A Meta-Analytic Investigation Examining Effective Characteristics of

Professional Development in K-12 Education Since the Inception of the No Child

Left Behind Act of 2002

by

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ABSTRACT

Professional development is a common phrase used by public school educators to describe the training they participate in order to stay current and increase their knowledge and skills in their respective fields. School districts implement professional development for various purposes including but not limited to curriculum, pedagogy, mathematics and so forth. In various school districts professional development training has many formats. Some of these formats include attending conferences, hiring outside consultants, using existing staff, small group book studies, live sessions and online training. Often, the sessions vary from one single isolated training session to on-going multi-year training plans. Essentially, no professional development programs are identical. This dissertation analyzes current secondary data including published articles, journals, reports, dissertations, theses and studies to identify effective characteristics of professional development in traditional public schools grades K-12 since the inception the No Child Left Behind Act of 2002 hereafter referred to as NCLB. The dependent variable of student test scores is analyzed to examine what characteristics/strategies are identified as effective and to what degree. Analysis revealed that the professional development of teachers had a moderate-to-large significant effect on student achievement.

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Finally, I extend my appreciation to all my family and friends who through the countless hours of study, always maintained unconditional love and support to achieve this accomplishment.

Dedication

I dedicate this work to my father, Joseph A. Thomas, Sr. and my mother, Barbara D. Thomas. They taught me at an early age to "…get your education; nobody can ever take that away." For instilling this value for learning and determination, unconditional love and believing in me through the most challenging years of my life, thank you and God bless you.

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CHAPTER I

Introduction

The purpose of this study is to determine effective characteristics used in professional development in traditional public schools, grades kindergarten through twelve. The universal independent variable in the study is the professional development. Specifically, other variables (strategies/characteristics) that improve student achievement are identified depending upon the education organizations' academic needs and philosophies. The variables vary based upon what factors prompted the educational organization to implement the professional development; i.e. student achievement, literacy, mathematics, and so forth. The dependent variable of test scores is used as the measure of student achievement, regardless of the wide range of focus, quality, purpose of teacher knowledge and the minimal well-validated instruments (Bell, 2010). Respectively, some experts are cited to explain and to excuse poor achievement in schools that have a population of low socioeconomic status (Coleman, Campbell, Hobson, McPartland, Mood, Weinfeld, & York, 1979; Jencks, Smith, Ackland, Bane, Cohen, Gintis, Heyns, & Michelson, 1972). Popham (2001) conducted a study of standardized tests and bias. It was determined that achievement test questions were biased toward students of middle class who grew up in home environments rich with materials of books, media and meaningful experiences as compared to students of low income families who grew up with parents with limited formal education all which are factors with which the school and teachers have no

control. However, for this study, student tests scores are the dependent measure used because currently student test scores are the one measure universally provided to give an indication of achievement. Fundamentally, the significance of this study is to identify the effective characteristics of professional development since the onset of NCLB that school districts can institute to attain desired results.

Problem Statement

Effective characteristics of professional development implemented in traditional public schools, grades K-12, improve teacher performance thus increasing student achievement scores.

Potential Contributions

The potential contributions of this study are that researchers and school districts build upon the capacity of effective strategies and create planned, strategic and fiscally responsible professional development programs for all staff. Also, the significance of this study leads to further research targeting specific topic areas encompassed in educational organizations to allow districts to strategically implement professional development programs designed to improve education for all student groups across America which ultimately help districts determine what model of professional development works best.

Outcome Measure

The outcome measure for this dissertation is student achievement. This variable contributes to the identification of moderators in the studies for the meta-analysis to analyze the impact of professional development.

Research Questions

The emphasis of the dissertation is to examine effective characteristics of professional development in K-12 education since the inception of NCLB. Respectively, two broad inquiries that frame the study include:

1. What is the impact of professional development on student achievement since the implementation of NCLB (2002)?

2. What aspects of professional development are found to have the greatest impact on student achievement?

Limitations of Study

This study is designed to identify the effective characteristics of professional development in schools, grades K-12 since the onset of NCLB. With this said, there are various limitations that can affect the significance of the characteristics. Some of these limitations include but are not limited to:

- Student test scores not being a good measure of student achievement;

- Available data on comparison of professional development prior to 2002;

- Available studies examining the impact of professional development on student achievement since the inception of NCLB;

- Current data that is not regional in studies;

- Current data that is not topic or grade level specific;

- The limit of what is reported in the available research;

- The extrapolation of the data;

- The lack of impact of professional development on teacher improvement;

- The various factors that impact student achievement beyond the scope of professional development.

CHAPTER II

LITERATURE REVIEW

Summary Statement

Chapter Two is structured with the purpose of demonstrating a timeline for improved characteristics of professional development leading up to NCLB with an emphasis on post NCLB (2002) to the present date.

In order to build a case for the necessity to perform the current investigation and better illustrate the impact that NCLB had on professional development, it is important to elucidate the history of NCLB, the progression of the movements to improve professional development due to the direct and indirect influence of NCLB and identify moderators that support the claims that professional development has an impact on student test scores, irrespective if student scores are or are not the best measure of student achievement.

This chapter provides a synthesis of literature supporting this study which is broad in the sense that it examines data from various published articles, journals, reports and studies. Also included in this section is a detailed account of the direct and indirect influences that NCLB had on school districts, schools and staff to provide and participate in professional development.

Introduction

With the dire financial crisis facing our national and state economy, schools are forced to reduce budgets. Concurrently, with identifying effective

characteristics for professional development, the literature reflects a variance in decision making and implementation of specific professional development programs. It is likely that with the advent of technology and the constraint of time, online professional development will become a format of choice. Yet, like traditional methods of professional development, there are still challenges to overcome.

