



Marzano Research Laboratory
Powered by Solution Tree

RISC vs. Non-RISC Schools

A Comparison of Student Proficiencies for Reading, Writing, and Mathematics

Prepared by Marzano Research Laboratory

for

Re-Inventing Schools Coalition

April, 2010

MARZANO RESEARCH LABORATORY
www.MarzanoResearch.com
Phone: 812-336-7700 • Fax: 866-308-3135



OUR MISSION

To provide the best research, the most useful actions, and the highest level of services to educators.

OUR VISION

To continuously develop tools that translate high quality educational research into practical applications educators can put to immediate use.

OUR GOAL

To be the place educators go for the latest information and data, synthesized into clear, concise resources that facilitate immediate action.

REPORT AUTHOR

Mark W. Haystead

For citation purposes, please refer to this document as:

Haystead, M.W. (2010). *RISC vs. non-RISC schools: A comparison of student proficiencies for reading, writing, and mathematics*. Englewood, CO: Marzano Research Laboratory.

BUSINESS DEVELOPMENT OFFICE

555 N Morton Street
Bloomington, IN 47404
Phone 888.849.0851
Fax 812.336.7790

RESEARCH CENTER

9000 E Nichols Ave Ste 210
Englewood, CO 80112
Phone 303.766.9199
Fax 303.694.1778

www.MarzanoResearch.com

Table of Contents

Table of Contents	i
Executive Summary	ii
Introduction.....	1
The RISC Model.....	1
Levels of RISC Implementation	2
Data Analysis and Findings	3
RISC vs. Non-RISC	4
Medium-RISC vs. Non-RISC	6
High-RISC vs. Non-RISC.....	8
High-RISC vs. Medium-RISC	9
RISC vs. Non-RISC by School Level.....	11
RISC vs. Non-RISC by State	15
Summary	20
References.....	22

Executive Summary

This report describes the findings for an analysis of data provided by the Re-Inventing Schools Coalition (RISC). A comparison was made between schools at seven districts that employ the RISC model and eight non-RISC districts (hereinafter referred to as RISC and non-RISC schools) on the percentages of students who scored proficient or above on state tests for reading, writing, and mathematics. State-level student testing data available from 2009 for the selected schools and districts was used in the sample data sets.

Selection of Schools and Districts

Schools and districts were selected by RISC for this comparison study based on comparable demographics including urban/rural, ethnicity, and size of student populations within each of three states: Alaska, Colorado, and Florida. In the sole case of the RISC charter school, a comparable urban charter school was selected with similar population size in Alaska.

Determination of the RISC Implementation Level

The RISC Organizational Assessment Tool was used by RISC to monitor and measure implementation of the RISC Model. This tool is based on a continuum that describes specific levels of implementation. The continuum is derived from the Concerns-Based Adoption Model and is broken into 6 key levels:

- Awareness
- Understanding
- 1st Implementation
- Routine
- Refinement
- Replication

For the purpose of this comparison study, schools were categorized by RISC as low, medium, or high implementation. Implementation was defined as being at the following levels of the RISC Organizational Assessment Tool:

- Low implementation – awareness and understanding levels
- Medium implementation – 1st implementation and routine levels
- High implementation – refinement and replication levels

RISC schools and districts are placed on the RISC Organizational Assessment Tool levels using the following methods: RISC On-Site Evaluations, Re-Inventing Schools Implementation Monitoring Survey, and RISC Organizational Assessment Tool self-assessment scores.

Key Findings

Using the statistical software package PASW® Statistics (SPSS, 2009), the number of students who scored proficient or above were compared to the number of students who scored below proficient on state tests for reading, writing, and mathematics at RISC and non-RISC schools. Five RISC and four non-RISC schools had percentages reported for grades 3 to 10, one RISC and one non-RISC school had percentages for grades 3 to 5, one RISC and two non-RISC schools had percentages for grades 7 to 10, and one non-RISC school had percentages for grades 9 to 10. Of the RISC schools, five were classified as medium implementation and two were classified as high implementation. Four separate comparisons were made on aggregate data with respect to the implementation of the RISC model: RISC vs. non-RISC, medium-RISC vs. non-RISC, high-RISC vs. non-RISC, and high-RISC vs. medium-RISC. Two additional comparisons were made, one between RISC and non-RISC schools at the elementary, middle, and high school levels, and one between RISC and non-RISC schools in each of the three states: Alaska, Colorado, and Florida.

The overall findings for the comparison between the number of students who scored proficient or above and the number of students who scored below proficient on state tests for reading, writing, and mathematics favored RISC schools and were statistically significant ($p < .001$):

- Reading (3,955 students)
 - Odds Ratio = 2.339, 95% CI (2.046, 2.673)
 - Risk Ratio = 1.368, 95% CI (1.298, 1.442)
 - Phi Coefficient = .200
- Writing (3,640 students)
 - Odds Ratio = 2.503, 95% CI (2.185, 2.866)
 - Risk Ratio = 1.540, 95% CI (1.439, 1.649)
 - Phi Coefficient = .222
- Mathematics (3,954 students)
 - Odds Ratio = 2.433, 95% CI (2.135, 2.772)
 - Risk Ratio = 1.551, 95% CI (1.448, 1.662)
 - Phi Coefficient = .214

A reasonable inference is that a true difference exists between RISC and non-RISC schools on student proficiencies on state tests for reading, writing, and mathematics.

