META-ANALYSIS OF THE IMPACT OF AFTER-SCHOOL PROGRAMS ON STUDENTS READING AND MATHEMATICS PERFORMANCE

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The purpose of this study employing meta-analysis was to assess the impact that after-school programs have on reading and mathematics outcomes. The participants in the primary studies were students in Grades K through 8; years 200 through 2009. The study utilized the theory of change as its theoretical basis. This meta-analysis used the effect size as the standard measure. It began with an overall Cohen's *d* of .40 for the impact that after-school programs have on reading and mathematics outcomes, and then proceeded to analyze three moderator variables: subject, time periods, and grade level.

The findings of the meta-analysis, both overall and sub analyses, show that the independent variable, after-school programs, has an impact on the dependent variable, reading and mathematics. The overall results indicated that after-school programs are educationally significant in the areas of reading and mathematics combined. As for the moderator variable, the results for the areas of (a) subject (reading and mathematics), (b) time period (2000-2002, 2003-2005 and 2006-2009), and (c) grade (middle, and middle plus elementary combined), all indicated educationally significant results. The notable exception was the grade moderator, elementary.

This study provides more information for researchers, practitioners and policy makers upon which to make practical research based decisions about after-school programs for the purpose of determining the applicability of such in their educational setting.

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CHAPTER 1

INTRODUCTION

Statement of the Problem

This research focuses on the impact that after-school programs have on reading and mathematics performance. In addition, the study looks for any differences in the impact on reading and mathematics performance during the three periods of time 2000-2002, 2003-2005, and 2006-2009 or by grade level elementary, middle school, or both. School districts across the nation wrestle with what they can do to improve student achievement in these academic areas. Some school districts utilize programs that are planned and coordinated through the school district; while other school districts become partners with members of the local community. These partnerships may be formed with community organizations. In these cases, each partner has something to contribute; agreements are normally entered into by the various partners involved in providing the after-school program, its activities and personnel (Haslam, Allender, Simko, & Reisner, 2008).

After-school programs emphasizing academics have mainly revolved around the areas of reading and mathematics (Miller, 2003; Owens & Vallercamp, 2003; Riggs & Greenberg, 2004; Smith, Roderick, & Degener, 2005; Witt, 2005). In addition, some after-school programs have focused on other areas, both academic and non-academic, such as science, social studies, dance and other activities. This literature review and the meta-analysis focuses on the areas of academics, specifically reading and mathematics. The meta-analysis analyzes data collected from the selected studies that are included in this research. The meta-analysis seeks to answer the research questions presented in this study.

The planning and implementation of after-school programs have been driven by three

major societal concerns. First of all, when many students go home they remain alone for long periods of time after-school, until their parents come home from work. Second, some students need more time to learn the curriculum than other students; as a result, many schools have looked to after-school programs to provide added instructional time for these students. Third, youth crime and victimization tend to be highest during the after-school hours for students (Afterschool Alliance, 2009; Kugler, 2001; Witt, 2005).

Looking at student performance, school principals across the nation have searched for ways to improve student performance in the academic areas of reading and mathematics (Bowman, 2001). This research utilizes the meta-analysis procedure to determine the impact of after-school programs that have components which focus on reading and mathematics performance among students in grades K – 8. After-school programs have been used by school districts around the country as a strategy to help improve students' academic performance in mathematics and reading. Often students in these programs are in need of additional instruction that is not available during the school day (Haslam, Allender, Simko, & Reisner, 2008; Vandell, Reisner & Pierce, 2007).

With the increased focus on after-school programs, there have been few evaluations on the success of the after-school programs (Riggs & Greenberg, 2004; Witt, 2000). The effectiveness of after-school programs has been questioned throughout their existence (Walker & Arbreton, 2004). Researchers have tried to determine if the use of resources for after-school programs are an effective method of improving student performance in reading and mathematics (Britsch, Martin, Stuczynski, Tomala, & Tucci, 2005; Fletcher & Padover, 2003; Halpern, 2002; Hausner, 2000; Hollister, 2003; Little & Harris, 2003; Kane, 2004; Schacter & Jo, 2005; Smith, Roderick, & Degener, 2005; Spielberger & Halpern, 2002). The results from these researchers'

efforts have generated mixed results. Improved student performance in reading and mathematics should lead to improved standardized test scores due to the increase in student fluency and comprehension.

The theoretical framework of the theory of change is used to define the desired outcome for the use of reading and mathematics after-school programs. Carol H. Weiss defined the theory of change approach to evaluation. It was further developed in work *New Approaches to Evaluating Community Initiatives* by Fulbright-Anderson, Kubisch, and Connell (1998). The theory of change identifies the activities, early outcomes, intermediate outcomes and long term goals for after-school programs (Fulbright-Anderson, Kubisch, & Connell, 1998). This coupled with the meta-analysis provides a clear picture of the impact of after-school programs on reading and mathematics outcomes. Table 1 shows some of the key activities and outcomes gathered from the various after-school studies. For example, looking at the early activity column one can see the community's early activities, decision to provide funding for the after-school program.

Table 1

Theory of Change for After-School Programs

	Early Activities	Early Outcomes	Intermediate Outcomes	Long-Term Outcomes
Community	Make decision to provide funding for after-school program.	Monitor program progress and effectiveness.	Monitor program progress and effectiveness.	Tax payers are satisfied with the after-school program.
School	• Determine the type of after-school program needed. • Identify students in need of academic help. • Plan the after- school program. • Source the after- school program curriculum. • Source the after- school program personnel.	• Implement the after-school program. • Monitor student progress through academic outcomes.	• Monitor and adjust after-school program; based on individual needs. • Monitor student progress through measures, such as benchmarks.	• Schools meet state standards. • Schools reach local school district goals.

(table continues)

Table 1 *(continued).*

	Early Activities	Early Outcomes	Intermediate Outcomes	Long-Term Outcomes
Family	Accept opportunity for student to participate in after- school program.	• Monitor student progress. • Provide encouragement to student. • Celebrate student's successes.	• Monitor student progress. • Provide encouragement to student. • Celebrate student's successes.	Parents are satisfied with their child's instruction.
Student	Participate in the after- school program.	Show improvement in academic performance.	Show greater improvement in academic performance than at the start of the program.	• Show significant improvement in reading. • Show significant improvement in mathematics.

Note. Adapted from *New Approaches to Evaluating Community Initiatives*, by K. Fulbright-Anderson, A. C. Kubisch, and J. P. Connell, pp. 24-25. Copyright 1998 by The Aspen Institute.

Background of the Study

The number of students who have difficulty achieving the academic goals set by their respective state has increased in recent years. As a result, all levels of government have searched for ways to positively impact the outcome of education for students. For example, the Federal Government often offers money to the states in attempts to influence the educational outcome of students. This often occurs through the performance requirements attached to various title funds and federal grants available to school districts, such as No Child Left Behind Act of 2001 and Race to The Top (United States Department of Education, 2009). Once a state or district accepts funds, districts must determine how to utilize the funds within the guidelines established by federal agencies.

For example, the No Child Left Behind Act of 2001 made changes to the 21st Century Community Learning Centers Program which expanded state and local accountability for the use of funds relating to after-school programs. The 21st Century Community Learning Centers Program is a key component of the No Child Left Behind Act. After-school programs fall within

the scope of this act. Congress appropriated $991 million for after-school programs in 2005 (Texas 21st Century, 2006). An additional requirement with the acceptance of these funds is that after-school programs utilize research-based programs.

The type of programs that fall within the scope of after-school programs vary widely (Durlak & Weissberb, 2007; Miller, 2003; Valentine, Cooper, & Bettencourt, & Dubois, 2002; Woodland, 2008). For instance academic programs for reading, mathematics, science and social studies are part of after-school programs in some school districts.

Taking a more in-depth look at after-school programs, the National Household Education Surveys Program of 2005 (Carver & Iruka, 2006) reported the following statistics: out of 35,311,000 (weighted total) kindergarten through 8th grade students, 20% attended at least one school- or center-based program. In these programs student activities included completing homework in reading and writing, work on computers and other non-academic activities. In addition the mean number of students per care provider at school- or center-based programs was 8.6 children.

Taking a further look at public elementary schools, Parsad and Lewis (2009) reported that a total of 49,700 public elementary schools had formal after-school programs located in their schools. This represented 4,007,000 enrolled students, of which 39% were enrolled in a stand-alone academic tutoring program, these stand-alone programs focus on academic instruction which includes supplemental educational services. About 34% of the students are enrolled in a fee-based stand-alone day care programs, these programs focus mainly on after-school day care, and however some of the day care programs include some form of academic enrichment. There are 16% in other types of formal stand-alone school programs. The other type category considered programs with fine arts enrichment, cultural, ethnic or mentoring focus. Finally, 11%

of the students were enrolled in learning center type programs. Learning center programs from Parsad and Lewis's report were funded by the 21st Century Community Learning Centers program.

Purpose of the Study

This research should add to the limited body of knowledge that currently exists in the field of education with a specific focus on after-school programs with reading and mathematics components and their effectiveness. This study was intended to provide more information for researchers, practitioners, and policy makers upon which to make practical research based decisions about after-school programs. Its focus was on providing information for determining the applicability of after-school programs in their educational setting.

Research Questions

This study was designed to answer the following questions:

1. Do after-school programs with a reading component have an impact on performance in reading of students in kindergarten through the eighth grade as determined by the effect size, known as Cohen's *d*?
2. Do after-school programs with a mathematics component have an impact on performance in mathematics of students in kindergarten through the eighth grade as determined by the effect size, known as Cohen's *d*?
3. Have after-school programs with a reading or mathematics component had an impact on performance of students in kindergarten through eighth grade, to the same level of effectiveness for each of the three time periods defined in this study?

4. Do after-school programs with a reading or mathematics component have an impact on performance of students in kindergarten through the eighth grade, with the same level of effectiveness at elementary and middle school grades?

Significance of the Study

Findings from this study should provide the practitioner, researcher, and policy maker with additional information upon which to make short-term, medium-term, and long-term decisions regarding after-school programs. Board members, superintendents, principals, teachers, other stakeholders and interest groups search for research that will be beneficial their day to day, medium term and long term plans for the improvement of student academic performance in the areas of reading and mathematics. As a result of this study, the practitioner should have additional information upon which to decide whether after-school programs will be beneficial in his or her particular environment.