This dissertation examines the influence NCLB had on schools and districts to provide professional development programs, the progression of traditional professional development toward online formats and the effective characteristics of both methods. These characteristics are identified as the independent variables.

Finally, the literature examines the variables of teacher testimonials and student achievement in an effort to identify effective characteristics of professional development. It is reasonable to infer that there are additional independent variables that either increase or decrease student test scores in conjunction with professional development practices whether supported through data or claims by teachers.

Professional Development Defined

The term professional development is a universal phrase used by various fields to describe training of employees. Specifically for this dissertation, "Professional development can be defined as a career-long process in which educators fine-tune their teaching to meet student needs" (Diaz-Maggioli, n.d., p. 2). Schools implement professional development for various reasons to improve

targeted outcomes. Some of the different topics include legal discourse, safety and policy development. For this investigation, professional development is broadly examined to analyze the effects it has of student achievement.

History of NCLB, Parameters of the Law and Accountability Measures

The United States Department of Education was formed in 1867 to collect data and ensure that public education was successful by assisting states to develop effective systems (United States Department of Education, 2012). Even with the formation of the Department of Education, inconsistencies amongst the educational institutions that were funded with public tax dollars in the United States existed (Smith & Wohlstetter, 2001; Young, 2001).

Throughout the 130 years of existence, the United States Department of Education changed its form and functions under the executive branch to influence educational reform and create a better education system for all citizens. One major movement from 1979-2002 that had an influence on NCLB and improving teacher quality, which is deemed as a primary indicator of a student's academic success in school (Darling-Hammond & Berry, 2006; Dash et al., 2012; Dickson, 2002; Geringer, 2003; Lasley, Siedentop, & Hattie, 2009; Yinger, 2006) was America 2000 that later evolved into Goals 2000 which derived from former Governor of South Carolina, Richard Riley, who was appointed as education secretary by President William Clinton. Goals 2000 was explained in a report released by Duke University:

> The purpose of Goals 2000 package was threefold: to promote the achievement of national education goals by the year 2000; to

expectations for parents, teachers, and students with the aid of high standards; and to give state and local reform efforts greater flexibility and more support (Stallings, 2002, p. 9).

A second event that contributed to the creation of NCLB occurred in 1987, A Nation At Risk. In an unparalleled report in 1983 the status of public education in the United States compared with other nations was deteriorating. The report concluded that:

The educational foundations of our society are presently being eroded by a rising tide of mediocrity that threatens our very future as a Nation and a people. What was unimaginable a generation ago has begun to occur--others are matching and surpassing our educational attainments (United States Department of Education, 1999).

This report, combined with political pressures prompted the government to take action led to the creation and implementation of NCLB.

Prior to NCLB, the government granted states authority to institute public education under the Bill of Rights in the United States Constitution. Under the tenth amendment, "The powers not delegated to the United States by the Constitution, nor prohibited by it to the states, are reserved to the states respectively, or to the people" (Cornell University School of Law, n.d.). With these provisions in place for almost 100 years, the conditions of inadequacy, lack of accountability and inconsistent standards in public education led to the necessity for the federal legislation of NCLB. Even with the highly politicized

and criticized law, organized federal influence and guidance in public education reached well beyond the spectrum of NCLB.

On January 8, 2002, the bipartisan support of Congress to reauthorize the Elementary and Secondary Education Act (ESEA) passed NCLB (VerBruggen, 2012). It was one of the most influential and organized movements in public education in an attempt to restructure and improve public education throughout the United States. NCLB had various sections addressing, measuring and penalizing schools and districts that failed to meet the predetermined benchmark standards. Among the components of NCLB was the aspect of high quality professional development as a key strategy to improve teaching and learning thus producing highly qualified teachers. Explained in NCLB under section nine addressing professional development, schools were to maintain that activities, "Are high quality, sustained, intensive, and classroom-focused in order to have a positive and lasting impact on classroom instruction and the teacher's performance in the classroom; and are not 1-day or short-term workshops or conferences …" (NCLB, Title IX, Section 9101(34)). Even with the passage of this powerful section, the national focus to improve instruction had momentum prior to the passage of NCLB. Consequently, NCLB outlined solutions to address this problem by creating federally mandated standards and high stakes assessment requirements, developed and instituted by individual states to measure the success toward improving educational systems in the United States. Through NCLB, clear and concise objectives were set. Essentially, "NCLB is built on 'four pillars' which guide the legislation. These four pillars are: stronger accountability

for results, more freedom for states and communities, proven education methods, and more choices for parents" (United States Department of Education, 2008).

Districts and states that failed to institute the legislation or failed in the efforts to reach preset benchmarks faced severe sanctions that included reduction and loss of federal funding.

With the onset of new guidelines and strategies for schools to implement, it was evident that NCLB had a direct and indirect influence on schools and districts. Essentially, the response by many schools and districts had been proactively addressed to meet the required standards through teacher training: professional development.

<div align="center">Criticism of NCLB and Its Mandates</div>

Since the inception of NCLB in 2002, there have been many debates that the law undermines public schools and teachers through various unfunded mandates that are essentially unrealistic. A survey of principals and superintendents released in 2003 highlighted multiple concerns calling the law political and another way to undermine our schools (NCLB, 2004). A focal point of criticism responding to the mandate of adequate yearly progress (AYP) for all students proclaimed,

> …whether states will have the capacity to help all the schools
> identified as missing adequate yearly progress targets. For the
> 2003-04 school year, 36 states planned to provide assistance to
> such schools, according to the survey. Twenty-two states and the

District of Columbia had consequences in place for consistently low-performing schools for 2003-04 (NCLB, 2004).

In essence, school districts were beginning to change in order to comply with NCLB.

