analysis was not possible because there were too few students in the group.

Grade 1(N = 7)	Pre	Post
Code Knowledge	11.14	62.86 ***
TOWRE Real	90.14	101.71*
TOWRE Nonsense	99.00	105.57 (ns)
WRAT Spelling	85.57	104.29*

All results but TOWRE Nonsense Word Reading are significant (***=p<0.001; *=p<0.05). The lack of significance for TOWRE Nonsense is likely due to the lack of lower basal standard scores on the test itself. The average pre-test raw score for grade 1 was "0", so none of the students could decode any of the nonsense words in the fall. Yet their standard score average in the fall was 99, which is "average" because the norms tables in the TOWRE Manual indicate that raw scores of "0" are simply converted to a standard score of "<98". If there were lower basal standard scores provided by the test publishers, then, the average standard score on the pre-test would certainly not have been "average." The raw score average on the post-test was 10.29, so these students obviously made very significant gains from pre to post-test, which is unfortunately not captured at this grade 1 level, because of the lack of a lower basal standard scores on the test itself.

Grade 2 (N = 8)		
Code Knowledge	51.25	75.25*
TOWRE Real	85.75	99.25*
TOWRE Nonsense	86.38	98.63*
WRAT Spelling	89.88	109.38***

All gains for the grade 2 students were significant to at least the p<0.05 level.

Grade 3 (N = 9)	Pre	Post
Code Knowledge	55.56	78.67*
TOWRE Real	79.56	96.11***
TOWRE Nonsense	80.89	93.33*
WRAT Spelling	86.44	102.44***

All gains for the grade 3 students were significant to at least the p<0.05 level.

OGDEN CAMPUS RESULTS FOR ONE-TO-ONE STUDENTS

(Results for all 58 students) (Average of 21 hours of remedial time only)

TOTAL FOR OGDEN CAMPUS (N = 58)

	Pre	Post
Code Knowledge	66.21	82.36***
Suffix endings	0.93	5.47 (x/11)***
TOWRE Real	89.97	94.05***
Percentile	23	35
TOWRE Nonsense	89.36	93.29*
Percentile	23	32
WRAT Spelling	93.97	97.52*

All these results are significant (p<0.05 or better). The probability of getting these results by "chance" or "other factors" is 1 in 1,000 when p<0.001 and 5 in 100 when p<0.05.

The grade by grade scores for students in Ogden receiving one-to-one remedial work are presented next.

Grade 4 (N = 17)	Pre	Post
Code Knowledge	65.76	82.65***
Suffix Endings	0.59	4.88***
TOWRE Real	93.35	101.29***
TOWRE Nonsense	97.59	104.53*
WRAT Spelling	99.00	104.53*

All gains are statistically significant on all variables.

Grade 5 (N = 12)		
Code Knowledge	60.33	80.83***
Suffixes	0.17	4.08*
TOWRE Real	86.00	86.83 ns
TOWRE Nonsense	86.17	87.33 ns
WRAT Spelling	90.42	95.75*

Gains on TOWRE (both subtests) were not significant for the grade 5 students. Gains on the remaining variables were significant.

Grade 6 (N = 10)	Pre	Post
Code Knowledge	68.40	89.00*
Suffixes	1.50	8.40***
TOWRE Real	90.70	94.10ns
TOWRE Nonsense	90.10	96.00 ns
WRAT Spelling	94.80	96.60 ns

Gains for Code Knowledge and Suffixes were significant. Gains were made on the remaining variables, but none of them reached statistical significance.

Grade 7 (N = 10)	Pre	Post
Code Knowledge	64.40	85.00*
Suffixes	1.20	7.00*
TOWRE Real	87.50	93.00*
TOWRE Nonsense	81.40	87.00ns
WRAT Spelling	86.90	90.60ns

Gains on three variables were significant; gains on two others were not.

Grade 8 (N = 3)

Because of the small number of students in this group, it was not possible to conduct any statistical analyses.

Grade 9 (N = 6)

Because of the small number of students in this group, it was also not possible to conduct any statistical analyses. As well, students received only a minimal amount of DR remediation to begin with (perhaps 5 hours).

OVERALL PROJECT IMPRESSIONS

The overall results of Year 1 of the 3 year research project indicate that use of the Discover Reading Program has a place in regular school instruction and certainly as a remedial tool for students who are showing some weakness in learning how to read or spell.