Limitations of the Study

This meta-analysis is limited to studies that have been published between the years 2000 and 2009. There are studies that have occurred prior to this time; however, with changes of curriculum and the focus of instruction since the year 2000; a narrowed look is desired in order to evaluate the effectiveness of after-school programs with reading and mathematics components in studies published from the years 2000 through 2009. Many studies involve after-school programs that address multiple issues, for instance academics and non-academics areas. This study focused specifically on studies examining academic after-school programs with components of reading and mathematics designed to impact academic outcomes in reading and mathematics.

Definition of Terms

After-school programs: These are programs that occur outside of the normal school day. The programs can occur before school, after-school or on the weekend.

Artifacts: Errors that occur in a study due to imperfections in the study.

Community schools: A community school is a place and is also a set of partnerships that mobilizes an array of community resources—after school, youth development, family support, health and mental health, parenting and adult education, employment, violence prevention, and others—and connects them to student learning and development. (Coalition for Community Schools, n.d.)

Effect Size: The effect size is the standardized difference between two means that provides a measure of the strength of a treatment or independent variable (Arthur, Bennett, & Huffcutt, 2001)

Fail safe N: The fail-safe *N* was developed by Rosenthal in order to compensate for the problem of publication bias. The calculation of fail-safe *N* produces a result that represents the number of new, unpublished, or unretrieved no significant studies that would most likely lower the significance of the meta-analysis (Carson, Schriesheim & Kinicki, 1990; Long, 2001; Rosenthal, 1979).

Homogeneity: Homogeneity answers the question whether the effect sizes that are averaged in the mean are all from the same population (Lipsey & Wilson, 2001).

Meta-analysis: A meta-analysis refers to the analysis of analyses (Glass, 1976)

Moderator: Any variable, used to explain the variance between at least two different variables (Arthur, Bennett, & Huffcutt, 2001).

Out-of-school-time: Activities that occur outside of the normal school day, this may include before the start of school day activities or after the end of the school day activities. In addition, these activities may occur during the regular school year or after the regular school year, for instance during the summer.

Publication bias: Publication bias is concerned about the bias that results from the non-published articles that are considered to be in file drawers. The extreme of this problem, is that journals are filled with the 5% of the studies that show Type I errors, while the file drawers back at the lab are filled with the 95% of the studies that show no significant results (Rosenthal, 1979).

Type I error: An error that falsely concludes that there is an effect when there is no effect.

Type II error: An error that falsely concludes that there is no effect when there is, in fact, an effect.

Summary

This chapter provided information about after-school programs and some of the reasons for their consideration and current use in our society. The next chapter reviews the literature available on after-school programs. The literature review looks at the literature through the lens of after-school programs, both small research studies and large research studies. Later in the study, a more in-depth look at the effectiveness of after-school programs through the use of meta-analysis occurs. As noted before, the results of this study should provide information upon which to make short-term, medium-term, and long-term research-based decisions regarding after-school programs. In addition, this study should add to the body of research that exists on

the topic of the effectiveness of after-school programs in the academic areas in the field of education.

CHAPTER 2

LITERATURE REVIEW

For several years, educators have attempted to find ways to bring students to the desired levels of academic achievement. After-school programs have been one of the strategies utilized in order to help close the gap in student achievement. The academic achievement gap differs among the various subgroups including: White, African-American, and Hispanic, Asian and economically disadvantaged students. It is believed that students in these groups who obtain lower scores only need more time to learn along with specific focus on targeted areas of need for the students in order help students to improve their academic achievement (Bowman, 2001; Cosden, Morrison, Gutierrez, & Brown, 2004; Harlow & Baenen, 2001; Kugler, 2001).

This literature review examined the research on after-school programs that had reading and or mathematics components as part of their after-school program. The literature review looks at research into after-school programs, both small research studies and large research studies. Research studies since the year 2000 were utilized in the meta-analysis; however, for the sake of providing a solid foundation in the review of after-school program literature research prior to the year 2000 is included in this section. In addition, after-school programs are also referred to as community school programs; in some cases after-school programs are referred to as out-of–school-time programs (Little & Harris, 2003; Miller, Snow, & Lauer, 2004). For this study all programs are referred to as after-school programs. Other terms are defined in the definition of terms section of this paper.

Many students across the nation perform below their expected academic levels in reading and mathematics (Britsch, Martin, Stuczynski, & Tucci, 2005; Hausner, 2000; Kugler, 2001). As a result, school districts have been utilizing after-school programs in order to improve student

performance. While not the only method utilized by educators in order to improve student performance, many consider the use of after-school programs an effective strategy for improving student academic performance in reading and mathematics. In addition, prior research shows signs that the use of after-school programs can have a positive impact upon student achievement within reasonable timeframes, and is likely cumulative overtime (Kane, 2004).

Kane (2004) reviewed four studies: 21st Century Community Learning Centers (21st CCLC), the After-School Corporation (TASC), Extended-Service Schools Initiative (ESS), and San Francisco Beacons Initiative (SFBI). Most of the after-school programs in this study operated for two to three hours after the regular school day for four to five days per week. In his findings, Kane noted that (a) attendance was sporadic, (b) the 21st CCLC evaluation failed to find a large impact on children not being supervised after-school, (c) no significant impacts were reported on achievement scores after the first year of participation, and (d) after-school programs seemed to promote greater parental involvement in school along with student engagement and attention to homework.

There is support available for after-school programs either directly by schools or through joint community agency and school initiatives (Caplan & Calfee, 2006; Goerge, Cusick, Wasserman, & Gladden, 2007; Halpern, 2002; Harder, 2008; Massachusetts 2020, 2004; Owens & Vallercamp, 2003; Smith, Roderick, & Degener, 2005; Witt, 2005). Studies and reports supported by foundations, colleges, universities and private and public institutions have addressed the effectiveness of after-school programs on student academic achievement, motivation, avoidance of drugs and on the development of positive behaviors, social skills, and self-concepts (Kane, 2004; Hollister, 2003; Miller, 2003; U.S. Department of Education Office of Elementary and Secondary Education, 2003).

After-School Programs

After-school programs have been established for many reasons and have been found to have strengths and weaknesses. For example, Halpern (2002) provides a brief history of after-school programs and their purposes through the years. He starts with their emergence during the last part of the nineteenth century as boys' clubs and proceeds through the twentieth century. Halpern ends with the present where after-school programs focus primarily on low and moderate social economic status children. He concludes with two cautions to consider as after-school programs move forward into the future. The first is a caution about the ability to finance after-school programs. The second is a caution about how much after-school programs are being stretched to achieve; from improved standardized test scores to improved discipline.

In another study, Kugler (2001) identified three major factors related to the growth of after-school programs. These influences are:

- A dramatic shift in employment patterns resulting in many youth being home alone for long periods in the late afternoon
- A realization that all children can learn and that some students may take longer than other students to learn
- Highest rates of teen crime and victimization from 3:00 to 6:00 p.m.

In most of the literature on after-school programs one or more of the above reasons provided the rationale for establishing an after-school program (Cosden, Morrison, Albanese, & Macias, 2001; Haslom, Allender, Simko, & Reisner, 2008; Hausner, 2000; Witt, 2000).

Evaluating 10 studies, Hollister (2003) discusses the social and economic issues that had an impact on the purpose and development of after-school programs. He cites increased sexual activity, drug and alcohol abuse, and weak educational performance. Studies were grouped into

three general categories: programs for mentoring, tutoring, and remedial schooling. Hollister concluded that tutoring was effective while remedial school and parent-community based programs had varying degrees of effectiveness.

In another look at after-school programs, Valentine, Cooper, Bettencourt, and Dubois (2002) provided a theoretical model of the relationships between out-of-school time and achievement. They defined six categories for the use of out-of-school time: (a) homework, (b) employment, (c) extracurricular activities, (d) structured out-of-school activities, (e) unstructured time alone and with family and peers, and (f) sleeping. In addition, they looked at the impact self-beliefs have on academic achievement (Valentine et al., 2002). They concluded that self-beliefs do have an impact on academic achievement.

In the year 2000, the National Association of Elementary School Principals conducted a survey of principals in Grades K-8. Based on responses from over 500 principals the reported numbers of after-school programs have increased from 22% to 67% since 1988. In addition, a 1993 national study conducted by the U.S. Department of Education found 93% of schools had after-school programs (Bowman, 2001). Such programs have continued to grow in popularity (Chung & Hillsman, 2005; Huang, Leon, Harven, La Torre, & Mostafavi, 2009; Office for Planning, Grants, and Evaluation, Texas Education Agency, 2005; Reisner, White, Russell, & Birmingham, 2004; Schacter & Jo, 2005; Vandell, Reisner, & Pierce, 2007; Walker & Arbreton, 2004; Walking Eagle, Miller, Cooc, LaFleur, & Reisner, 2009; Watts, Witt & King, 2008; Welsh, Russell, Williams, Reisner, & White, 2002; Witt, 2000).

A review of the research identified several challenges when assessing the impact after-school programs have on students. The areas that may be impacted by such programs are numerous. In addition, there are many programs that fall within the after-school program

category. For example 4 Counties for Kids (4C4K) utilized after-school programs in rural counties in Illinois. 4C4K was designed to meet five goals, one of which is applicable to this study is to extend learning beyond the school day. They made use of both academic activities such as tutoring and non-academic activities such as recreation and life skills education. The evaluation of the program considered information from students, teachers and parents. The study concluded that students believed that the 4C4K program had a positive impact on their academic performance. In addition, over 75% of the parents believed that the program had a positive impact on their children's academic performance. Teachers found favorable improvement in student performance for students participating in the after-school program. As for reading and mathematics, significant improvement was found in 1st and 2nd grade reading and in 3rd through 6th grade mathematics. (Center for Prevention Research and Development, 2004).