Nonetheless, as time progressed, there were varying opinions and opponents to NCLB and AYP due to the lack of teacher training and options. At a panel discussion in Milwaukee, Wisconsin, many education experts pronounced their opposition to NCLB and AYP. Some adversaries included Elaine Garan, professor at California State University-Fresno, who stated, "If you're teaching in a school like that, the more miserable you are, the better a teacher you are" (Opponents, 2009). Doug Christensen, Commissioner of Education in Nebraska stated,

I can think of nothing in my 42 years in education that I've been as angry about as this…the law's 'adequate yearly progress' system for measuring schools was doing nothing to improve education, including for the students most in need of help, and that the system of sanctions created by the law was headed for 'an educational meltdown' (Opponents, 2009).

Ultimately, with NCLB and AYP taking a brunt of criticism, Richard Allington, a professor at the University of Tennessee and past president of the International Reading Association, summed up the conference by stating, "The question that underlies this whole session is, so what do you replace bad ideas with. . . . We have to have an alternative and, so far today, I haven't gotten a sense

that the panel has an alternative" (Opponents, 2009). Even with the political outcry and obvious need to repeal unrealistic goals, denouncement of the law as ineffective and unconstitutional remains in full force and is widespread across the nation (McCluskey & Coulson, 2007; Greifner, 2006; Newport, 2009; Welner, 2005). Nevertheless, to date, there has been no reauthorization of NCLB under President Barack Obama, though there seems to be bipartisan support that such legislation will be drafted and passed soon after the presidential election. Influential political leaders Bill Frist and John Podesta commented about the urgency of the reauthorization of NCLB.

> Congress needs to come together now to reauthorize the law – and here is why:
>
> 1. NCLB is outdated approach needs to be revised;
>
> 2. The law's current accountability framework is outdated;
>
> 3. Economic competitiveness requires that all students graduate from high school ready for college or a career;
>
> 4. The law should integrate innovative competitive grant programs; [Race to the Top round 3!]
>
> 5. We need better teacher evaluation systems. Recruiting, retaining, rewarding and evaluating good teachers and leaders is everything. Let's get on it (Frist, 2011).

Regardless of the timing and content reauthorized under NCLB, it is inevitable that opposition will occur, especially from local, state and national advocacy groups.

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NCLB Warrants the Need for High Quality Professional Development

Since NCLB's inception into law in 2002, there were a series of changes needed by schools and districts to implement the requirements of highly qualified teachers. In 2004, Margaret Spellings, Secretary of Education for the United States Department of Education, outlined "A Roadmap for State Implementation." Spellings succumbed that since its creation in 2001, education has been fundamentally changed. "NCLB was a national endorsement of the conviction that every child matters and that every child can learn" (Spellings, 2004, p. 2). With her words, she described NCLB as a law of principles that involved all students in grades three through eight that measured student achievement annually leading up to one hundred percent proficiency by 2013-2014 with a strong emphasis on teachers to reach this goal. She explained,

> States are responsible for implementing a rigorous system for ensuring teachers are highly qualified, for making strong efforts to ensure that all students have access to highly qualified teachers, and for providing support for recruiting and retaining the best and brightest teachers for our schools (pp. 2-3).

Among various academic and funding features of NCLB, the law's heightened accountability measures for schools, districts and teachers required them to move well beyond the scope of professional development. NCLB influenced schools and districts to evaluate student data in specific academic content areas, develop plans for improvement in areas of weaknesses and implement the plans including staff training. The National Science Teachers

Association issued a report a few months following the enactment of NCLB that responded to the expanded requirements.

> Science teachers are strongly encouraged to take an active role in their training by working with their school/district to create a needs assessment, then charting their own professional growth with an individual professional development plan that can be used in developing the district's Local Improvement Plan (No Child Left Behind, 2002).

These new unforeseen measures forced districts to respond quickly in order to attain compliance with the law.

Through the new accountability standards under NCLB, the law was redirecting school districts to identify specific academic areas with specific student groups to raise student achievement. Schools that failed to raise achievement were faced with multiple sanctions by the state system, some severe. Nevertheless, the building of capacity to address the demands of NCLB was viewed through various lenses. Funding, reasonable goals, teaching strategies, assessments and school reform all contributed to the success of attaining the compromised goals of improving student achievement for all students under NCLB. Thus, it was evident that NCLB encompassed more than just accountability among students and administrators. Teachers were required to accept leadership roles and take responsibility for their own learning and development that built capacity, stability and civility among their students, classrooms and individual buildings (Freiberg, 2009). Respectively, every

strategy under NCLB of school and academic improvement involved staff training (Guskey, 2003; Holloway, 2003; Hunt, 2006; McCarthy, 2006).

Progression of Effective Practices of Professional Development

In response to the high stakes accountability measures of NCLB to increase student achievement for all students, professional development was implemented as an instrument to improve instruction putting teachers at the forefront to attain increased results in student achievement (Smith, 2007; Blank & Alas, 2009; Wilson & Berne, 1999). Consequently, the professional development implemented had received mixed reviews about what worked and was effective. With the various purposes that professional development was performed, it was difficult to narrowly define high quality professional development.

> There is a large literature describing 'best practices' in professional
> development, drawing on expert experiences. Despite the size of
> the body of literature, however, relatively little research has been
> conducted on the effects of professional development on
> improvements in teaching or on student outcomes (Garet, Porter,
> Desimone, Birman, & Yoon, 2004, p. 917).

With NCLB still at its infancy for reshaping what schools and teachers typically touted as success, the professional development activities that were being implemented prior to and after NCLB were falling short of the expected outcomes. A report released by Educational Leadership stated, "Much of the professional development that is offered to teachers, however, simply does not meet the challenges of the reform movement" (Birman, Desimone, Porter, &

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Garet, 2000, p. 28). Nevertheless, there were still inconsistent results from the implementation of professional development, student achievement and teacher growth (Bullough, Kauchak, Crow, Hobbs, & Stokes1997; Cordingly, Bell, Rundell & Evans, 2003; Lustic & Sykes, 2006; Ross, Bruce, & Hogaboam-Gray, 2006).