Introduction

This report describes the findings for an analysis of data provided by the Re-Inventing Schools Coalition (RISC). A comparison was made between schools at seven districts that employ the RISC model and eight non-RISC districts (hereinafter referred to as RISC and non-RISC schools) on the percentages of students who scored proficient or above on state tests for reading, writing, and mathematics.

Schools and districts were selected by RISC for this comparison study based on comparable demographics including urban/rural, ethnicity, and size of student populations within each of three states: Alaska, Colorado, and Florida. In the sole case of the RISC charter school, a comparable urban charter school was selected with similar population size in Alaska. State-level student testing data available from 2009 for the selected schools and districts was used in the sample data sets. Figure 1 reports the number of districts within each state.

Figure 1. Number of RISC and Non-RISC Districts by State

State	RISC	Non-RISC
Alaska	5	6
Colorado	1	1
Florida	1	1
Total	7	8

It should be noted that the data provided by RISC reflects the percentages of students for all schools within five RISC districts (4 in Alaska and 1 in Colorado) and four non-RISC districts (3 in Alaska and 1 in Colorado). The data for the remaining districts reflects the percentages for a single school within each district.

The RISC Model

The Re-Inventing Schools Coalition (RISC) brings communities together to service students regardless of age, ability, or ethnicity. Since its inception RISC has scaled its effort to 15 districts and over 100 schools around the country. The RISC philosophy is implemented through four interrelated elements (see reinventingschools.org for more information):

- **Shared Vision** — the education community speaking as one voice.
- **Standards-Based Design** — the core of RISC’s distinctive approach to the teaching and learning process. Key aspects include:

- A transparent curriculum. The knowledge and skills students must learn as they progress through developmental levels to high school graduation are open and clear to everyone.
- Flexibility. Students are encouraged to move in and out of levels in different content areas, at their own pace.
- Student ownership. Students own, lead, and partner with their teachers in every phase of learning.
- High standards. Students must demonstrate proficient or better knowledge or skill (equivalent to a grade of B or better) in every required standards area.
- **Leadership** — the deliberate focus on developing strong leaders at every level.
- **Continuous Improvement** — RISC’s continuous improvement cycles are focused, systemic and systematic, and create a climate of ongoing refinement and innovation.

Levels of RISC Implementation

The RISC Organizational Assessment Tool was used by RISC to monitor and measure implementation of the RISC Model. This tool is based on a continuum that describes specific levels of implementation. The continuum is derived from the Concerns-Based Adoption Model and is broken into 6 key levels:

- Awareness
- Understanding
- 1st Implementation
- Routine
- Refinement
- Replication

For the purpose of this comparison study, schools were categorized by RISC as low, medium, or high implementation. Implementation was defined as being at the following levels of the RISC Organizational Assessment Tool:

- Low implementation – awareness and understanding levels
- Medium implementation – 1st implementation and routine levels
- High implementation – refinement and replication levels

RISC schools and districts are placed on the RISC Organizational Assessment Tool levels using the following methods: RISC On-Site Evaluations, Re-Inventing Schools Implementation Monitoring Survey, and RISC Organizational Assessment Tool self-assessment scores.

Data Analysis and Findings

Using the statistical software package PASW® Statistics (SPSS, 2009), the number of students who scored proficient or above were compared to the number of students who scored below proficient on state tests for reading, writing, and mathematics at RISC and non-RISC schools. Five RISC and four non-RISC schools had percentages reported for grades 3 to 10, one RISC and one non-RISC school had percentages for grades 3 to 5, one RISC and two non-RISC schools had percentages for grades 7 to 10, and one non-RISC school had percentages for grades 9 to 10. Again, schools were categorized by RISC as low, medium, or high implementation. Five RISC schools were categorized as medium and two were categorized as high; none of the schools were categorized as low. Four separate comparisons were made on aggregate data with respect to the implementation of the RISC model: RISC vs. non-RISC, medium-RISC vs. non-RISC, high-RISC vs. non-RISC, and high-RISC vs. medium-RISC. Two additional comparisons were made, one between RISC and non-RISC schools at the elementary, middle, and high school levels, and one between RISC and non-RISC schools in each of the three states: Alaska, Colorado, and Florida.

Three measures of effect size are utilized in this report—odds ratio, risk ratio, and phi coefficient. The odds and risk ratio effect sizes offer different ways of comparing the likelihood of an event between two distinct groups (i.e., RISC/non-RISC). The odds ratio compares the relative odds of an event in each group while the risk ratio directly compares the probability of an event occurring in each group. For both ratios, a value equal to 1 indicates no relationship between groups (i.e., no difference between groups), a value greater than 1 indicates a positive relationship in favor of the group exposed to a treatment or intervention (i.e., RISC), and a value less than 1 indicates a negative relationship in favor of the group not exposed to a treatment or intervention (i.e., non-RISC). The phi coefficient is a measure of the degree of association, or correlation, between two binary (or dichotomous) variables (i.e., RISC/non-RISC and Proficient/Below Proficient). The closer the phi coefficient is to +/- 1.0, the stronger the correlation between the variables. It should be noted that the phi coefficient is sensitive to the proportion split for each dichotomy (see Lipsey & Wilson, 2001, pp. 60-61).