In examining 16 after-school literacy development programs, Spielberger and Halpern (2002) identified various approaches in program development and implementation. Key features of such programs were literacy rich environment, regular times for reading, and facilitating book discussions. Key challenges to each program included appropriate allocation of time, space, and material resources. Other problem areas were staffing, children's diverse literacy needs, relationships with parents and the philosophy of after-school reading programs. They conclude that

- After-school programs provide a potentially strong base for nurturing children's literacy development, and for providing a variety of types of literacy experiences.
- The role of after-school programs should be to provide complementary and perhaps very different kinds of literacy experiences than those provided by school.

Within the after-school field as a whole, much work needs to be done if after-school programs are to fulfill their distinctive potential. (Spielberger & Halpern, 2002).

In addition, minority groups look to after-school programs in order to help close the gap between minority and majority populations. For example, after-school programs are highlighted by Woodland (2008). He defines what he considers the core elements of after-school programs. He reviewed several after-school programs and identified three types of programs as being beneficial to black males: (a) extracurricular activities models, (b) mentoring models, and (c) rite of passage (ROP) models.

Small After-School Program Studies

Several small studies have been conducted by researchers. Small studies are defined as studies which have fewer than 1000 participants. For example, Hausner (2000) investigated the relationship between after-school program use as an intervention for kindergarten students. The study involved 283 kindergarten children in six different schools. Students received a treatment that consisted of an extended day intervention for the development of their reading skills. The study sought to help at-risk students close the achievement gap by second grade. The findings suggested that the literacy intervention significantly increased the literacy scores of the low performing students.

Perkins-Gough (2003) discussed the success of after-school programs. She pointed out the contrast between two studies, each study producing results that are at opposite ends of the spectrum. One of the studies indicated that after-school programs are not effective and the other study indicated that the after-school programs are effective.

In another study, Hollister (2003) in *The Growth in After-school Programs and Their Impact* addresses a few areas associated with after-school programs. Hollister (2003) addresses four

areas in his study about after-school programs. They are the: (1) growth of after-school programs, (2) reasons for after-school program growth, (3) goal of the after-school programs, and (4) costs of the programs. Hollister examines the effectiveness of after-school programs by looking at ten studies and their outcomes. The findings from his work indicate that mentoring and tutoring are effective in helping to improve student performance.

In a study conducted by Riggs and Greenberg (2004), they looked at the impact of ecological factors on migrant Latino students who attended an after-school program. The after-school program is called Generacion Diez (G-10). The program was used with migrant Latino students in Pennsylvania County. Specifically, the study looked at the moderators and their impact on the academic outcomes. The moderators that they considered are: age, acculturation, and family functioning and parent involvement with school. They found that the impact of the ecological factors varied with the most positive impact being in the area of reading and spelling. The gain for students was around one full standard deviation.

Witt (2005) evaluated a 21st Century Learning Center Program in Bryan I.S. D., Texas. The program had an after-school component during the school year and an after-school component that was conducted during the summer. There were over 500 students that participated in this after-school program. The regular school year program had positive results. In addition to this program, Witt (2005) evaluated the East Harris County Youth Program. It had an after-school component that occurred during the school year as well as an after-school summer component. When teachers were surveyed they indicated that they felt that during the school year and the summer program had a positive impact on student academic performance.

After-school programs are not just for the regular education students, special education students have been focused on as well. Hock, Pulvers, Deshler and Schumaker (2001) conducted

two studies on two different groups of students. Each group of students contained learning disabled (LD) students. The students from the first study received academic tutoring two to three times per week for about 30 minutes per session. These students received what was referred to as strategic tutoring methods. Strategic tutoring methods are designed to teach students how to learn and perform not just how to solve a problem. The result from the first study showed positive results for the students who received the strategic tutoring. They improved their scores on quizzes and tests. As for the second study, the students received strategic tutoring for about four days per week for 45 minutes per session. Overall the students from the second study showed improvement based on the strategic tutoring. For both studies, the participants were able to better explain the process that they used to solve problems (Hock, Pulvers, Deshler, & Schumaker, (2001).

The Family Literacy Project (Ho, Dixon, Brown, Tomlinson, & Fox, 2005) is an after-school program that seeks to improve student performance by focusing on the parents of English language learners. Specifically, the program focuses on improving the academic skills of English as a second language (ESL) parents as a way of improving student performance. The after-school program serves about 125 parents and 250 children per year. As for the outcome, the parents of students did improve in their English language Skills. This in turn helped develop the parents' confidence in speaking with their children and teachers about their child's academic progress. In addition, the study does show statistical significance in academic areas for students of parents who received help from the parent after-school program.

The results of after-school programs on the academic areas of reading and mathematics have varying levels of impact on student performance. Some of the programs have significant

impact on outcome of student performance. In other after-school programs there is not significance, but in some cases there is improvement in academic performance.

Large After-School Program Studies

Large studies are studies that have 1000 or more participants. The term, large studies, is a researcher defined term. In 2003, *When Schools Stay Open Late: The National Evaluation of the 21st-Century Community Learning Centers Program*, reported its first year findings (United States Department of Education, Office of Elementary and Secondary Education Academic Improvement and Teacher Quality Programs, 2003). The report took a look at after-school programs in middle schools and elementary Schools. The report discussed the impact that the programs had at each of these levels of education. Schools that were selected for the study were in their second or third year of funding. The year this study was published represented the first year that data was evaluated to such a level in order to determine the effectiveness of after-school programs. The first year findings indicated that after-school programs had limited impact on academic achievement. These findings were obtained through the statistical analysis of data collected about students. It should be noted that this was a national study, and did not show the positive conclusion of many other studies.

Students who were participants in the after-school program were compared to students who were not participants in the after-school program. It is common practice to compare students in the program to students who aren't in the program. Usually variables such as test scores, teacher opinions, student opinions student grades or a combination thereof are used to determine the effectiveness of the program.

After-school programs have been shown to improve student academic performance and student attendance. Fletcher and Padover (2003) stated that, "the long-term goal of

strengthening the ability of young people to build knowledge and skills necessary to succeed in adolescence and early adulthood is critically important to community stakeholders, city and county governments, community foundations and local businesses have a vested interest in what is broadly termed youth development." (p. 22). Again, the different interest groups and stakeholders are evident throughout the literature.

Zhang and Byrd (2006) investigated after-school programs that are operated under the 21st Century Community Learning Centers concept. They address the development and funding of after-school programs under the concept. They refer to the studies by the United States Department of Education that were released in 2003 and 2005 respectively. These two reports were not very favorable towards after-school programs. However, Zhang and Byrd are also quick to point out that a number of other studies that focus on state and local programs show that students achieve noticeable improvement in the areas of mathematics, reading, and language arts.

An ecological analysis of after-school program participation was conducted by Mahoney, Lord, and Carryl (2005). Their study consisted of a longitudinal study which investigated the relationship between the programs and students academic performance and motivation. This study identified several possible after-school care program arrangements. Their study identified four patterns of after-school care that explained 61% of the variance in the after-school arrangements. In their study, they defined four after-school arrangements:

- After-school program care: Characterized by children who attended an after-school program nearly every afternoon and were also cared for by a parent for a portion of time on some afternoons
- Parent care: Characterized by children who were primarily cared for by a parent each afternoon

- Parent/nonadult care: Characterized by children who regularly experienced a combination of parent and nonadult care each afternoon
- Other adult/nonadult care: Characterized by children who experienced a mix of care from other adults and nonadult care across the school week (Mahoney, Lord, & Carryl, 2005)

Huang, Leon, La Torre, and Mostafavi (2008) researched the relationship between after-school program attendance and academic achievement. The amount of time spent in after-school programs is believed to be a determining factor in how successful students will be in their academic areas. LA's BEST after-school program in Los Angeles, California, is a comprehensive after-school program for at-risk children. The program was first implemented in the fall of 1988. Its goal is the development of the whole child. They do this by focusing on a students' intellectual, social-emotional, and physical development. This study contained about 10,000 students and utilized a longitudinal approach to the analysis of the student data. The study concluded that regular attendance in LA's BEST after-school program generates positive math achievement growth in mathematics. However, in the area of English Language Arts a significant relationship was not found. Of specific importance is the area of academics, several factors were discovered as a result of this study. For instance, students showed improvement in English language arts and or math, student attendance and doing better on homework assignments.

In another study, as part of the Harvard Family Research Project's series of Out-of-School Time Evaluation Snapshots, a review of 27 evaluations in its database found statistically significant improvement in areas such as: academic involvement, achievement motivation, achievement test scores, attitude toward school or academics, college attendance, competence,

educational aspirations, expulsions, grades, homework completion, lower rates of course failure, overall academic performance, reduced suspensions and school attendance (Little & Harris, 2003). This review consisted of experimental and quasi-experimental evaluations.

Additional research has confirmed reports by previous researchers. For instance Miller (2003) conducted research on after-school programs which focused predominantly on middle school students. In her research she drew the following four conclusions:

- Youth benefit from consistent participation in well run, quality after-school programs
- After-school programs can increase engagement in learning
- After-school programs can increase educational equity
- After-school programs can build key skills necessary for success in today's economy (Miller, 2003)

In addition, Miller identified three common approaches to enhancing the academic impact of after-school programs. The approaches that she identified are homework help, linkages with the school day, and literacy development. These three approaches provide support to areas that are foundational to student success in other academic areas.

Cosden, Morrison, Gutierrez, and Brown (2004) compare the impact of after-school homework programs versus after-school extracurricular activities and homework programs. At the conclusion of their review, the authors define risk factors and protective factors for after-school activities and after-school homework programs. An important point derived from their research is that the benefit for any student depends on the students specific needs. Consequently, what may benefit one student in one particular situation may benefit another student in a totally different manner.

In *The Evaluation of Enhanced Academic Instruction in After-School Programs* study (Black, Doolittle, Zhu, Unterman, & Grossman, 2008), a study that considered whether of enhanced after-school tutoring, selected structured programs, was better than what was considered the prevailing tutoring method at the time, mainly homework help. In the enhanced after-school program students received increased tutoring time along with the structured programming. Study participants were located in 13 different states consisting of 16 sites which represented 50 after-school centers. The conclusion of the study was significant improvement in mathematics for students in the enhanced after-school mathematics program over the regular tutoring program. As for reading, statistical significance was not found in the area of reading. Which meant the enhanced after-school reading program did not significantly outperform the regular after-school reading program.