With the dilemma of inconsistent results and practices of professional development, the nation's educators faced a new challenge: find what works.

With this, it was determined that a range of controllable characteristics such as curriculum development and teacher efficacy were deemed to have more of an impact on teachers and student scores than others. (Huffman & Thomas, 2003; McBride, 2006; Ross & Bruce, 2007). Still, more challenges and barriers were emerging; there was a shortage of teachers.

In a report by the United States Department of Education analyzing teacher shortages from 1991-2012, several provisions such as loan forgiveness and alternative certification were enacted to rectify this increasing problem (The Abell Foundation, 2001), though, many experts challenged the report fearing the negation of the standards of highly qualified teachers under NCLB. Nevertheless, certification was not a variable. "You would think it would be simple to compare student achievement for certified versus uncertified teachers, but it is not" (Whitehurst, 2002, p. 44). Reasons to deflate the claim of certification as a stand alone variable were supported by various resources prior to NCLB (Bradshaw & Hawk, 1996; Hammond, 2001; Teacher, 2001). First, in most states, certification was needed to begin employment in teaching. Second, certification was

sometimes bypassed through alternative certification in order to eliminate various required teaching courses. Third, out of field teaching, such as teaching math with an English degree, was a common practice. Further, certification requirements from state to state differed. Whitehurst warrants this claim in a study performed in 1998 by Goldhaber and Brewer explaining they,

> …analyzed data from over 18,000 10th graders who participated in the National Education Longitudinal Study of 1988. After adjusting for students' achievement scores in 8th grade, teacher certification in 10th grade was not significantly related to test scores in 10th grade" (p. 44).

In another study, notable because it used experimental logic rather than the correlational approaches that dominate study of this topic, Miller, McKenna, and McKenna (1998) matched 41 alternatively trained teachers with 41 traditionally trained teachers in the same school. There were no significant differences in student achievement across the classrooms of the two groups of teachers (Whitehurst, 2002, pp. 45). Furthermore, a study by Darling-Hammond (1999) stands in contrast to the many studies that finds no effects or very small effects for teacher certification. She related scores on the National Assessment of Educational Progress at the state level to the percentage of well-qualified teachers in each state. "Well qualified" was defined as a teacher who was fully certified and held the equivalent of a major in the field being taught. For generalist elementary teachers, the major had to be in elementary education; for elementary specialists, the major had to be in content areas such as reading, mathematics, or

special education. Darling-Hammond reported that teacher qualifications accounted for approximately 40 to 60 percent of the variance across states in average student achievement levels on the NAEP 4th and 8th grade reading and mathematics assessment, after taking into account student poverty and language background (Whitehurst, 2002, p. 45).

With certification not necessarily a correlated variable for teacher quality (Angrist & Guryan, 2003; Angus, 2001), the search for effective strategies and characteristics of professional development continued.

Contrary to teacher certification, several experts identified a more controllable variable that was significant. The characteristic of subject area knowledge as a factor in student achievement and teacher effectiveness was identified. For example, teachers with a math or science major have higher test scores than teachers who are teaching these subjects out of field (Brewer & Goldhaber, 2000; Monk, 1994; Meyer & Sutton, 2006; Monk & King, 1994; Rowan, Chiang, & Miller, 1997; Santau, Maerten-Rivera, & Huggins, 2011; Young & Lee, 2005). Though, even with the ability to control and improve this variable, there were still mixed results in teacher performance.

Concurrent with content area expertise, a wide range of effective characteristics began to emerge from practices prior to NCLB and beyond. Many researchers discovered that professional development had similar effective characteristics across a wide range of subject areas taught in schools. Collectively, the strategies of enhancing knowledge and skills, modeling, creating a culture for professional growth, professional learning communities, empowering

staff within to become leaders and providing context to the various areas of educational systems were becoming prevalent as a norm for teacher professional growth and student achievement (Birman, Desimone, Porter, & Garet, 2000; Bruce, Esmonde, Ross, Dooke, & Beatty, 2010; Darling-Hammond & McLaughlin, 1995; Jeanpierre, Oberhauser, & Freeman, 2005; Johnson, 2010; Lieberman, 1995; Little,1997; Niess, 2005; Scantlebury, 2011). Along with these characteristics and like good teaching, it was discovered, "…that professional development focused on specific instructional practices increases teachers' use of those practices in the classroom" and "…that specific features, such as active learning opportunities, increase the effect of the professional development on teacher's instruction" (Desimone, Porter, Garet, Yoon, & Birman, 2002, p. 81). Correspondingly, professional development that improves teaching generally results in increased student achievement (Birman et al., 2000; Burkhouse, Loftus, Sadowski, & Buzard, 2003; Garet, Porter, Desimone, Birman, & Yoon, 2001, Guskey, 2002; Hill, Rowan, & Ball, 2005; Yoon, Duncan, Lee, Scarloss, & Shapley, 2007).