The odds ratio and risk ratio effect sizes are based on statistical probability. Probability is often expressed as the ratio of the number of actual occurrences to the number of possible occurrences. For example, the probability of rolling a 1 on a six-sided die is $1/6$ or .167. In other words, there is a 17% probability of rolling a 1. Conversely, there is a $5/6$ or 83% probability against rolling a 1. The odds of an event occurring is often expressed as a ratio of two probabilities—the probability of the event occurring to the probability of the event not occurring. Considering the same example, the odds of rolling a 1 are approximately .200 (.167/.833). Therefore, the odds in favor of successfully rolling a 1 are 1 to 5 (one success to five failures). Stated in terms of failure, the odds against rolling a 1 are 5 to 1 (five failures to one success). In other words, rolling a number other than 1 would be five times more likely.

Both the odds ratio and risk ratio effect sizes have a long tradition in biomedical research as mechanisms to examine contributing factors to disease or mortality. Within social science research logistic regression and odds ratios have become more common in recent years (see Osborne, 2006). However, the odds ratio has been criticized as being less intuitive than the risk

ratio and therefore more easily misunderstood and misinterpreted (see Osborne, 2006; Siström & Garvan, 2004; Davies, Cromie, & Tavakoli, 1998). Given the recent increased use of odds ratios in social science research and concerns over misinterpretation, both the odds ratio and risk ratio effect sizes are presented in this report for purposes of comparison. To better understand the interpretation of both effect sizes, Figure 2 displays a contingency table for a fictitious educational program.

Figure 2. 2x2 Contingency Table for Fictitious Educational Program

	Pass	Fail
Program	70	30
No Program	40	60

Considering the fictitious data presented in Figure 2, the odds ratio effect size is calculated by dividing the odds of a student passing an achievement test in the group that received the program by the odds of a student passing in the group that did not receive the program. The odds of passing for students in the program are 7 to 3 in favor of passing, $odds_{(program)} = 2.33 (70/30)$. The odds of passing for students not in the program are 2 to 3 in favor of passing, or 3 to 2 against, $odds_{(no\ program)} = .67 (40/60)$. The odds ratio for this fictitious program is $OR = 2.33/.67 = 3.48$. This odds ratio indicates that the odds of passing for the students in the program were 3.48 times greater than the odds of passing for students not in the program.

Again, the odds ratio effect size is a ratio of two sets of odds and the risk ratio effect size is a ratio of the probabilities for the two groups. The risk ratio is calculated by dividing the probability of a student passing in the group that received the program by the probability of a student passing in the group that did not receive the program. The probability of passing for students in the program is 70/100 or 70%. The probability of passing for students not in the program is 40/100 or 40%. The risk ratio is $RR = .70/.40 = 1.75$. This risk ratio indicates that the probability of students passing the achievement test in the program is 1.75 times higher than for students not in the program. Stated differently, students in the program are 75% more likely to pass the achievement test than students not in the program.

RISC vs. Non-RISC

Figure 3 displays a 2x2 contingency table comparing the total number of students, grades 3 to 10, who scored proficient or above on state tests for reading, writing, and mathematics at RISC and non-RISC schools. Figure 4 shows the odds ratio and risk ratio effect sizes and phi coefficients for reading, writing, and mathematics respectively.

Figure 3. Proficiency Frequencies — RISC vs. Non-RISC

		Proficiency		Total
		Proficient	Below Proficient	
Reading	RISC	1729	655	2384
	Non-RISC	833	738	1571
	Total	2562	1393	3955
Writing	RISC	1383	776	2159
	Non-RISC	616	865	1481
	Total	1999	1641	3640
Mathematics	RISC	1466	917	2383
	Non-RISC	623	948	1571
	Total	2089	1865	3954

Figure 4. Odds Ratios, Risk Ratios, and Phi Coefficients — RISC vs. Non-RISC

		Value	95% Confidence Interval	
			Lower	Upper
Reading N=3955	Odds Ratio	2.339	2.046	2.673
	Risk Ratio	1.368	1.298	1.442
	Phi Coefficient	.200*		
Writing N=3640	Odds Ratio	2.503	2.185	2.866
	Risk Ratio	1.540	1.439	1.649
	Phi Coefficient	.222*		
Mathematics N=3954	Odds Ratio	2.433	2.135	2.772
	Risk Ratio	1.551	1.448	1.662
	Phi Coefficient	.214*		

* - $p < .001$.

The odds ratio effect sizes in Figure 4 are the ratios of the odds of a student scoring proficient or above at a RISC school to the odds of a student scoring proficient or above at a non-RISC school on state tests for reading, writing, and mathematics. The risk ratio effect sizes are the ratios of the probability of a student scoring proficient or above at a RISC school to the probability of a student scoring proficient or above at a non-RISC school.