A large urban district in Minnesota, Saint Paul Public Schools, established an after-school program called Pathways to Progress. This program served over 3,000 students since its beginning. Their after-school program provided students with after-school activities for up to four times each week. One of the goals of Pathways to Progress was to increase student academic achievement. Results from the program included positive student improvement in reading and mathematics of participants compared to the nonparticipants in the program (Wahlstrom, Sheldon, & Lewis, 2004).

Goerge, Cusick, Wasserman, and Gladden (2007) studied the impact attending Chicago's After School Matters program had on school performance and attendance. The researchers point out that after-school programs in general provide benefits to students who participate in such programs. In their study they found that students had improved attendance, fewer course failures, higher graduation rates and lower dropout rates.

Summary

It is important to look at studies and the parameters in which the after-school activities take place. This is especially true in light of the fact that all schools may not need the same type of after-school program. Indeed as the review of the literature shows schools, districts, and communities may use different after-school programs in order to achieve the same outcomes; sometimes successfully and sometimes unsuccessfully.

After-school programs have been evolving for over a century. The programs have served different purposes as determined by student needs at a given point in time. According to the research, success of after-school programs has yielded mixed results. It is apparent from the literature, that after-school programs have been researched from both a qualitative and quantitative perspective; but yet without a conclusive conclusion. There are a few studies which conclude that after-school programs have a negligible impact on improving student academic performance, however other studies have different findings.

In the next chapter, the steps taken in this meta-analysis are outlined, along with a brief review of the research studies included in this meta-analysis. This meta-analysis seeks to determine the impact that after-school programs have on the outcomes of reading and mathematics. In addition, the meta-analysis divides the selected studies into three different periods of time: Period-1: 2000 – 2002, Period-2: 2003 – 2005, and Period-3: 2006 – 2009.

CHAPTER 3

METHOD

This study utilizes meta-analysis, which refers to the analysis of analyses (Glass, 1976).

Research Questions

The research addressed the following research questions as the focus of the meta-analysis.

1. Do after-school programs with a reading component have an impact on performance in reading of students in kindergarten through the eighth grade as determined by the effect size, known as Cohen's *d*?
2. Do after-school programs with a mathematics component have an impact on performance in mathematics of students in kindergarten through the eighth grade as determined by the effect size, known as Cohen's *d*?
3. Have after-school programs with a reading or mathematics component had an impact on performance of students in kindergarten through eighth grade, to the same level of effectiveness for each of the three time periods defined in this study?
4. Do after-school programs with a reading or mathematics component have an impact on performance of students in kindergarten through the eighth grade, with the same level of effectiveness at elementary and middle school grades?

Data Analysis

The meta-analysis process was used for this study. A meta-analysis refers to a set of statistical procedures that are used to quantitatively aggregate the results of multiple primary studies to arrive at an overall conclusion or summary across these studies (Arthur, Bennett and

Huffcutt, 2001). According to Arthur (2001), there are 11 steps in the meta-analysis process. The steps are listed below, as described by Arthur:

1. Topic selection—defining the research domain
2. Specifying the inclusion criteria
3. Searching for and locating relevant studies
4. Selecting the final set of studies
5. Extracting data and coding study characteristics
6. Deciding to keep separate or to aggregate multiple data points (correlations or effect sizes) from the same sample – independence and non-independence of data points
7. Testing for and detecting outliers
8. Analyzing —calculating mean correlations, variability, and correcting for artifacts
9. Deciding to search for moderators
10. Selecting and testing for potential moderators
11. Interpreting results and making conclusions

This meta-analysis examined the impact that after-school programs with reading and mathematics components have on the outcome of reading and mathematics achievement for students in grades kindergarten through eighth grade. There have been studies that have looked at the impact of after-school programs in several areas of student life. This study narrowed the analysis to studies that have been reported from 2000 – 2009. Each study chosen for the actual meta-analysis had results for reading, mathematics or both academic areas.

Procedure

Search for Studies

The search for studies consisted of searching several databases from the University of North Texas Libraries electronic resources. A few of the databases searched were ERIC and EBSCO, Education Research Complete, Cambridge, Sage, Harvard Family Resource Project, Dissertations and Thesis among other databases. In addition, a Google search was conducted, as well.

The following key terms were used in the search for studies that contained the data necessary to conduct a meta-analysis: "after-school study," "after-school research," "after-school effect size," "after-school programs," and "out of school time." In addition, variations of these terms were used to locate possible studies. The results from the searches using these key terms were further narrowed by limiting the date of the studies to the years 2000 – 2009. Next, studies were divided into three groups according to the following time periods: 2000 – 2002, 2003 – 2005 and 2006 – 2009. The final results of the search are listed in Table 2, Table 3 and Table 4 respectively. All of these studies were not used in the meta-analysis, because some of the studies didn't have appropriate information to calculate effect sizes.

Table 2

Studies Published 2000 – 2002

Author	Grades	Program	Subject
Cosden, Morrison, Albanese, and Macias	4th	School Year	Reading Mathematics
Harlow, Baenen	5th - 8th	Summer	Reading Mathematics
Hausner	K - 2nd	*Special	Reading
Hock, Pulvers, Deshler, and Schumaker	7th - 9th	School Year	Mathematics
Schinke, Cole, and Poulin	K - 8th	School Year	Reading Mathematics

(table continues)

Table 2 *(continued).*

Author	Grades	Program	Subject
Welsh, Russell, Williams, Reisner, and White	K - 8th	School Year	Reading Mathematics
Witt	PK - 7th	**Both	Reading Mathematics

* This program was conducted during the day of the school year instead of after-school during the school year or during the summer.
** This program was conducted during the school and in the summer.

Table 3

Studies Published 2003-2005

Author	Grades	Program	Subject
Huang, Kim, Marshall, and Perez	K - 8th	School Year	Reading Mathematics
Luftig	1st - 4th	Summer	Reading
Texas Education Agency, 21st Century Community Learning Centers (CCLC)	PK - 12th	School Year	Reading Mathematics
Reisner, White, Russell, and Birmingham	3rd - 8th	School Year	Mathematics
Schacter and Jo	1st	Summer	Reading
Vandell, Reisner, Brown and Dadisman; Pierce, Lee, and Pechman	3rd - 4th	School Year	Reading Mathematics
Walker and Arbreton	K - 12th	**Both	Reading Mathematics
Walstrom, Sheldon, and Lewis	K - 6th	School Year	Reading Mathematics
Walstrom, Sheldon, and Lewis	6/7 - 8	School Year	Reading Mathematics

** This program was conducted during the school and in the summer.

Table 4

Studies Published 2006-2009

Author	Grades	Program	Subject
Halslam	5th and 6th	School Year	Reading
Huang, Leon, Haven, La Torre, and Mostafavi	2nd and 3rd	School Year	Reading Mathematics
Vandell, Reisner, and Pierce	Elementary Middle School	School Year	Mathematics

(table continues)

Table 4 *(continued).*

Author	Grades	Program	Subject
Watts, Witt, and King	Elementary	**Both	Reading Mathematics
Walking Eagle, Miller, Cooc and La Fleur, and Reisner	K - 8	School Year	Reading Mathematics

** This program was conducted during the school and in the summer.

Criteria for Inclusion of Studies

Studies were selected for review based on several factors. The first criterion applied was to select studies that were applicable to any grade or grades between kindergarten and eighth grade. This resulted in a selection of 79 studies for further analysis. A more in depth analysis of the 79 studies using the following selection criteria 1) an effect size was provided or 2) statistical information was provided that could be used to calculate an effect size. The final list of studies used for the meta-analysis is found in the results section in Tables 5, 6 and 7 in Chapter 4.

Coding Protocol

The necessary data were extracted from the studies and then coded for use in calculation of the meta-analysis. The coding manual along with the coding form is included in the Appendix A and Appendix B, respectively. The coding scheme consisted of the following: (a) study ID, (b) publication date, (c) publication name, (d) subject, (e) program treatment, (f) grade level, (g) effect size, (h) *t-statistic*, (i) *F-statistic*, (j) *mean*, (k) *standard deviation*, (l) N, and (m) sampling method, and (n) *correlation coefficient r*.

Publication Bias

One concern with the use of meta-analysis is the level of publication bias, also known as the "file drawer problem." Publication bias refers to the impact that the choice of researchers not to submit or publishers not to publish studies that are not significant (Long, 2001). One method to address this potential problem is the calculation of the "fail-safe *N*." Fail-safe *N* statistic is

used to estimate the number of new, unpublished, or not retrieved no significant studies that would, on the average, change the significance of a meta-analysis study to non significance (Long, 2001).

Test for Homogeneity

The effect sizes were tested for homogeneity. Homogeneity answers the question whether the effect sizes that are averaged in the mean are all from the same population (Lipsey & Wilson, 2001). The *chi-square* test was used for homogeneity. A c*hi-square* test was used to determine if the study sample was homogeneous or heterogeneous. Homogeneous effect sizes would mean that the effect sizes all estimate the same population effect size (Lipsey & Wilson, 2001).

Variables Examined

Dependent Variables

The dependent variables in this study are student outcomes in the academic areas of reading and mathematics, as measured by Cohen's *d*. In addition, outcomes relating to the effectiveness in reading and mathematics during the three time periods, and elementary and middle school grade levels are dependent variables, as well. Which are calculated based on the effect sizes from the studies included in the meta-analysis.

Independent Variables

The independent variable is the afterschool program. The effect sizes are the measures of the independent variables impact on the dependent variables. Where effect sizes were not directly given in the study, they were calculated from available statistical information. If available statistical information was not enough to calculate an effect size, then information from that study was not included in the meta-analysis.

Data-Analysis

The meta-analysis calculations were conducted using PASW Statistics 17 software. The software itself does not directly do the calculations for a meta-analysis. Syntax was obtained for the calculation of the meta-analysis of standardized differences between means and moderator variable analysis and other calculations. The files used with PASW Statistics 17 were obtained from Field and Gillett, 2009. In addition, formulas from articles and books (Arthur, Bennett, & Huffcutt, 2001; DeCoster, 2004; Lipsey & Wilson, 2001; Thalheimer & Cooks, 2002) were used to calculate effect sizes for studies that did not have effect sizes but had the appropriate statistical information that could be used to calculate the effect sizes.