With the wide array of philosophies of professional development and identifiable characteristics emerging, it is reasonable to believe that effective characteristics of professional development determine the success of districts. In a four year random study of cross-categorical districts ranging in size and demographics of teacher-led professional development, effective characteristics were identified by comparing healthy and unhealthy districts (Pritchard & Marshall, 2002). Essentially, as mentioned in other studies, professional

development in a healthy district was an institutional norm whereas it was embraced as part of the culture as opposed to the unhealthy districts whereas professional development had little to no record of existence. Respectively, the effective characteristics of healthy districts:

1. Address fundamental issues of curriculum and instruction as part of an integrated district strategy;

2. Are driven by a shared district focus on learning for all professionals;

3. Are driven by a shared building focus aligned with the district vision; format varies by purpose;

4. Are expected as a job responsibility of every employee;

5. Are based first on district constancy of purpose and secondarily on individual selection;

6. Involve administrators in planning and participating in professional development activities, and emphasizes that professional development assures system excellence;

7. Are predominantly addressed during work time;

8. Provide thematic activities targeted to the district purpose and offered over time;

9. Use assessments of district needs for setting professional development priorities;

10. Has a protected, designated line item in budget (pp. 126-134).

Concisely, it is reasonable to synthesize that healthy districts do not determine professional development based upon individual needs of teachers, rather on

institutional needs. Professional development in healthy districts is part of the

culture and vision that is systemic and sustainable through budgeting and time

(Johnson, Kahle, & Fargo, 2007). It is carefully planned and executed with a

clear vision, defined to enhance the performance of existing staff and is relevant

so that teachers can easily adapt and apply their learning into the classroom

setting (Heller, 2007; Yoon, Duncan, & Lee, 2007; Guskey, 1995).

<center>Online Professional Development Emerges</center>

With the increasing demands of NCLB, dwindling budgets and the ever so

rapidly changing influx of technology, many school and districts are moving

toward an online format for professional development. Prior to NCLB, there were

varying philosophies and methods to implement professional development. Such

common strategies involved hiring outside consultants, utilizing in-house staff,

sending teachers to outside conferences, empowering teachers to build

professional learning communities that had shared values and norms, a clear focus

on student learning, and collaboration (Vescio, Ross, & Adams, 2008).

Nonetheless, the overarching goals for professional development were to provide

relevant, on-going strategies with clear and concise goals that challenged the

teachers intellectually (French, 2007). Undoubtedly, teachers who participated

were expected to translate the learning into the classroom. If not, valuable human

resources and time were wasted.

With the constraints of time and human and financial resources, many

districts struggled with providing professional development programs that

reflected the effective characteristics of traditional practices. Nevertheless, many

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schools, districts and teachers were turning to online professional development

opportunities to fill these voids thus providing professional growth and

motivation, increasing the opportunities in collaborative forums and participation

in problem solving exercises that could be transferred into the classroom

(Marrero, Riccio, Schuster, & Woodruff, 2010; Adams, 2010).

One emerging practice was use of an online web-supported professional

development format that created a virtual learning community. One study

involved math and science teachers in grades five through twelve that created an

Inquiry Learning Forum, "…a web-based professional development system

designed to support a community of practice (CoP) of in-service and pre-service

mathematics and science teachers who are creating, reflecting upon, sharing, and

improving inquiry-based pedagogical practices" (Barab, MaKinster, & Scheckler,

2003, p. 237). Other methods similar to this format involved online communities

that shared practices, engaged in knowledge sharing and fostered relationships

(Booth, 2011; Burke, 2012; Mitchell, 2012; Elias, 2012). Essentially, effective

characteristics of professional development seemed universal whether it was

implemented face-to-face in real time or web-based by fostering relationships and

pedagogy in an effort to improve instructional strategies.

One report by the Interactive Educational Systems Design (IESD) in 2010

used both quantitative data from teachers grades K-12 and qualitative data from

principals who had used online social networks for professional growth. The key

findings reflected that more than 62 % of teachers utilized social networking sites

as compared to 54 % of principals. Typically, the younger the participants, the

more likely they joined social groups. Even with the disparity between teachers and principals, the majority of the principals believed that the activities of social networking sites had the potential to improve educational experiences for students (Interactive Educational Systems Design, 2010).

Another example of an online professional development model in an attempt to reform and enhance teaching strategies involved the creation of professional development schools (PDS). PDS are not new. "Professional development schools (PDS) are innovative institutions formed through partnerships between professional education programs and P–12 schools" (NCATE, n.d.).   Essentially, PDS have clear standards that are closely aligned with effective characteristics of professional development. The focus of PDS revolved around developing learning communities, accountability, collaboration amongst participating entities, allocation of resources, school improvement and professional development to ensure diverse learners' needs were satisfied (Castle, Arends, & Rockwood, 2008, Creasy, 2006; NCATE, n.d.).

One specific study about PDS characterized the collaboration between higher education and public school employees and the impact it had on school change and professional teacher growth (Bullough et al., 1997). The study entailed seven PDS utilizing 49 interviews of teachers and principals including data from questionnaires; program results varied. Key findings reflected:

> Program results were mixed, underscoring the importance of a range of context variables to program success, including school district support, principal, staff and University faculty stability,

student body composition, school and faculty size, as well as the nature of teachers' program involvement (Bullough et al., 1997, p. 153).

Nevertheless, with these ideas in mind and considering that every school and district faced multiple external variables that affected teacher performance, again, similar results that were translatable to effective practices and characteristics of traditional professional development were present. Bullough explained, "…we believe the best that can be hoped for is a cluster of general qualities, of the sort…as characteristics of good schools, a set of general goals, and a shared value commitment" (Bullough et al., 1997, p. 163). This finding translated into a shared common vision and emphasis on teacher development in order to achieve increased results.

With online professional development experiencing mixed results in the delivery, participation and measurable growth, just like traditional professional development, design was a factor that had to be considered when utilizing online strategies. (Hinson & LaPrairie, 2005; Zhao, Lei, Yan, Lai, & Tan, 2005). Specifically, "Well-designed online training can be highly effective" (Tyre, 2002, p. 37). When compared to traditional professional development, online learning could be so much more (Kleiman, 2004). What was once delivered utilizing correspondence courses, videos and audio tapes has been transformed by the use of the Internet, both synchronous and asynchronous learning. Essentially, "Distance education, once characterized by correspondence courses, videotapes, and satellite downlinks, has migrated to the Internet and involves streaming video

and audio, self-paced lessons, desktop videoconferencing, video broadcasting, and high-end multimedia" (Thomas, 2009). Eventually, various topics addressing various grade levels and multiple skill levels were addressed through online professional development. Also online professional development allowed for quality training for teachers that normally would not be accessible due to budgetary constraints or rural locations (Salazar, Anguirre-Munoz, Fox, & Nuanez-Lucas, 2010).