Direct instruction in letter and sound connections, at least to the depth covered in the DR Program, is rarely done in schools, usually for philosophical reasons. There is however, plenty of evidence showing that instruction in letters and sound connections both in elementary school and upper grades is important information for students and assists with both reading and spelling (Graham and Santangelo, 2014). For example, students in junior high school rarely receive

instruction in prefixes, suffixes and morphology. Such instruction not only is important for basic skills such as spelling and writing, it can also help students glean the meaning of words and therefore can help with word meanings and overall comprehension.

Systematic instruction in letter/sound instruction occurs reasonably well at Almadina School compared to other schools (again, there is no data available to support this claim, but it is the author's clinical impression, based on years of service in many educational settings, that such instruction does not occur, even at Almadina.

Here are the Post-test scores for Code Knowledge at each grade-level:

	1	2	3	4	5	6	7	8	9
DR	67%	85%	--	85%	83%	82%	88%	-	-
No DR	56%	71%	79%	75%	80%	80%	79%	83%	82%

Notice that no grade ever reaches the minimum standard for Code Knowledge (70% by the end of grade 1 and 90% thereafter with growing knowledge of suffix endings in each grade level after that). In fact, in the No DR groups, Code Knowledge ceases to grow appreciably after grade 4, which clearly illustrates the need for more DR instruction from grade 3 forward. Note as well, that the addition of DR instruction starts to move Code Knowledge scores in the right direction.

ANALYSIS BY "HOURS OF INSTRUCTION" IN DISCOVER READING

Gains per hour of instruction becomes a metric whereby instructional gains can be measured. Only Code Knowledge gains per hour are presented here as those gains would be some of the first to be noticed if instruction in the DR Program is having a direct effect. Unfortunately, it was not possible to find a comparable metric with the No DR group since it isn't possible to know how many hours of instruction took place using regular classroom teaching methods.

Keep in mind as well that only a portion of each hour of instruction in DR involves direct instruction in Code Knowledge. The gains all reflect a gain in *percentage score* from pre-test to post-test.

GAINS PER HOURS FOR ALL STUDENTS RECEIVING ONE-TO-ONE ONLY

Students	DR Hours	Pre	Post	% Gain	% Gain Per Hour
All (N=38)	31.45	58.89	77.00	18.11	0.58
MV (N=19)	45.66	48.84	74.21	25.37	0.56
Ogden (N=19)	17.24	68.95	79.79	10.84	0.63

Gains per hour are strong in the one-to-one students. With more instructional hours, students would have been more likely able to achieve the targets for each grade in terms of their knowledge of letter and sound connections.

GAINS PER HOUR FOR STUDENTS RECEIVING DR CLASSROOM ONLY

Students	DR Hours	Pre	Post	% Gain	% Gain Per Hour
All (N=179)	58.90	60.01	77.94	17.93	0.30
MV (N=103)	68.04	47.55	72.49	24.94	0.37
Ogden (N=76)	46.51	76.89	85.33	8.44	0.18

The pace of learning letter/sound connections is much slower in the regular classrooms with DR SMART Board only. This is to be expected given that individual attention cannot occur in the same intensity as the one-to-one. The pace of gain in Ogden is only half that of Mountain View, which is a function of the hours of instruction provide at each campus.

RECOMMENDATIONS FOR YEAR TWO

1. The project should continue as originally proposed for Year Two.
2. More effort needs to be made to have teachers provide at least the minimum hours recommended for the DR Program. Adjustments have already been made to see that this happens. The DR Program will be implemented earlier in the school year and targets set for each month. Delivery at the junior high level will be carried out in the ELO classes.
3. The one-to-one remedial work with students needs to continue. Students who received such instruction in Year One who obviously still need it should be the first priority. After that, a systematic procedure for selecting students for one-to-one work, needs to be developed.

LIMITATIONS OF THIS STUDY

1. This study is quasi-experimental in nature as it occurred in a natural school setting and was intended to meet the needs of Almadina School's charter mandate. It was not intended to be a formal scientific study. To accomplish that, a much larger budget would have been necessary. Nevertheless, some valuable and interesting data collection and analysis was still possible.
2. There were some inconsistencies and confusion in collecting the suffix ending data with students. Because of this, analysis of suffix endings scores was limited in scope.
3. There were several challenges in having teachers implement the Discover Reading Program systematically. This resulted in delays of program instruction, particularly at the

junior high level. Again, changes have been made to bring more instructional time in the program to all students.

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