Summary

In this chapter, we reviewed the use of meta-analysis and its use in consolidating information from several studies in order to draw a true conclusion about the impact of after-school programs on the academic areas of reading and mathematics. In addition, effect sizes were defined.

CHAPTER 4

RESULTS

This chapter presents the results of data analyses exploring the impact of after-school programs with components of reading and mathematics on the academic outcomes of student performance in reading and mathematics. The study was guided by the following research questions:

1. Do after-school programs with a reading component have an impact on performance in reading of students in kindergarten through the eighth grade as determined by the effect size, known as Cohen's *d*?
2. Do after-school programs with a mathematics component have an impact on performance in mathematics of students in kindergarten through the eighth grade as determined by the effect size, known as Cohen's *d*?
3. Have after-school programs with a reading or mathematics component had an impact on performance of students in kindergarten through eighth grade, to the same level of effectiveness for each of the three time periods defined in this study?
4. Do after-school programs with a reading or mathematics component have an impact on student performance of students in kindergarten through the eighth Grade, with the same level of effectiveness at elementary and middle school grades?

First, studies were identified for inclusion in the meta-analysis through the use of electronic databases. They were examined and coded for inclusion in the meta-analysis statistical procedures. The Cohen's *d*, effect size, was either recorded from the selected studies

or calculated using available data from the studies. For instance, where the *t, r or F* statistics are given, formulas are available to calculate Cohen's *d* (Arthur, Bennett, & Huffcutt, 2001; DeCoster, 2004; Thalheimer & Cook, 2002; Zakzanis, 2001). Next, calculations of the Cohen's *d* mean effect size was made, using Field and Gillet's (2010) meta-analysis programs.

Study Effect Sizes

The effect sizes for all the studies are included in the Table 5 through Table 7, and then followed by boxplot in Figure 1 through Figure 3. Boxplots are schematic diagrams of distributions. The box portion of the diagram shows the central 50% of the distribution. The horizontal line within the box denotes the median. The upper end of the box shows 25% of the scores above the median. The lower portion of the box shows 25% of the scores below the median. The vertical lines extending from the bottom and top of the box show the lowest and highest scores that are not considered outliers. Outliers are represented by circles (Sinacore, Chang, & Falconer, 1992).

An understanding of the results of the meta-analysis requires a general knowledge of the meaning of effect size measurements. The effect sizes that are used in the meta-analysis are categorized by three different periods in Table 5, Table 6 and Table 7. The effect sizes ranged from a minimum of .02 to a maximum of 1.70. This created a range of 1.68. The effect sizes for both reading and mathematics are presented in Table 5, Table 6 and Table 7. As seen in Figure 1, the effect size of 1.70 is considered an outlier. The effect size 1.7 is represented by A-7 in the boxplot. In addition the lower vertical line, referred to as a whisker is longer than the upper whisker. This is an indication of the distribution is skewed. In this case the distribution is skewed on the low end of the effect sizes.

Table 5

Effect Sizes: Period A, 2000-2002

Author	Cohen's *d*	Grades	Subject
Hausner	.82	Elementary	Reading
Welsh, Russell, Williams, Reisner, and White	.02	Both	Reading
Welsh, Russell, Williams, Reisner, and White	.17	Both	Mathematics
Schinke, Cole, and Poulin	.37	Elementary	Mathematics
Schinke, Cole, and Poulin	.34	Elementary	Reading
Cosden, Morrison, Albanese, and Macias	1.70	Both	Reading
Cosden, Morrison, Albanese, and Macias	.77	Both	Mathematics

The calculations for the meta-analysis should be conducted with and with the outliers. The result between the two should be compared in order to determine if there is a difference in the two calculations.

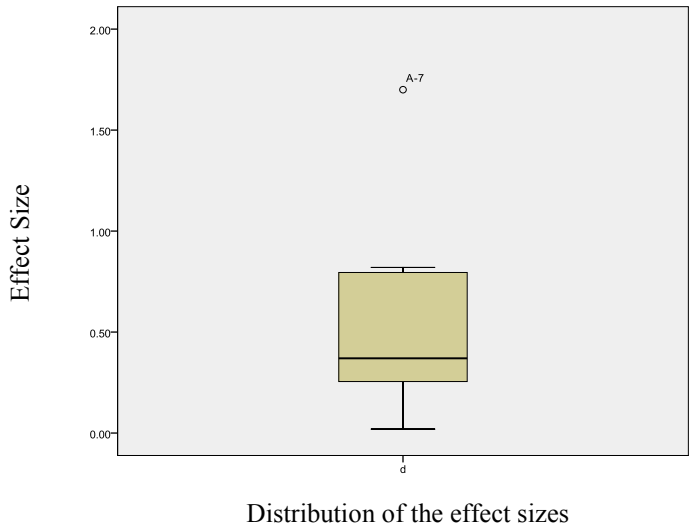

Figure 1. Boxplot for Period A, 2000–2002, effect sizes. The box represents the 50% of the distribution of the effect sizes. The horizontal line in the box represents the median, 0.37. The lower portion of the box shows the 25% of the effect sizes below the median. The upper portion of the box shows the 25% of the effect sizes above the median. The vertical lines extending from the bottom and top of the box represent the lowest and highest scores, 0.02 and 0.82, respectively that are not considered outliers. The circle labeled A-7 is an outlier.

Turning to effect sizes for the Period 2003 – 2005, the range is .03 through 1.34. Figure 2 shows there are not any outliers in the selected data. In addition, the median for the boxplot is slightly below the center of the box. The lower whisker is slightly shorter than the upper whisker. This indicates a very slight level of skewness. The skewness is in the direction of the high effect sizes for this period.

Table 6

Effect Sizes: Period B, 2003-2005

Author	Cohen's *d*	Grades	Subject
Walker and Arbreton	.51	Elementary	Reading
Walker and Arbreton	.87	Elementary	Reading
Schacter and Jo	.47	Elementary	Reading
Reisner, White, Russell, and Birmingham	.79	Both	Mathematics
Texas Education Agency	.03	Both	Mathematics
Texas Education Agency	.10	Both	Reading
Luftig	1.34	Elementary	Reading
Luftig	.30	Elementary	Reading

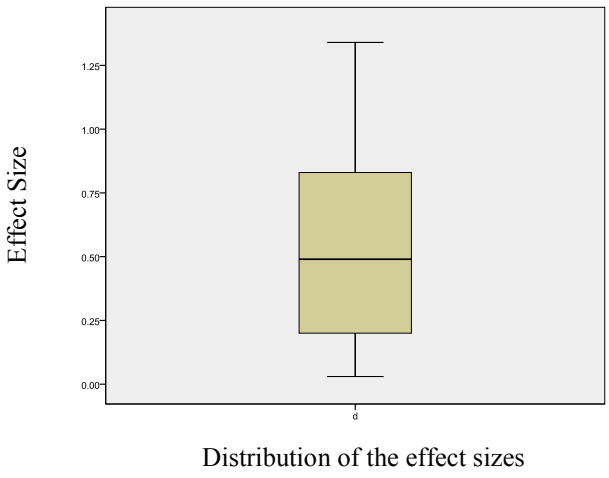

Figure 2. Boxplot for Period B, 2003-2005, effect sizes. The box represents the 50% of the distribution of the effect sizes. The horizontal line in the box represents the median, 0.49. The lower portion of the box shows the 25% of the effect sizes below the median. The upper portion of the box shows the 25% of the effect sizes above the median. The vertical lines extending from the bottom and top of the box represent the lowest and highest scores, 0.03 and 1.34, respectively that are not considered outliers.

Next, the effect sizes for the Period 2006 – 2009 range from .08 through .55. The boxplot shows the median to be just below the center of the box, which is an indication of the distribution being slightly skewed. In addition the upper whisker of the boxplot is longer than the lower whisker of the boxplot. This would indicate that the boxplot is skewed on the high end of the effect sizes for this time period.

Table 7

Effect Sizes: Period C, 2006-2009

Author	Cohen's *d*	Grades	Subject
Walking Eagle, Miller Cooc, LaFleur, and Reisner	.24	Elementary	Reading
Haslam, Allender, Simko, and Reisner	.31	Elementary	Reading
Watts, Witt, and King	.17	Middle	Mathematics
Watts, Witt, and King	.13	Elementary	Reading
Vandell, Reisner, and Pierce	.52	Middle	Mathematics
Vandell, Reisner, and Pierce	.55	Both	Mathematics
Huang, Leon, Harven, La Torre, and Mostafavi	.08	Elementary	Mathematics
Huang, Leon, Harven, La Torre, and Mostafavi	.20	Elementary	Reading

Another observation about the Period C boxplot, Figure 3, is that there are not any outliers present in the data for this period.

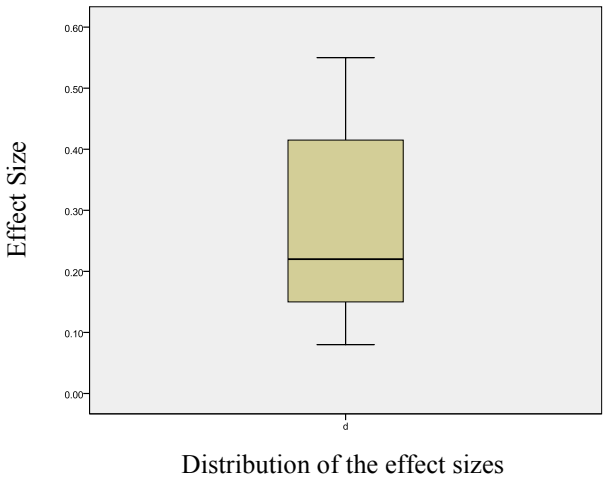

Figure 3. Boxplot for Period C, 2006-2009, effect sizes. The box represents the 50% of the distribution of the effect sizes. The horizontal line in the box represents the median, 0.22. The

lower portion of the box shows the 25% of the effect sizes below the median. The upper portion of the box shows the 25% of the effect sizes above the median. The vertical lines extending from the bottom and top of the box represent the lowest and highest scores, 0.08 and 0.55, respectively that are not considered outliers.