<div align="center">Advantages of Online Professional Development</div>

In essence, online professional development had many advantages. Online methods allowed participants to have active interaction (Harasim, Hiltz, Teles & Toroff, 1995.) which was traditionally characterized as effective practices in traditional methods. The barrier of time constraints for participants and space limitations were eliminated as participants gained greater flexibility around diverse schedules to learn and address problems (Hara, Bonk, & Angeli, 2000). With budget constraints facing most districts, extensive travel and common scheduling of participants were eliminated as training could be done through an asynchronous model through assigned timeframes (Russell, Kleiman, Carey, & Douglas, 2009). Essentially, online professional development allowed for teachers to participate with flexible schedules which created job embedded opportunities that addressed individualized needs and learning styles, utilized a variety of methods to interact with one-another including multi-media formats concurrently with gaining valuable technology skills that was utilized in their everyday instructional practices (Docherty & Sandhu, 2006; Garrison &

Cleveland-Innes, 2005; Ginsberg, Gray, & Levin, 2004; Richardson, 2002; Treacy, Kleiman, & Peterson, 2002). Technology was becoming a tool for teaching and learning as sought after by many twenty-first century leaders.

Disadvantages of Online Professional Development

With any new instructional method come disadvantages. The same is so with online professional development. With the widespread fiscal constraints, an obvious barrier was the lack of adequate technology to deliver professional development.

Dating back to the infusion of technology, online professional development required a commitment and comfort level of participants to use the Internet, problem solve interface platforms, utilize communication skills for retrieval and submission of materials and understand the various tools. This allowed the participants not to be distracted from the learning objective. Essentially, online professional development participants needed to be comfortable with using a computer and its functions (Armstrong, Blaschke, Brown, Burk, Chanikian, & Chilcoate, 2000). Other barriers included the lack of training of participants with computer "Netiquette" which involved the proper etiquette for using the Internet and technology to communicate (Harasim et al., 1995, p. 210). Also, common hurdles involved network breakdowns and slow Internet connections. Though, as with traditional professional development, intrinsic motivation of participants was imperative considering that there was no set schedule for online courses which often resulted in high levels of attrition (Stanford-Bowers, 2008; Tyler-Smith, 2006). Furthermore, participants

encountered difficulties accessing online programs (Collins & Berge, n.d.) or like

the stereotype of online schools, claimed to miss the personal interaction that

typically occurred and was taken for granted in face-to-face professional

development activities (Richardson & Swan, 2003; Rivera & Rowland, 2008).

Nevertheless, testimonials about online professional development opportunities

when compared with traditional face-to-face professional development

opportunities often received negative ratings by participants (Johnson, Aragon,

Najmuddin & Palma-Rivas, 2000). Even so, it was imperative to understand the

wide range of online professional opportunities that involved lack of rigor with

poor planning and construct as opposed to highly effective programming that was

individualized to meet specific needs, were well designed and were relevant to the

high stakes requirements of NCLB and diverse student populations (Dede, 2006;

Galley, 2002).

Impact of Online and Traditional Professional Development on Student

Achievement

The overarching impact of online professional development is not yet fully

understood. Some research has suggested that this delivery model is effective,

though contradictory findings have suggested that online delivery models might

not be the catholicon that proponents of the online delivery model want to believe.

In an effort to resolve these contradictions, this dissertation meta-analyzes the

existing research of professional development for teachers in the K-12 grade level

since the onset of NCLB.

A meta-analytic investigation of the existing research examining professional development can provide valuable information about what aspects of professional development works best in different educational settings. Respectively, it is imperative to remain cognizant that professional development is rapidly evolving, becoming more accessible to schools and teachers and increasingly becoming the focal point for addressing high stakes accountability in the twenty first century. Accordingly, it is essential to acknowledge that to date there has been no meta-analytic study that analyzed the effective characteristics of professional development in K-12 education since the inception of NCLB (2002).

CHAPTER III

METHOD

Overview of Meta-Analysis

The analytical method for this study is a meta-analysis. A meta-analysis is

defined as the, "Analysis of analyses" (Glass, McGaw, & Smith, 1981). The

purpose of the meta-analysis is to analyze multiple studies in order to determine

the significance of multiple variables against the outcome variable of student

achievement. Glass et al., (1981) explains that a meta-analysis allows for studies

with smaller sample sizes to be combined thus produce a much larger sample size

which in turn will increase the statistical power.

According to Glass et al., there are three necessary steps when performing

a meta-analysis. The first step involves collecting research studies to analyze

against the outcome variable. The studies collected must fit parameters of the

overall analysis as well as match the data on the specified research topic. While

performing and analyzing the search for relevant studies, it is likely that bias will

be discovered. In order to minimize the bias, it is imperative to continue deeper

into the search for available studies.

The second step according to Glass et al. is to analyze the data. By the

analysis, it is suggested that the studies be described, classified and coded. An

important aspect of this step involves measurement consistency. In order to

obtain this, Glass et al. suggests coding the studies twice in order to establish rater

agreement which essentially is a score of homogeneity for the ratings. In order

for this to occur, it is important to clearly define the moderator variables so that

apparent differences are evident between the different classifications. This process creates reliability of the coding processes in data and is found to be reliable in the classifications more than 95% of the time.

The final step in a meta-analysis according to Glass et al. is the analysis of the complete mean effect size measures including each individual mean effect size measure for each research variable being studied. Once all of the effect size measures are calculated, the results are analyzed, interpreted and reported as findings.