Figure 4 shows that the odds ratio and risk ratio effect sizes favor RISC schools. The odds ratio effect sizes suggest that the odds of a student scoring proficient or above at RISC schools are 2.3 times larger on state tests for reading, 2.5 times larger on state tests for writing, and 2.4 times larger on state tests for mathematics than the odds of a student scoring proficient or above at non-RISC schools. The risk ratio effect sizes suggest that students at RISC schools are 37% more likely to score proficient or above on state tests for reading, 54% more likely to score proficient or above on state tests for writing, and 54% more likely to score proficient or above on states tests for mathematics than students at non-RISC schools. The column labeled “95% Confidence Interval” contains the 95% confidence interval for the reported odds ratio and risk ratio effect sizes. The reported effect sizes are considered an estimate of the true odds ratio and risk ratio. This interval includes the range of effect sizes in which one can be 95 percent certain the true effect size falls. When the confidence interval does not include 1.00, the effect size is determined to be statistically significant at the .05 level ($p < .05$). In other words, $OR = 1.00$ or $RR = 1.00$ would not be considered a reasonable assumption.

Applying a widely used convention for appraising the magnitude of effect sizes as “small,” “medium,” or “large” (see Cohen 1977, 1988), the phi coefficients for reading, writing, and mathematics could be considered close to medium effects in the social sciences. Additionally, all three correlations are statistically significant at the .001 level ($p < .001$). In other words, there is a statistically significant moderate correlation between proficiency on state tests for reading, writing, and mathematics and implementation of the RISC model.

Medium-RISC vs. Non-RISC

Figure 5 shows a 2x2 contingency table comparing the total number of students, grades 3 to 10, who scored proficient or above on state tests for reading, writing, and mathematics at medium-RISC and non-RISC schools. Figure 6 displays the odds ratio and risk ratio effect sizes and phi coefficients for reading, writing, and mathematics respectively.

Figure 5. Proficiency Frequencies — Medium-RISC vs. Non-RISC

		Proficiency		Total
		Proficient	Below Proficient	
Reading	Medium-RISC	1480	612	2092
	Non-RISC	833	738	1571
	Total	2313	1350	3663
Writing	Medium-RISC	1159	708	1867
	Non-RISC	616	865	1481
	Total	1775	1573	3348
Mathematics	Medium-RISC	1277	814	2091
	Non-RISC	623	948	1571
	Total	1900	1762	3662

Figure 6. Odds Ratios, Risk Ratios, and Phi Coefficients — Medium-RISC vs. Non-RISC

		Value	95% Confidence Interval	
			Lower	Upper
Reading N=3663	Odds Ratio	2.143	1.869	2.456
	Risk Ratio	1.334	1.264	1.408
	Phi Coefficient	.182*		
Writing N=3348	Odds Ratio	2.299	2.000	2.642
	Risk Ratio	1.492	1.392	1.601
	Phi Coefficient	.204*		
Mathematics N=3662	Odds Ratio	2.387	2.088	2.729
	Risk Ratio	1.540	1.436	1.652
	Phi Coefficient	.212*		

* - $p < .001$.

The odds ratio effect sizes in Figure 6 suggest that the odds of a student scoring proficient or above at medium-RISC schools are 2.1 times larger on state tests for reading, 2.3 times larger on state tests for writing, and 2.4 times larger on state tests for mathematics than the odds of a student scoring proficient or above at non-RISC schools. The risk ratio effect sizes suggest that students at medium-RISC schools are 33% more likely to score proficient or above on state tests for reading, 49% more likely to score proficient or above on state tests for writing, and 54% more likely to score proficient or above on states tests for mathematics than students at non-RISC schools. All three phi coefficients are statistically significant at the .001 level ($p < .001$). A statistically significant moderate correlation exists between proficiency on state tests for reading, writing, and mathematics and medium implementation of the RISC model.

High-RISC vs. Non-RISC

Figure 7 depicts a 2x2 contingency table comparing the total number of students, grades 3 to 10, who scored proficient or above on state tests for reading, writing, and mathematics at high-RISC and non-RISC schools. Figure 8 lists the odds ratio and risk ratio effect sizes and phi coefficients for reading, writing, and mathematics respectively.

Figure 7. Proficiency Frequencies — High-RISC vs. Non-RISC

		Proficiency		Total
		Proficient	Below Proficient	
Reading	High-RISC	249	43	292
	Non-RISC	833	738	1571
	Total	1082	781	1863
Writing	High-RISC	224	68	292
	Non-RISC	616	865	1481
	Total	840	933	1773
Mathematics	High-RISC	189	103	292
	Non-RISC	623	948	1571
	Total	812	1051	1863

Figure 8. Odds Ratios, Risk Ratios, and Phi Coefficients — High-RISC vs. Non-RISC

		Value	95% Confidence Interval	
			Lower	Upper
Reading N=1863	Odds Ratio	5.130	3.657	7.197
	Risk Ratio	1.608	1.505	1.719
	Phi Coefficient	.238*		
Writing N=1773	Odds Ratio	4.626	3.460	6.184
	Risk Ratio	1.844	1.690	2.013
	Phi Coefficient	.261*		
Mathematics N=1863	Odds Ratio	2.792	2.152	3.623
	Risk Ratio	1.632	1.470	1.812
	Phi Coefficient	.184*		

* - $p < .001$.