Finally, a contrast of the three periods is presented. Several things are evident from this contrast: 1) the narrowest range between the three periods occurred during Period C, 2) outliers were only present during Period A, and 3) The widest range occurred during Period B.

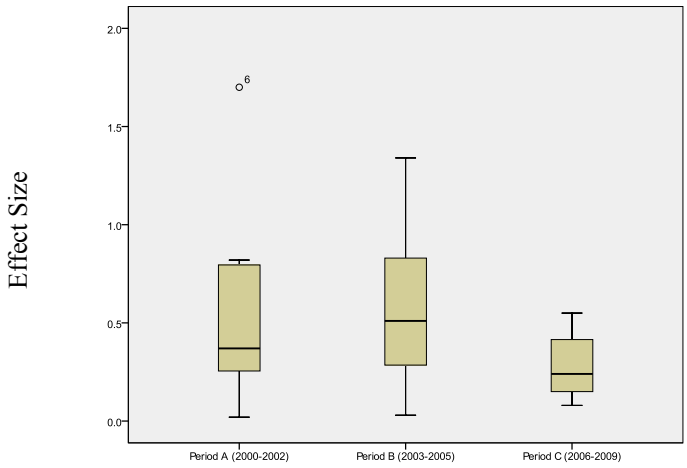

Figure 4. Boxplot contrasting Periods A, B and C effect sizes. Data from Figure 1, Figure 2, and Figure 3 are side by side in this figure. The outlier is represented by the small circle labeled 6.

The effect sizes in Table 5, Table 6 and Table 7 were used to calculate the mean *d* effect size for the meta-analysis. The results of the meta-analysis calculations appear in the next section.

In addition, to looking at the effect sizes by three periods of time, the effect sizes were considered by the subject areas reading and mathematics separately. Table 8, contains these effect sizes. In this case the effect sizes range from 0.02 through 1.70. Looking at these effect sizes within the parameters of a boxplot, there are two outliers 1.34 and 1.70, which are represented by 4 and 8 in the Figure 5. The median for the reading effect sizes is slightly below the center. In addition, the upper and lower whiskers are not extremely different.

Table 8

Effect Sizes: Reading from Periods A, B and C

Author	Cohen's *d*	Period	Grade	Subject
Walker and Arbreton	.51	2003-2005	Elementary	Reading
Walker and Arbreton	.87	2003-2005	Elementary	Reading
Schacter and Jo	.47	2003-2005	Elementary	Reading
Texas Education Agency	.10	2003-2005	Both	Reading
Luftig	1.34	2003-2005	Elementary	Reading
Luftig	.30	2003-2005	Elementary	Reading
Walking Eagle, Miller Cooc, LaFleur, and Reisner	.24	2006-2009	Elementary	Reading
Haslam, Allender, Simko, and Reisner	.31	2006-2009	Elementary	Reading
Watts, Witt, and King	.13	2006-2009	Elementary	Reading
Huang, Leon, Harven, La Torre, and Mostafavi	.20	2006-2009	Elementary	Reading
Hausner	.82	2000-2002	Elementary	Reading
Welsh, Russell, Williams, Reisner, and White	.02	2000-2002	Both	Reading
Schinke, Cole, and Poulin	.34	2000-2002	Elementary	Reading
Cosden, Morrison, Albanese, and Macias	1.70	2000-2002	Both	Reading

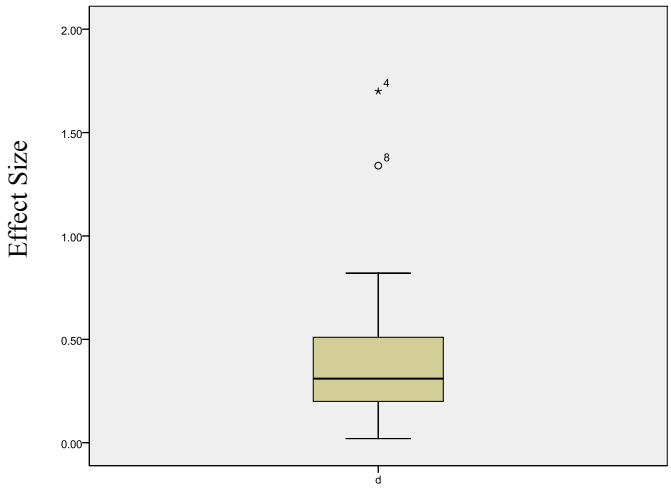

Figure 5. Boxplot for Reading effect sizes. The box represents the 50% of the distribution of the effect sizes. The horizontal line in the box represents the median, 0.33. The lower portion of the box shows the 25% of the effect sizes below the median. The upper portion of the box shows the 25% of the effect sizes above the median. The vertical lines extending from the bottom and top of the box represent the lowest and highest scores, 0.02 and 0.87, respectively that are not considered outliers. The outliers are represented by the circle and star.

Mathematic effect sizes appear in Table 9. The effect sizes for mathematics from all periods range from .03 through .79. Figure 6 reveals several things. The median is nearly in the center of the box. As for the whiskers both the lower and the upper are practically equal. These two points taken together indicate that the data is practically normally distributed.

Table 9

Effect Sizes: Mathematics from Periods A, B and C

Author	Cohen's *d*	Period	Grade	Subject
Welsh, Russell, Williams, Reisner, and White	.17	2000-2002	Both	Mathematics
Schinke, Cole, and Poulin	.37	2000-2002	Elementary	Mathematics
Cosden, Morrison, Albanese, and Macias	.77	2000-2002	Both	Mathematics
Reisner, White, Russell, and Birmingham	.79	2003-2005	Both	Mathematics
Texas Education Agency	.03	2003-2005	Both	Mathematics
Watts, Witt, and King	.17	2006-2009	Middle	Mathematics
Vandell, Reisner, and Pierce	.52	2006-2009	Middle	Mathematics
Vandell, Reisner, and Pierce	.55	2006-2009	Both	Mathematics
Huang, Leon, Harven, La Torre, and Mostafavi	.08	2006-2009	Elementary	Mathematics

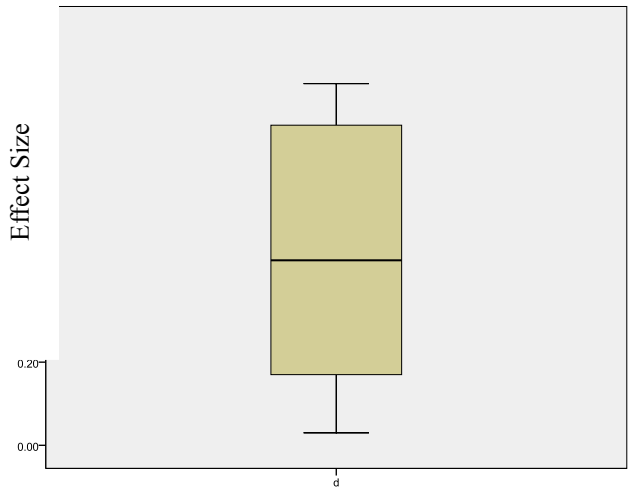

Figure 6. Boxplot for Mathematics effect sizes. The box represents the 50% of the distribution of the effect sizes. The horizontal line in the box represents the median, 0.37. The lower portion of the box shows the 25% of the effect sizes below the median. The upper portion of the box shows the 25% of the effect sizes above the median. The vertical lines extending from the bottom and top of the box represent the lowest and highest scores, 0.03 and 0.79, respectively that are not considered outliers.

Effect size interpretation should depend on the topic being studied (Zakzanis, 2001). This point was pointed out by depending on the field of study effect sizes fall in a particular range.

In the next sections Cohen's mean *d*s from the meta-analysis is presented for a) Mathematics and Reading combined, b) Reading, c) Mathematics d) by periods 2000-2002, 2003-2005, 2006-2009. In addition, publication bias and homogeneity is considered.

Meta-Analysis of Overall Mean Effect Size

The mean *d* effect size was calculated for reading and mathematics combined. This gives us an overall impact that after-school programs have on the combined academic areas of reading and mathematics. The individual outcome by subject is considered in the moderator section of this study. The random-effects model was used in order to generate the mean effect size data for the meta-analysis. As shown in Table 10, the mean *d* is .40 with a standard error of .052. Using Cohen's (1992) definitions of small, medium and large effect sizes, which correspond to .20, .50 and .80 respectively, the combined effect size of .40 means that after-school programs have a medium impact on the outcome of reading and mathematics. In addition, the chi-square calculated value of 46.299 exceeds the critical value, 33.92. This indicates that there is likely an influence by moderators. In the next section, subject, period and grade level are be considered as moderators.

Table 10

Meta-Analysis Overall Effect Sizes (Reading and Mathematics)

Variable	Number of Cohen's *d*s	Sample Size	Mean *d*	SEM	LL	UL	Chi^2
Overall	23	40,745	.40	.052	.300	.502	46.299

Publication Bias

Publication bias is concerned about the bias that results from the non-published articles that are considered to be in file drawers. The extreme of this problem, is that journals are filled with the 5% of the studies that show Type I errors, while the file drawers back at the lab are filled with the 95% of the studies that show no significant results (Egger, Smith, Schneider and Minder, 1997; Rosenthal, 1979; Sterne, Becker and Egger, 2005). The fail-safe N was developed by Rosenthal in order to compensate for this problem. The calculation of fail-safe N produces a result that represents the number of new, unpublished, or unretrieved no significant studies that would most likely lower the significance of the meta-analysis (Carson, Schriesheim, & Kinicki, 1990; Long, 2001; Rosenthal, 1979). In addition, Carson, Schriesheim, & Kinicki (1990) point out that in addition to solving the file drawer problem the fail-safe N serves as an indicator of the stability of the meta-analytic results.

The fail-safe N was calculated for this meta-analysis in order to determine the level of publication bias. The Rosenthal method of fail-safe N calculation was used to calculate N = 6,138. This means that it would take 6,138 studies hidden in file drawers in order to make the meta-analysis results of no effect.