A more linear approach to conducting a meta-analysis is described by Lipsey, (2011) in seven basic steps. Specifically, the steps involve:

1. Problem definition – topic, empirical relationships of interest, type of research and acceptable methods;

2. Defining the population of relevant studies and determining eligibility criteria;

3. Locating and retrieving eligible studies – attempt to obtain entire population, published and unpublished;

4. Developing and testing a coding scheme and coding manual;

5. Coding eligible studies; constructing a database;

6. Statistical analysis of the meta-analytic data;

7. Interpretation and reporting of analysis results (Lipsey, 2011).

Utilizing and integrating the best practices of Glass et al. and Lipsey, (2011) for this meta-analysis will improve the validity and reliability of this overall study.

Research Questions

The purpose of this study is to analyze effective characteristics of professional development in K-12 education since the inception of NCLB. In order to examine the multiple variables against the outcome variable of student achievement, data from the studies will be meta-analyzed to examine the following questions.

Primary Questions:

1. What is the impact of professional development on student achievement across different school levels (elementary, middle, high school, mixed)?

2. What is the impact of professional development on student achievement across different dosages (the duration of the teacher training or professional development)?

3. What is the impact of professional development on student achievement across different delivery methods (face-to-face, mixed, online)?

4. What is the impact of professional development on student achievement across different sample sizes?

5. What is the impact of professional development on student achievement across different subject areas?

6. What is the impact of professional development on student achievement across the different characteristics of programs?

7. What is the impact of professional development on student achievement across the different characteristics of strategies?

8. What is the impact of professional development on student achievement across different providers (internal or external, expert, both, etc.)?

9. What is the impact of professional development on student achievement across different funding (school budget, grant or both)?

10. What is the impact of professional development on student achievement across different attendance choices of participants (volunteer, mandatory or both)?

11. What is the impact of professional development on student achievement across different exam types (local, state, national, combination or commercial)?

Secondary Questions:

1. What is the impact of professional development on student achievement across different locations?

2. What is the impact of professional development on student achievement across different publication years?

3. What is the impact of professional development on student achievement across different sources (dissertation, article, grant, presentation, etc.)?

Sample of Studies

The studies for this meta-analysis were sought utilizing technology.

Extensive online searches utilizing databases over a nine month period included

Google, Google Scholar, Educational Resources Information Circuit (ERIC),

EBSCO, Electronic Journal Dissertations (EJC), edgov, JSTOR and other

electronic files gathered and saved throughout recent coursework at Youngstown

State University. Most of the research spanned from 2000-2012 with some of the

research spanning from 1992-2000 in order to establish a historical perspective of

studies prior to NCLB.

The specific descriptive search criteria included history of NCLB,

opponents of NCLB, accountability measures of NCLB, NCLB professional

development, NCLB certification, influence of NCLB on professional

development, effective practices of professional development, ineffective

practices of professional development, online professional development student

achievement, advantages of online professional development, disadvantages of

online professional development, and online professional development and

student achievement. Abstracts, summaries and table of contents of articles were

reviewed in order to select which studies to include. The criteria to include

articles were: (1) articles that addressed public schools grades K-12; (2) articles

that addressed student achievement; (3) studies that addressed improvement in

student achievement scores in various subject areas.

Once a substantial number of articles, dissertations and presentations were

found, they were downloaded electronically and printed. The articles were

carefully analyzed in order to determine whether the information and data were

pertinent to this study. The articles that were not relevant were discarded.

Once specific identified articles were secured, reference lists from the

various articles were examined in order to produce any additional references that

did not surface during the initial search process in which the screening to include

or discard newly identified references was repeated. Overall, there were more

than 500 initial resources identified for this study in which more than half were

discarded due to generalized claims and discrepancies in the research. The

elimination process left 213 resources to consider using in the study. After

careful consideration and discretion, 115 studies were selected to be used

primarily in the literature review as well as other chapter sections. From the 115

sources, 90 mention professional development and student achievement but only

have data on efficacy or results about teachers' scores on some measure. Also, 17

studies that included inferential quantitative data such as means, standard

deviations, variances, t tests, f tests, and chi-square data were selected from the

115 studies for the meta-analysis and are denoted in the reference list with an

asterisk.

Essential for analyzing the data, this exhaustive search, review and

selection process yielded 17 studies for the meta-analysis in which 53 effect sizes

were calculated, a student sample size of 69,556 and an overall total of 14

moderators to build a case for the study and shape the questions.

Coding of the Studies

The research is coded according to the following primary and secondary

study characteristics. Primary: school level, dosage, delivery method, sample

size, subject area, programs, strategies, providers, funding, attendance and exam type. Secondary: location, publication year and source.

Primary:

School Level

The data obtained in the studies for the meta-analysis includes elementary school grades K-5, middle school grades six through eight, high school grades nine through twelve and mixed school grades; any combination of grades spanning whether one grade level above or one grade level below the previous descriptions. The moderator of school level was coded according to the following: 1 = elementary school, 2 = middle school, 3 = high school, 4 = elementary and middle school, 5 = middle and high school and 6 = elementary, middle and high school.

Dosage

The data obtained in the studies for the meta-analysis involves various levels of dosage: how long the teacher training or professional development was implemented. The moderator of dosage was coded according to the following: 1 = less than one week, 2 = less than one month, 3 = one to six months, 4 = six months to one year and 5 = more than one year.

Delivery Method

The data obtained in the studies for the meta-analysis includes the following delivery methods; face-to-face, mixed, and online. The moderator of delivery method was coded according to the following: 1 = face-to-face, 2 = online and 3 = face-to-face and online (both).

Sample Size

The data obtained in the studies for the meta-analysis has varying sample sizes. The moderator of sample size by the number of students was coded according to the following: $1 = 1$-250 students, $2 = 250$-500 students, $3 = 500$-750 students, $4 = 750$-1000 students and $5 =$ greater than 1000 students.