The odds ratio effect sizes suggest that the odds of a student scoring proficient or above at high-RISC schools are 5.1 times larger on state tests for reading, 4.6 times larger on state tests for writing, and 2.8 times larger on state tests for mathematics than the odds of a student scoring proficient or above at non-RISC schools. The risk ratio effect sizes suggest that students at high-RISC schools are 61% more likely to score proficient or above on state tests for reading, 84% more likely to score proficient or above on state tests for writing, and 63% more likely to score proficient or above on states tests for mathematics than students at non-RISC schools. All three phi coefficients are statistically significant at the .001 level ($p < .001$). As was the case with RISC vs. non-RISC and medium-RISC vs. non-RISC, a statistically significant moderate correlation exists between proficiency on state tests for reading, writing, and mathematics and high implementation of the RISC model.

High-RISC vs. Medium-RISC

Figure 9 shows a 2x2 contingency table comparing the total number of students, grades 3 to 10, who scored proficient or above on state tests for reading, writing, and mathematics at high-RISC and medium-RISC schools. Figure 10 displays the odds ratio and risk ratio effect sizes and phi coefficients for reading, writing, and mathematics respectively.

Figure 9. Proficiency Frequencies — High-RISC vs. Medium-RISC

		Proficiency		Total
		Proficient	Below Proficient	
Reading	High-RISC	249	43	292
	Medium-RISC	1480	612	2092
	Total	1729	655	2384
Writing	High-RISC	224	68	292
	Medium-RISC	1159	708	1867
	Total	1383	776	2159
Mathematics	High-RISC	189	103	292
	Medium-RISC	1277	814	2091
	Total	1466	917	2383

Figure 10. Odds Ratios, Risk Ratios, and Phi Coefficients — High-RISC vs. Medium-RISC

		Value	95% Confidence Interval	
			Lower	Upper
Reading N=2384	Odds Ratio	2.395	1.709	3.354
	Risk Ratio	1.205	1.141	1.274
	Phi Coefficient	.107*		
Writing N=2159	Odds Ratio	2.012	1.510	2.681
	Risk Ratio	1.236	1.149	1.329
	Phi Coefficient	.104*		
Mathematics N=2383	Odds Ratio	1.170	.906	1.510
	Risk Ratio	1.060	.967	1.161
	Phi Coefficient	.025		

* - $p < .001$.

The odds ratio effect sizes suggest that the odds of a student scoring proficient or above at high-RISC schools are 2.4 times larger on state tests for reading, 2.0 times larger on state tests for writing, and 1.2 times larger on state tests for mathematics than the odds of a student scoring proficient or above at medium-RISC schools. The risk ratio effect sizes suggest that students at high-RISC schools are 21% more likely to score proficient or above on state tests for reading and 24% more likely to score proficient or above on state tests for writing than students at medium-RISC schools. The risk ratio for mathematics is close to 1.0 indicating that virtually no difference exists between high-RISC and medium-RISC schools. The phi coefficients are statistically significant at the .001 level ($p < .001$) for reading and writing but not mathematics. Therefore, a statistically significant correlation exists between proficiency on state tests for reading and writing and implementation of the RISC model which favors high implementation.

RISC vs. Non-RISC by School Level

Figure 11 displays a 2x2 contingency table comparing the total number of students at the elementary, middle, and high school levels who scored proficient or above on state tests for reading at RISC and non-RISC schools. Figure 12 lists the odds ratio and risk ratio effect sizes and phi coefficients for elementary, middle, and high school.

Figure 11. Proficiency Frequencies — RISC vs. Non-RISC by School Level for Reading

		Proficiency		Total
		Proficient	Below Proficient	
Elementary School	RISC	787	256	1043
	Non-RISC	296	283	579
	Total	1083	539	1622
Middle School	RISC	571	235	806
	Non-RISC	316	269	585
	Total	887	504	1391
High School	RISC	371	164	535
	Non-RISC	221	186	407
	Total	592	350	942

Figure 12. Odds Ratios, Risk Ratios, and Phi Coefficients —RISC vs. Non-RISC by School Level for Reading

		Value	95% Confidence Interval	
			Lower	Upper
Elementary School N=1622	Odds Ratio	2.939	2.369	3.646
	Risk Ratio	1.476	1.353	1.610
	Phi Coefficient	.247*		
Middle School N=1391	Odds Ratio	2.068	1.656	2.584
	Risk Ratio	1.312	1.202	1.431
	Phi Coefficient	.173*		
High School N=942	Odds Ratio	1.904	1.456	2.489
	Risk Ratio	1.277	1.149	1.419
	Phi Coefficient	.154*		

* - $p < .001$.

The odds ratio effect sizes suggest that the odds of a student scoring proficient or above on state tests for reading at RISC schools are 2.9 times larger at the elementary school level, 2.1 times larger at the middle school level, and 1.9 times larger at the high school level than the odds of a student scoring proficient or above at non-RISC schools. The risk ratio effect sizes suggest that students at RISC schools are 48% more likely to score proficient or above at the elementary school level, 31% more likely to score proficient or above at the middle school level, and 28% more likely to score proficient or above at the high school level than students at non-RISC schools. The phi coefficients are statistically significant at the .001 level ($p < .001$) for all three school levels. Therefore, a statistically significant moderate correlation exists between proficiency on state tests for reading at the elementary, middle, and high school levels and implementation of the RISC model.