In addition, to conducting the fail-safe N calculation a funnel plot was generated. The funnel plot is a simple scatter plot of the treatment effects estimated from the individual students against a measure of the study. In the case of this meta-analysis, the standard error of measure is on the vertical axis and the effect size for the study is on the horizontal axis (Sterne & Egger, 2001; Sterne & Harbord, 2004). Figure 7 represents the data from both reading and mathematics combined.

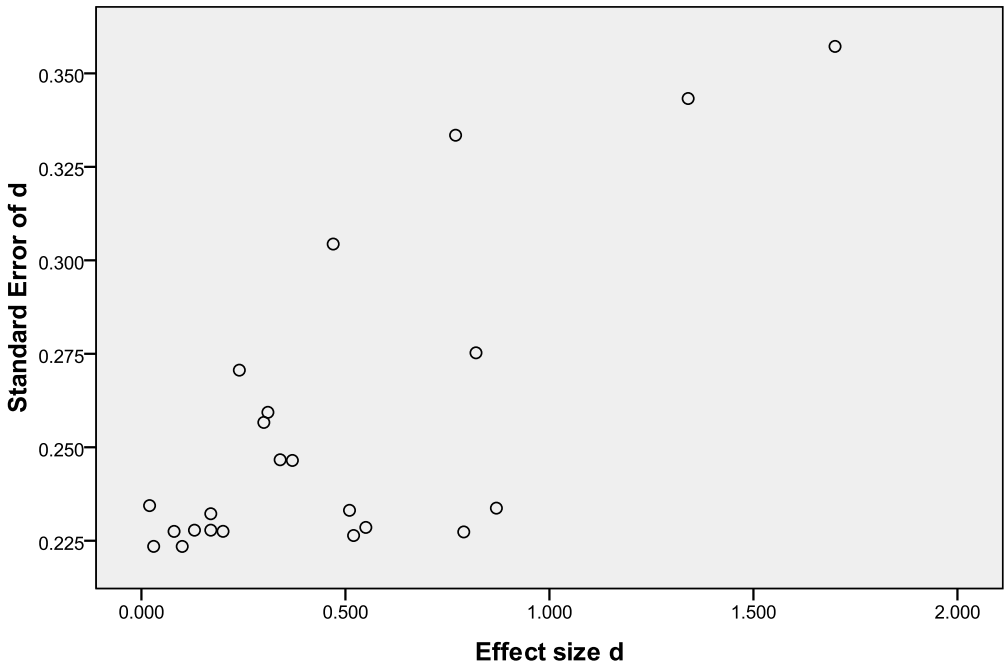

Figure 7. Funnel plot for mathematics and reading effect sizes.

Test for Homogeneity

Homogeneity answers the question whether the effect sizes that are averaged in the mean are all from the same population (Lipsey and Wilson, 2001). The chi-square test was used for homogeneity. The result of the calculations produced the result 46.299 with 22 *df* at $p < .05$. The confidence lower and upper limits are .300 and .502 respectively. Based on the degrees of freedom, 22, at $p < .05$ the calculation of chi-square is significant. This means that the distribution is heterogeneous. A heterogeneous sample means that the various effects sizes are not from the same population. As a result, the random-effects model was used to make the calculations for the meta-analysis.

Analysis of Moderators

Subject, period and grade were selected as moderators for this meta-analysis. Each moderator is considered in a sub analysis with the effect size information provided from the

various studies in Table 5, Table 6 and Table 7. Each sub analysis is presented in conjunction with the overall analysis, as this allows an easier comparison of the metrics between the overall and each moderator.

Results by Subject

The first moderator considered is subject. There are two subjects reading and mathematics. The results of the meta-analysis for the subject moderators appear in Table 11. The mean effect size for reading of .38 is .02 lower than the overall mean d. In addition, the chi-square for reading is 35.908 which is statistically significant because it exceeds the critical value. On the other hand, the mean d effect size for mathematics of .42 is .02 higher than the overall mean d effect size. In addition, the chi-square for mathematics is not statistically significant. This means that after-school programs with reading components have a moderating impact on the overall outcome.

Table 11

Meta-Analysis Subject Moderator

Variable	Number of Cohen's *d*s	Sample Size	Mean *d*	SEM	LL	UL	Chi^2
Overall	23	40,745	.40	.052	.300	.502	46.299
Reading	13	19,253	.38	.063	.251	.499	35.908
Mathematics	10	21,492	.42	.110	.204	.634	7.272

Results by Period

Next, the results for moderators by period is reviewed and discussed. The three periods represented are 2000-2002, 2003-2005 and 2006-2009. Under this moderator the range is wide.

First of all, the period 2000-2002 has the largest mean d, .51. This mean d exceed the mean d for the overall. This means that the after-school programs were most effective during this time period. A .51 is considered an indication that the independent variable, after-school programs, has a medium effect on the academic outcome. In addition, the period 2003-2005 of .32 is .08 below the overall mean d. This indicates that the after-school programs were not as effective as the previous period.

Table 12

Meta-Analysis Period (2000-2002, 2003-2005 and 2006-2009) Moderator

Variable	Number of Cohen's *d*s	Sample Size	Mean *d*	SEM	LL	UL	Chi^2
Overall	23	40,745	.40	.052	.300	.502	46.299
2000-2002	7	1,390	.51	.132	.251	.770	13.001
2003-2005	8	32,882	.32	.089	.319	.666	17.949
2006-2009	8	6,473	.13	.074	.130	.421	5.237

What is readily visible is that the largest difference is between the overall and the 2006-2009 time period and the overall. The 2006-2009 mean d is .13 while the overall mean d is .40. This means that the afterschool programs had a small impact on academic outcomes. Also, the Chi-squares for the periods 2000-2002 and 2003-2005 are significant, while the Chi-square for the period 2006-2009 is not significant.

Results by Grade

Finally, we look at the grade moderator results, Table 13. The mean *d* effect size for elementary grades was only .27 compared to the overall .40. This indicates that the elementary grades seem to have been impacted less than all grades combined. Also, the middle grade mean

d of .35 was only .05 away from the overall reading. This would indicate that after-school programs are beneficial to students. The mean ds fall in the educationally significant range. The elementary mean *d*, is significantly lower than the mean ds for the other overall, middle or both; however, the measure still falls into the educationally significant range, though just barely. A look at the chi-squares reveal that none of them are significant for this moderator category.

Table 13

Meta-Analysis Grade (Elementary, Middle and Both) Moderator

Variable	Number of Cohen's *d*s	Sample Size	Mean *d*	SEM	LL	UL	Chi^2
Overall	23	40,745	.40	.052	.300	.502	46.299
Elementary	13	4,786	.27	.080	.266	.580	15.041
Middle	2	2,394	.35	.175	.003	.689	1.00
Both	8	33,565	.39	.081	.227	.544	28.846

Summary by Research Questions

Now let us look at the results in relation to the research questions. As they are addressed the reference is made to our meta-analysis results.

1. Do after-school programs with a reading component have an impact on performance in reading of students in kindergarten through the eighth grade as determined by the effect size, known as Cohen's *d*?

The meta-analysis results revealed that after-school programs have an educationally significant impact on student reading outcomes. Cohen's *d* for the mean effect size is .38, Table 11.

2. Do after-school programs with a mathematics component have an impact on performance in mathematics of students in kindergarten through the eighth grade as determined by the effect size, Cohen's *d*?

The meta-analysis revealed that after-school programs have an educationally significant impact on student mathematics outcomes. In this case, the Cohen's *d* for the mean effect size is .42, Table 11.

3. Have after-school programs with a reading or mathematics component had an impact on performance of students in kindergarten through eighth grade, to the same level of effectiveness for each of the three time periods defined in this?

This question determined if there was a difference in the effectiveness of after-school programs during the various time periods on outcomes of the academic areas of mathematics and reading combined. The data seem to indicate that effectiveness was strongest in the earliest period, 2000-2002, see table 12. The earliest period has a mean d of .51, which is an educationally significant indication. In addition, in the latest period, 2006-2009 the mean *d* outcome of .13, indicates the weakest impact. In addition to the period of 2006-2009 showing the weakest mean *d*, it is educationally not significant. In summary, it appears the results have varied over the time periods.

4. Do after-school programs with a reading or mathematics component have an impact on performance of students in kindergarten through the eighth grade, with the same level of effectiveness at elementary and middle school?

The results in this area are mixed, as well. See Table 12. The most effective area based on a mean d calculation of .39 seems to be when a program is applied to the Both, K-8, category. When looking at the elementary or the middle school categories the mean *d*s are .27 and .35

respectively. An observation, all three of the categories have mean ds that are educationally significant.

In summary, it is evident that from the meta-analysis, for overall and sub analyses, that after-school programs do have an educationally significant impact on the outcome of students academics; specifically in reading and mathematics. The meta-analysis overall calculations were based on reading and mathematics combined. In addition, the sub analyses looked at reading and mathematics respectively, grade levels and time periods of the studies. Also, grade levels and timeframes were analyzed from a moderator perspective.

CHAPTER 5

SUMMARY, DISCUSSION, AND RECOMMENDATIONS

The purpose of this study was to conduct a meta-analysis on the impact that after school programs have on the academic areas of reading and mathematics. The research in this study was driven by the following research questions:

1. Do after-school programs with a reading component have an impact on performance in reading of students in kindergarten through the eighth grade as determined by the effect size, known as Cohen's *d*?
2. Do after-school programs with a mathematics component have an impact on performance in mathematics of students in kindergarten through the eighth grade as determined by the effect size, known as Cohen's *d*?
3. Have after-school programs with a reading or mathematics component had an impact on performance of students in kindergarten through eighth grade, to the same level of effectiveness for each of the three time periods defined in this study?
4. Do after-school programs with a reading or mathematics component have an impact on performance of students in kindergarten through the eighth grade, with the same level of effectiveness at elementary and middle school grades?

A meta-analysis is statistical process that takes various studies and calculates a standard measure for the outcome of each study and produces an overall outcome for the studies. In addition, the meta-analysis can be used to determine the impact of moderator variables on the outcome of the dependent variable.

