

**Research Results for AceReader Study
At CFS Elementary School, Lakewood, CO
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**by
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Author Bio

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NCLB compliance in this study

One of the main requirements of NCLB as applied to a Title I grant is creating *randomized controlled* trials that are well designed and implemented. The groups that we will use are based upon pure randomization, such as the toss of a coin, to place students into either the test group or the control group.

Ace Reader Treatment with two samples

An Ace Reader treatment has been given to a group of 23 elementary age students for about 25 to 30 minutes for about 10 to 15 days during a 4 week period. [The fourth and fifth graders averaged about 15 days; the third graders averaged about 10 or 11]. This standard set of reading exercises that they performed is described in the AceReader User's Manual. The purpose of the exercises is to increase reading fluency while preserving the same level of reading comprehension. For both the control group and the test group, a sample of student reading speed was taken near the beginning of the Ace Reader treatment (pre-test) and near the end of the treatment (post-test). Student comprehension was maintained at 75 to 100% throughout the entire test. If a student fell below this level, they were asked to retake the comprehension test until they reached the 75 to 100% level. The students seemed to have no major problems complying with this requirement.

Purpose of the statistical test

The purpose of the statistical test (t-test) described in this report is to compare the means of the two samples when dependent samples have been chosen. These two samples represent the pre-test and the post-test reading scores for both the treatment group and the control group. The treatment and control sample values have no assumed distribution.

Null Hypothesis

We are proposing that the AceReader treatment will improve reading times by at least 40%. Therefore, the research hypothesis is that $H_a: \mu_{diff} \geq 40\%$. The Null hypothesis is $H_0: \mu_{diff} < 40\%$.

Confidence Level

We wanted to be confident at the 97.5% level, so that $\alpha = 0.025$ for a one-tailed test.

Finding the critical value

The degrees of freedom (dof) are $n - 1$, where $n = 23$, so that $dof = 22$. The critical value for a right-tailed test with $\alpha = 0.025$ is 2.074.

The Control Group

The control group was chosen at random at the same time the treatment group was chosen at random. This group followed as close as possible the mandate of the NCLB for control groups, which is to “do whatever the group would do under normal circumstances.” Most of the time, according to the teachers normal preference for these students, the control group sat and read quietly while the other group was performing the AceReader exercises.

Rules for analyzing the data

1. Student must have used AceReader at least 8 times to be in the treatment group.
2. In order to pair pre-test scores with post-test scores, we found the closest match in levels, usually the same level, and no more than one level apart.
3. For the treatment group, we chose an average of 3 at the start and at the finish. When there were only 2 that met the criteria 2, we averaged 2 instead of 3.
4. For the control group, we used the single score for the pretest and a single score for the post test. (This represents all the available data).
5. We discarded any reading speed scores above 1000 as unreasonable scores to consider. Perhaps these one or two rare scores were caused by student.

Here are the statistical results from our 23 students:

N	23	sample size of elementary students treatment group from Christian Fellowship School in Lakewood, CO			
Before	After	Diff	Diff²	Grade	
121	138	17	289	5	

208	328	120	14400	5
80	88	8	64	5
124	240	116	13456	5
101	287	186	34596	5
213	302	89	7921	5
91	118	27	729	5
118	87	-31	961	4
79	217	138	19044	4
103	164	61	3721	4
92	371	279	77841	4
86	158	72	5184	4
89	172	83	6889	4
81	121	40	1600	4
128	324	196	38416	4
94	106	12	144	3
94	103	9	81	3
108	383	275	75625	3
135	117	-18	324	3
92	146	54	2916	3
66	202	136	18496	3
79	73	-6	36	3
87	130	43	1849	3
Total	2469	4375	1906	324582
Mean	107.3478	190.21739		

ΣD 1906 $\Sigma(D^2)$ 324582
 $\Sigma D/n$ 82.9

$(\Sigma D)^2/n$ 157949.4
 S_b 87.0

t-Stat

2.200

pretest mean
107.3478
40% increase
42.93913

t-Stat (observed value - exp value) / std error

critical t p < .025

2.074

We reject the null hypothesis that the difference in the populations is less than 40% of the mean of the pre-test at the 97.5% level of significance.

In these results, the t statistic is to the right of the critical value of 2.074 at 2.20, so we reject the null hypothesis that the difference is less than 40%.

Control Group Data

The data for the sample size of 23 elementary students control group from Christian Fellowship School in Lakewood, CO:

N = 23	Before	After	Diff	Diff ²	Grade
	72	85	13	169	3
	325	159	-166	27556	3
	87	84	-3	9	3
	54	86	32	1024	3
	85	84	-1	1	3
	73	47	-26	676	3
	121	69	-52	2704	3
	65	80	15	225	4
	228	129	-99	9801	4
	94	153	59	3481	4
	35	103	68	4624	4
	138	92	-46	2116	4
	59	49	-10	100	4
	44	47	3	9	4
	127	76	-51	2601	4
	82	142	60	3600	4
	108	62	-46	2116	4
	196	220	24	576	5
	185	130	-55	3025	5
	98	203	105	11025	5
	129	188	59	3481	5
	167	114	-53	2809	5
	85	69	-16	256	5
Total	2657	2471	-186	81984	91
Mean	115.5217	107.4348			
ΣD			186	81984	$\Sigma(D^2)$
$\Sigma D/n$			8.1		
$(\Sigma D)^2/n$			1504.2		pretest mean
S_b			60.5		107.3478
					0% difference
t-Stat			0.641		
t-Stat			(observed value - exp value) / std error		
critical t	p < .025		2.074		

With the test statistic at 0.641 and the critical t statistic at 2.074, we accept the null hypothesis that there is no difference in the control group pre-test mean and the post-test mean at the 97.5% level of significance.

Teacher Perspective

The three teachers involved in the study each informally indicated that this was a worthwhile study and that the students benefited significantly from the use of AceReader. Each of the three teachers had no prior experience with the software. Both students and teachers found the software easy to use.

Student Motivation to Use AceReader

The 23 students were each asked this question: Compared to your other schoolwork, was the AceReader program more fun than most of your schoolwork, about the same as most of your schoolwork, or less fun than most of your schoolwork? Twenty-one of the twenty-three students replied that it was more fun than their other school work. Many of them were very enthusiastic with this response. Two students said that it was about the same as their other schoolwork. No students were in the third category.

Conclusion

The control group showed no positive improvement during the same time period. The measured mean of the pre-test reading speed for the control group was 115. The mean post-test reading speed was 107. Although there is no conclusion that there was a decline in reading speed for the control group, there is no indication of any significant gain such as achieved by the treatment group.

The measured mean of the treatment pre-test reading speed was 107. The mean post-test reading speed was 190. We conclude from this statistical analysis that the AceReader treatment had a positive effect on the students in raising their average speed rates by at least 40% while at the same time maintaining or improving their comprehension at 75% to 100%.