Figure 13 depicts a 2x2 contingency table comparing the total number of students at the elementary, middle, and high school levels who scored proficient or above on state tests for writing at RISC and non-RISC schools. Figure 14 lists the odds ratio and risk ratio effect sizes and phi coefficients for all three school levels.

Figure 13. Proficiency Frequencies — RISC vs. Non-RISC by School Level for Writing

		Proficiency		Total
		Proficient	Below Proficient	
Elementary School	RISC	557	262	819
	Non-RISC	209	280	489
	Total	766	542	1308
Middle School	RISC	488	318	806
	Non-RISC	246	339	585
	Total	734	657	1391
High School	RISC	338	196	534
	Non-RISC	161	246	407
	Total	499	442	941

Figure 14. Odds Ratios, Risk Ratios, and Phi Coefficients —RISC vs. Non-RISC by School Level for Writing

		Value	95% Confidence Interval	
			Lower	Upper
Elementary School N=1308	Odds Ratio	2.848	2.259	3.591
	Risk Ratio	1.591	1.421	1.781
	Phi Coefficient	.248*		
Middle School N=1391	Odds Ratio	2.115	1.703	2.626
	Risk Ratio	1.440	1.290	1.608
	Phi Coefficient	.183*		
High School N=941	Odds Ratio	2.635	2.021	3.436
	Risk Ratio	1.600	1.396	1.834
	Phi Coefficient	.236*		

* - $p < .001$.

The odds ratio effect sizes suggest that the odds of a student scoring proficient or above on state tests for writing at RISC schools are 2.9 times larger at the elementary school level, 2.1 times larger at the middle school level, and 2.6 times larger at the high school level than the odds of a student scoring proficient or above at non-RISC schools. The risk ratio effect sizes suggest that students at RISC schools are 59% more likely to score proficient or above at the elementary school level, 44% more likely to score proficient or above at the middle school level, and 60% more likely to score proficient or above at the high school level than students at non-RISC schools. The phi coefficients are statistically significant at the .001 level ($p < .001$) for all three school levels. As was the case for reading, a statistically significant moderate correlation exists between proficiency on state tests for writing at the elementary, middle, and high school levels and implementation of the RISC model.

Figure 15 displays a 2x2 contingency table comparing the total number of students at the elementary, middle, and high school levels who scored proficient or above on state tests for mathematics at RISC and non-RISC schools. Figure 16 lists the odds ratio and risk ratio effect sizes and phi coefficients for all three school levels.

Figure 15. Proficiency Frequencies — RISC vs. Non-RISC by School Level for Mathematics

		Proficiency		Total
		Proficient	Below Proficient	
Elementary School	RISC	758	285	1043
	Non-RISC	278	300	578
	Total	1036	585	1621
Middle School	RISC	460	346	806
	Non-RISC	223	362	585
	Total	683	708	1391
High School	RISC	248	286	534
	Non-RISC	122	286	408
	Total	370	572	942

Figure 16. Odds Ratios, Risk Ratios, and Phi Coefficients —RISC vs. Non-RISC by School Level for Mathematics

		Value	95% Confidence Interval	
			Lower	Upper
Elementary School N=1621	Odds Ratio	2.870	2.321	3.550
	Risk Ratio	1.511	1.378	1.657
	Phi Coefficient	.245*		
Middle School N=1391	Odds Ratio	2.158	1.736	2.682
	Risk Ratio	1.497	1.329	1.687
	Phi Coefficient	.187*		
High School N=942	Odds Ratio	2.033	1.549	2.668
	Risk Ratio	1.553	1.305	1.849
	Phi Coefficient	.168*		

* - $p < .001$.

The odds ratio effect sizes suggest that the odds of a student scoring proficient or above on state tests for mathematics at RISC schools are 2.9 times larger at the elementary school level, 2.2 times larger at the middle school level, and 2.0 times larger at the high school level than the odds of a student scoring proficient or above at non-RISC schools. The risk ratio effect sizes suggest that students at RISC schools are 51% more likely to score proficient or above at the elementary school level, 50% more likely to score proficient or above at the middle school level, and 55% more likely to score proficient or above at the high school level than students at non-RISC schools. The phi coefficients are statistically significant at the .001 level ($p < .001$) for all three school levels. As was the case for reading and writing, a statistically significant moderate correlation exists between proficiency on state tests for mathematics at the elementary, middle, and high school levels and implementation of the RISC model.

RISC vs. Non-RISC by State

Figure 17 displays a 2x2 contingency table comparing the total number of students in Alaska, Colorado, and Florida who scored proficient or above on state tests for reading at RISC and non-RISC schools. Figure 18 lists the odds ratio and risk ratio effect sizes and phi coefficients for all three states.