Studies were selected for the meta-analysis from electronic databases and a review of relevant references from studies and articles. The studies were narrowed based

on the selection criteria. In addition, information from the study was coded for use by statistical software.

Interpretation of the Findings

The findings of the meta-analysis both overall and sub analyses show that the independent variable, after-school programs, has an impact on the dependent variable, reading and mathematics. The overall results indicated that after-school programs are educationally significant in the areas of reading and mathematics combined. As for the moderator variables (a) subject (reading and mathematics), (b) time period (2000-2002, 2003-2005 and 2006-2009), and (c) grade (middle and elementary plus middle combined) all indicated educationally significant results. The notable exception was the grade moderator variable, elementary.

Recommendations for Overall Results

The overall results for reading and mathematics combined indicate that after-school programs have a positive impact on student academic outcomes. This may be used by educators in order to make decisions about whether to institute an after-school program. This is critical decision for school boards, superintendents, principals, teachers, parents, students and other members of the educational community, especially when considering the expenditures for acquiring and developing the resources for after-school programs. The personnel cost associated with hiring staff for after-school programs and the development or purchase of curriculum are primary examples.

Recommendations for Subject Moderator

As for the subject moderators, reading and mathematics, the benefit here is that decision makers are able to more readily address one subject or both subjects in an after-school program. This is important if a school or school district is considering implementing an after-school

program to address only reading or mathematics deficits in their school or school district. A school or school district might base this on some form of diagnostic assessment. The diagnostic assessment will direct stakeholders in the best direction for students by showing where student need exists. Again, in this time of scarce resources to address areas where the need exists is important, as this saves the resources for other areas of need.

Recommendations for Time Period Moderator

The time period analysis result may indicate a need to look at the programs that occurred during each of the time periods. As an example, a closer look at the programs that were published during the 2000-2002 time frame may produce insight into effective methods from programs of that time. This can serve as a starting point for educators to consider the identified methods and discuss the potential effectiveness for inclusion in the development of after-school programs. On the other hand, the strength of the effectiveness of that time frame may no longer be effective because of changes in students or the changes in the curriculum that was employed during the various time periods.

In this area, the decision makers should consider the key factors that were considered beneficial in the included meta-analysis studies. For instance, a review of the studies listed in Period A with specific attention given to the Cohen's *d* for each study listed give insight into the individual effect size of each study. Next, a review of the specific activities and outcomes from a specific study should help to guide stakeholders as they develop their after-school program. Several iterations of this review for various studies should lead to possible activities that can be used in developing the after-school program using the Theory of Change model.

Recommendation for Grade Moderator

As for the grade analysis, the strongest evidence seems to be indicated across the K-8

spectrum. It is important to note, however, that there were only two Ns to draw from in the pool of effect sizes that applied only to middle school. As a result, the results from this area should not be given as much weight as the other areas of the grade analysis.

Here decision makers can decide whether they want their after-school program to lean toward a particular grade level or levels. Again, this decision should make use of diagnostic assessment data in order to guide the school districts efforts and to save time.

In summary, these findings taken together mean that the use of after-school programs to improve the outcome of students in reading and mathematics is an effective way to get results. Whether for No Child Left Behind, Race to the Top Fund, or any future mandates from federal, state or local levels, after-school programs should be in the tool kit of every educator who wants to have an impact on student academic outcomes.

Theory of Change

The theory of change presented in Table 1 can help all stakeholders to maintain a proper focus as an after-school program is developed for the educational entity. Initially, stakeholders need to be identified. Next, all stakeholders will need to define their perspective of early activities, early outcomes, intermediate outcomes, and long-term outcomes. All stakeholders should then come together and discuss and merge activities into an acceptable and workable plan for the development of their specific after-school program. As the after-school program is developed stakeholders should keep in mind what is academically best for the students.

Considering the results generated by this meta-analysis, some recommended activities that may be used for further development of the theory of change for after-school programs are presented in Table 14.

Table 14

Theory of Change for After-School Programs: Recommended Preliminary Activities

	Early Activities	Recommended Preliminary Activity
School	• Determine the type of after-school program needed. • Identify students in need of academic help.	• Give a diagnostic test to students in order to determine needs in mathematics, reading, or both. • Review existing current data on students in order to determine student needs in mathematics, reading, or both.
School	• Plan the after- school program.	• Review the characteristics and strategies used in the most effective studies from the meta-analysis in mathematics, reading, or both. • Decide what grades after-school programs should be provided to; consider the knowledge of need in conjunction with the knowledge of what grade levels show the the best results, when after-school programs are implemented.

Note. Adapted from "New Approaches to Evaluating Community Initiatives," by K. Fulbright-Anderson, A. C. Kubisch, and J. P. Connell, pp. 24-25. Copyright 1998 by The Aspen Institute.

Relationship of the Current Study to Previous Research

When looking at this study in relation to current and prior research, a few points come to light. First, in narrowing the focus of the studies to the years 2000 and forward, the after-school programs that were looked at may have had the benefit of taking advantage of the years of after-school programming that had occurred prior to the year 2000. This is most beneficial from a practical point of view, as analysis of the programs may indicate clearly what should and should not be a part of an after-school program that has as its goal to have a positive impact on student academic performance. Second, several meta-analyses that have been recently conducted include studies published 20 or more years ago. This is possibly a hindrance to analysis of the

effectiveness of after-school programs, as students are not the same as they were 20 years ago or for that matter 5 years ago.

Of the three major societal concerns that have driven after-school programs: 1) when many students go home they remain alone for long periods of time after-school, until their parents come home from work, 2) some students need more time to learn the curriculum than other students, 3) youth crime and victimization tend to be highest during the after-school hours for students (Kugler, 2001; Witt, 2005). The second is most relevant to this study. The meta-analysis confirms the effectiveness of after-school programs on student achievement in mathematics and reading. As a result, this is a strong indicator that students who get more time to participate in after-school programs will most likely learn the curriculum.

Suggestions for Additional Research

When looking at possible areas for further research the following should be considered: (a) research in science after-school programs, (b) research in non-academic area after-school programs, (c) research in middle socio-economic status students, only, and (d) research on a moving average basis. These areas of research would further expand the knowledge available in the effectiveness of after-school programs.

Research in science has become more important as schools expand their curricula to include more science. This is especially important with the foundational importance science has in areas of technology and engineering. According to the *Science*, *Technology, Engineering and Mathematics (STEM) Education: Background Federal Policy and Legislative Action Report* (Kuenzi, 2008), legislation was introduced in the 110th Congress that supports STEM education in the United States.

Research in non-academic areas has increased in importance, when one considers that often upper-middle class and above do not normally have a need for traditional academic after-school programs which improve academic performance. In this area, non-academic programs gain in importance to students in this category. These programs might consist of programs that explore the various professions and occupations. This is not to imply that professions and occupations are not of value to all students, but to point out the fact that students who are not in need of traditional academic after-school programs will probably not be interested in traditional academic after-school programs.

In addition, parental support for the traditional after-school program will likely not be garnered. Usually students and their parents must see a benefit themselves. As a result, educators should consider including after-school activities that are beneficial to all students in order to get the widest community support.

As for middle socio-economic status students, their needs differ from lower socio-economic status students. Some students might need help in academic areas; however, the intensity of this help may not need to be to the level that low socio-economic students need. In addition, more enrichment type activities should be introduced in after-school programs targeted at students in this socio-economic level. This will likely not only bridge the academic gap but bridge the experience and knowledge gap that exists about nonacademic life and experiences (Afterschool Alliance, 2010).

Another area that deserves further research is to analyze after-school programs on a simple moving average basis. For example every, three to five years a meta-analysis should be conducted that only looks at studies that have been published within the past ten years from that date. The reason published is used versus conducted is that conducted studies are not normally

reported in the same year that they are conducted. The reasoning behind this idea is that both the curriculum and students change over time. As a result, a look at the effectiveness of after-school programs within a recent context would be more beneficial to educational stakeholders.

In conclusion, after-school programs have a positive impact on the outcome of academic areas, reading and mathematics. In addition, further research might prove that after-school programs have room to impact several other areas that have nothing to do with academic areas.

APPENDIX A

CODING MANUAL

As you code the studies, create a separate coding form for each subject area. This will allow the data to be easily utilized in the calculation of the meta-analysis.

1. APA citation. Write the citation in accordance with the American Psychological Association guidelines.

2. Study ID (Identification). The study ID should consist of a letter A, B or C followed by a "-"and then the next unused number in the sequence counting from 1 until all studies have been coded. The number sequence should begin with 1 for each letter. Examples A-1, B-4 and C-10

    a. The letter represents the following time period of the publication. A = 2000-2002, B = 2003-2005 or C = 2006-2009
    b. The number represents the next number in the sequence counting from "1."

3. Year Study Published. Record the year the study was published in the publication.

4. Publication Type. Record one of the following for publication type.

    a. Journal = 1
    b. Association or Agency Study = 3
    c. Dissertation = 2
    d. Other = 4

5. Sampling Method. Describe the method used to sample or assign the students for the study.

6. Grade Level. Record one of the following for grade level:

    a. Elementary (K-5, K-6) = 1
    b. Middle School (7-8, 7-9, 6-8) = 2
    c. Both (K-8) = 3

7. Subject. Code the subject as listed below:
    a. Reading = 1
    b. Mathematics = 2

8. Program. Describe the program included in the study as follows,
    a. During the School Year = 1
    b. During the Summer = 2
    c. During the School Year and Summer = 3

The next section includes the statistical information that should be recorded as is available in the study. All the information may or may not be available in the study. It is important that special attention is given to the data given in the study.

9. N. N is the sample size in the study.

10. t-statistic

11. F-statistic

12. Mean

13. Standard Deviation

14. Effect Size. (Cohen's d)

15. Correlation effect = r

APPENDIX B

CODING FORM

APA Citation	
Study Identification (A-?/B-?/C-?)	
Year Study Published	
Name of Publication	
Publication Type	
Sampling Method	
Grade Level	
Subject (Reading=1/Math=2)	
Program (SY=1/Sum=2/Both=3)	
N	
t-statistic	
F-statistic	
Mean	
Standard Deviation	
Effect Size (Cohen's d)	
Correlation Coefficient (r)	

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