Figure 17. Proficiency Frequencies — RISC vs. Non-RISC by State for Reading

		Proficiency		Total
		Proficient	Below Proficient	
Alaska	RISC	1092	562	1654
	Non-RISC	422	575	997
	Total	1514	1137	2651
Colorado	RISC	339	56	395
	Non-RISC	318	117	435
	Total	657	173	830
Florida	RISC	298	37	335
	Non-RISC	93	46	139
	Total	391	83	474

Figure 18. Odds Ratios, Risk Ratios, and Phi Coefficients —RISC vs. Non-RISC by State for Reading

		Value	95% Confidence Interval	
			Lower	Upper
Alaska N=2651	Odds Ratio	2.648	2.252	3.112
	Risk Ratio	1.560	1.439	1.690
	Phi Coefficient	.232*		
Colorado N=830	Odds Ratio	2.227	1.564	3.171
	Risk Ratio	1.174	1.095	1.259
	Phi Coefficient	.156*		
Florida N=474	Odds Ratio	3.984	2.437	6.512
	Risk Ratio	1.330	1.176	1.503
	Phi Coefficient	.264*		

* - $p < .001$.

The odds ratio effect sizes suggest that the odds of a student scoring proficient or above on state tests for reading are 2.7 times larger at RISC schools in Alaska, 2.2 times larger at RISC schools in Colorado, and 4.0 times larger at the RISC school in Florida than the odds of a student scoring proficient or above at non-RISC schools (please note that Florida data reflects two schools, one RISC and one non-RISC). The risk ratio effect sizes suggest that students are 56% more likely to score proficient or above at RISC schools in Alaska, 17% more likely to score proficient or above at RISC schools in Colorado, and 33% more likely to score proficient or above at the RISC school in Florida than students at non-RISC schools. The phi coefficients are statistically significant at the .001 level ($p < .001$) for all three states. Therefore, a statistically significant moderate correlation exists between proficiency on state tests for reading in Alaska, Colorado, and Florida and implementation of the RISC model.

Figure 19 displays a 2x2 contingency table comparing the total number of students in Alaska, Colorado, and Florida who scored proficient or above on state tests for writing at RISC and non-RISC schools. Figure 20 lists the odds ratio and risk ratio effect sizes and phi coefficients for all three states.

Figure 19. Proficiency Frequencies — RISC vs. Non-RISC by State for Writing

		Proficiency		Total
		Proficient	Below Proficient	
Alaska	RISC	986	667	1653
	Non-RISC	353	643	996
	Total	1339	1310	2649
Colorado	RISC	297	98	395
	Non-RISC	219	216	435
	Total	516	314	830
Florida	RISC	100	11	111
	Non-RISC	44	6	50
	Total	144	17	161

Figure 20. Odds Ratios, Risk Ratios, and Phi Coefficients —RISC vs. Non-RISC by State for Writing

		Value	95% Confidence Interval	
			Lower	Upper
Alaska N=2649	Odds Ratio	2.693	2.288	3.169
	Risk Ratio	1.683	1.534	1.847
	Phi Coefficient	.235*		
Colorado N=830	Odds Ratio	2.989	2.224	4.018
	Risk Ratio	1.493	1.339	1.666
	Phi Coefficient	.256*		
Florida N=161	Odds Ratio	1.240	.431	3.564
	Risk Ratio	1.024	.908	1.154
	Phi Coefficient	.031		

* - $p < .001$.

The odds ratio effect sizes suggest that the odds of a student scoring proficient or above on state tests for writing are 2.7 times larger at RISC schools in Alaska, 3.0 times larger at RISC schools in Colorado, and 1.2 times larger at the RISC school in Florida than the odds of a student scoring proficient or above at non-RISC schools. The risk ratio effect sizes suggest that students are 68% more likely to score proficient or above at RISC schools in Alaska and 49% more likely to score proficient or above at RISC schools in Colorado than students at non-RISC schools. The risk ratio effect size for Florida (RR = 1.024) indicates that no difference exists between RISC and non-RISC schools with respect to proficiency on state tests for writing. The phi coefficients are statistically significant at the .001 level ($p < .001$) for two of the three states. Therefore, a statistically significant moderate correlation exists between proficiency on state tests for writing in Alaska and Colorado and implementation of the RISC model.

Figure 21 displays a 2x2 contingency table comparing the total number of students in Alaska, Colorado, and Florida who scored proficient or above on state tests for mathematics at RISC and non-RISC schools. Figure 22 lists the odds ratio and risk ratio effect sizes and phi coefficients for all three states.

Figure 21. Proficiency Frequencies — RISC vs. Non-RISC by State for Mathematics

		Proficiency		Total
		Proficient	Below Proficient	
Alaska	RISC	889	764	1653
	Non-RISC	319	678	997
	Total	1208	1442	2650
Colorado	RISC	287	108	395
	Non-RISC	205	230	435
	Total	492	338	830
Florida	RISC	290	45	335
	Non-RISC	99	40	139
	Total	389	85	474

Figure 22. Odds Ratios, Risk Ratios, and Phi Coefficients —RISC vs. Non-RISC by State for Mathematics

		Value	95% Confidence Interval	
			Lower	Upper
Alaska N=2650	Odds Ratio	2.473	2.098	2.915
	Risk Ratio	1.681	1.520	1.859
	Phi Coefficient	.212*		
Colorado N=830	Odds Ratio	2.981	2.230	3.987
	Risk Ratio	1.542	1.372	1.732
	Phi Coefficient	.260*		
Florida N=474	Odds Ratio	2.604	1.606	4.221
	Risk Ratio	1.215	1.085	1.362
	Phi Coefficient	.182*		

* - $p < .001$.

The odds ratio effect sizes suggest that the odds of a student scoring proficient or above on state tests for mathematics are 2.5 times larger at RISC schools in Alaska, 3.0 times larger at RISC schools in Colorado, and 2.6 times larger at the RISC school in Florida than the odds of a student scoring proficient or above at non-RISC schools (please note that Florida data reflects two schools, one RISC and one non-RISC). The risk ratio effect sizes suggest that students are 68% more likely to score proficient or above at RISC schools in Alaska, 54% more likely to score proficient or above at RISC schools in Colorado, and 22% more likely to score proficient or above at the RISC school in Florida than students at non-RISC schools. The phi coefficients are statistically significant at the .001 level ($p < .001$) for all three states. Therefore, a statistically significant moderate correlation exists between proficiency on state tests for mathematics in Alaska, Colorado, and Florida and implementation of RISC model.

Summary

When comparisons were made between RISC and non-RISC schools on the number of students who scored proficient or above (grades 3 to 10 combined) on state tests for reading, writing, and mathematics, the odds ratio effect sizes were 2.339 ($N = 3,955$; 95% CI, 2.046 – 2.673), 2.503 ($N = 3,640$; 95% CI, 2.185 – 2.866), and 2.433 ($N = 3,954$; 95% CI, 2.135 – 2.772). The odds ratio effect sizes suggest that for the RISC schools the odds of a student scoring proficient or above were 2.3 times greater on state tests for reading, 2.5 times greater on state tests for writing, and 2.4 times greater on state tests for mathematics than the odds of a student scoring proficient or above at the non-RISC schools. The risk ratio effect sizes were 1.368 ($N = 3,955$; 95% CI, 1.298 – 1.442), 1.540 ($N = 3,640$; 95% CI, 1.439 – 1.649), and 1.551 ($N = 3,954$; 95% CI, 1.448 – 1.662). The risk ratio effect sizes suggest that students at RISC schools are 37% more likely to score proficient or above on state tests for reading, 54% more likely to score proficient or above on state tests for writing, and 55% more likely to score proficient or above on state tests for mathematics than students at non-RISC schools.

When applying Cohen's (1977, 1988) widely used convention for appraising effect sizes, the phi coefficients for reading ($\phi = .200$), writing ($\phi = .222$), and mathematics ($\phi = .214$) might be considered medium effects in the social sciences. All of the correlations were statistically significant at the .001 level ($p < .001$). This level of significance is generally considered highly significant and can be interpreted as an indication that if there were no true difference between the RISC and non-RISC schools (i.e., both groups were identical) there would be less than a 0.1% chance (i.e., less than one time in one thousand) of observing differences as large as those reported. Therefore, the observed differences between RISC and non-RISC schools is unlikely to be a coincidence (i.e., function of random factors). A reasonable inference is that a true difference exists between RISC and non-RISC schools and student proficiencies on state tests for reading, writing, and mathematics.

Additionally, comparisons were made between RISC and non-RISC schools on the number of students who scored proficient or above on state tests for reading, writing, and mathematics at the elementary, middle, and high school levels. The odds ratio effect sizes ranged from 1.904 to

2.939, the risk ratio effect sizes ranged from 1.277 to 1.600, and the phi coefficients ranged from .154 to .248. All of the correlations were statistically significant at the .001 level ($p < .001$).

Finally, comparisons were made between RISC and non-RISC schools on the number of students who scored proficient or above on state tests for reading, writing, and mathematics in Alaska, Colorado, and Florida. The odds ratio effect sizes ranged from 1.240 to 3.984, the risk ratio effect sizes ranged from 1.024 to 1.683, and the phi coefficients ranged from .031 to .264. With the exception of the phi coefficient for Florida on writing, the correlations were statistically significant at the .001 level ($p < .001$).

References

- Cohen, J. (1977). *Statistical power for the behavioral sciences* (Rev. ed.). New York: Academic Press.
- Cohen, J. (1988). *Statistical power for the behavioral sciences* (2nd. ed.). Hillsdale, NJ: Erlbaum.
- Cooper, H. (2009). *Research synthesis and meta-analysis: A step-by-step approach* (4th ed.). Thousand Oaks, CA: SAGE Publications.
- Davies H.T.O., Crombie I.K. & Tavakoli M. (1998). When can odds ratios mislead? *British Medical Journal*, 316, 989-991.
- Lipsey, M. W., & Wilson, D. B. (2001). *Practical meta-analysis*. Thousand Oaks, CA: SAGE Publications.
- Osborne, J.W. (2006). Bringing balance and technical accuracy to reporting odds ratios and the results of logistic regression analysis. *Practical Assessment Research & Evaluation*, 11(7). Available online: <http://pareonline.net/getvn.asp?v=11&n=7>
- Sistrom, C. L., & Garvan, C. W. (2004). Proportions, odds, and risk. *Radiology* 230, 12–19.
- SPSS (2009). *PASW® Statistics* (Version 17.0.2) [computer software]. Chicago, IL: SPSS.
- Valentine, J.C., & Cooper, H. (2003). *Effect size substantive interpretation guidelines: Issues in the interpretation of effect sizes*. Washington, DC: What Works Clearinghouse.