Subject Area

The data obtained in the studies for the meta-analysis includes the subjects of math, reading and science (biology and chemistry). The moderator of subject area was coded according to the following: $1 =$ math, $2 =$ reading and $3 =$ science.

Programs

The data obtained in the studies for the meta-analysis involves programs that are individually tailored to individual schools/staffs and commercialized pre-made training sessions (packaged). The moderator of programs was coded according to the following: $1 =$ packaged program and $2 =$ not packaged.

Strategies

The data obtained in the studies for the meta-analysis involves strategies to address a focal topic of the professional development. The moderator of strategies was coded according to the following: $1 =$ pedagogy, $2 =$ content, $3 =$ content and pedagogy, $4 =$ efficacy and $5 =$ other.

Providers

The data obtained in the studies for the meta-analysis involves whether the professional development was done by existing staff "in-house" or contracted to an outside agency/person. The moderator of providers was coded according to the following: $1 =$ internal, $2 =$ external and $3 =$ both internal and external.

Funding

The data obtained in the studies for the meta-analysis involves the source of the funding through school or district budgets (internal), grants (external), or both. The moderator of funding was coded according to the following: 0 = did not say, 1 = internal, 2 = external or 3 = both internal and external.

Attendance

The data obtained in the studies for the meta-analysis involves whether the attendance of participants was voluntary, mandatory or both. The moderator of attendance was coded according to the following: 1 = voluntary, 2 = mandatory and 3 = both voluntary and mandatory.

Exam Types

The data obtained in the studies for the meta-analysis involves student achievement scores across different exam types (local, state, national, combination or commercial). The moderator of exam types was coded according to the following: 1 = local exam, 2 = state exam, 3 = national exam, 4 = any combination of local, state or national exam and 5 = commercial.

Secondary:

Location

The data obtained in the studies for the meta-analysis involves various studies across the United States of America and beyond. The moderator of location was coded according to the following: 1 = one state, 2 = multiple states and 3 = out of the United States.

Publication Year

The data obtained in the studies for the meta-analysis span over the years of 2002-2012; since the inception of NCLB to the present year. The moderator of publication year was coded according to the following: 1 = 2006 and newer and 2 = 2005 and older.

Source

The data obtained in the studies for the meta-analysis include a wide range of resources. The moderator of source was coded according to the following: 1 = research journal or research article, 2 = research reports or government reports, 3 = dissertation and 4 = conference.

Dependent Variable

The dependent variable in this dissertation for all studies is student achievement. In 17 studies, the authors provide a mean achievement measure score for student achievement.

Effect Sizes

Cohen (1992) suggests the following guidelines in interpreting the effect: an effect size greater than 0.5 is considered large, an effect size at least 0.3 is considered medium and an effect size less than 0.1 is considered small. Cohen (1992) suggests using these guidelines have been found to be most appropriate for use in social sciences.

For the sake of performing a meta-analysis of the data in this study, individual studies with independent effect sizes are calculated as independent samples (Glass et al., 1981; Kulik, 1983). The rationale for separating the samples facilitates combining and incorporating the various effect sizes in the analysis

which allows for the final analysis to reflect all possible data. Essentially for each individual study, the effect sizes are calculated. As a group, a comprehensive mean effect size measure is calculated. Also, under each category identified in the research, mean effect sizes are computed if a heterogeneous effect is discovered from this initial analysis, a post hoc analysis follows in an effort to discover any significant moderators. All of these calculations of analysis use the Comprehensive Meta-Analysis (CMA) Program. The post hoc analysis determines if there are significant differences in the mean effect size measures for every level in the individual moderators. Also, this analysis will reveal at which level each moderator a significant effect is significantly different from zero.

CHAPTER IV

RESULTS

Introduction

The purpose of this study was to investigate the effective characteristics of professional development in K-12 education since the inception of NCLB. The study utilized meta-analytic techniques on a group of studies that individually investigated the effectiveness of various professional development characteristics against the dependent variable of student achievement. The meta-analysis was guided by two research questions:

1. What is the impact of professional development on student achievement since the implementation of NCLB (2002)?

2. What aspects of professional development are found to have the greatest impact on student achievement?

The meta-analysis had 14 primary and secondary research questions that were investigated and guided the study. These questions included:

1. What is the impact of professional development on student achievement across different school levels (elementary, middle, high school, mixed)?

2. What is the impact of professional development on student achievement across different dosages (the duration of the teacher training or professional development)?

3. What is the impact of professional development on student achievement across different delivery methods (face-to-face, mixed, online)?

4. What is the impact of professional development on student achievement across different sample sizes?

5. What is the impact of professional development on student achievement across different subject areas?

6. What is the impact of professional development on student achievement across the different characteristics of programs?

7. What is the impact of professional development on student achievement across the different characteristics of strategies?

8. What is the impact of professional development on student achievement across different providers (internal or external, expert, both, etc.)?

9. What is the impact of professional development on student achievement across different funding (school budget, grant or both)?

10. What is the impact of professional development on student achievement across different attendance choices of participants?(volunteer, mandatory or both)?

11. What is the impact of professional development on student achievement across different exam types (local, state, national, combination or commercial)?

Secondary Questions:

12. What is the impact of professional development on student achievement across different locations?

13. What is the impact of professional development on student achievement across different publication years?

14. What is the impact of professional development on student achievement

    across different sources (dissertation, article, grant, presentation, etc.)?

    The 14 primary and secondary questions were used to identify the 14

moderators that were coded and analyzed using CMA to determine if there was

any significant effect of the characteristics of professional development on student

achievement and if so, what was the level of the effect. The level of < 1 week

under the moderator of dosage and the level of content under the moderator of

strategy were not represented by any of the research included in this investigation.

<div align="center">Descriptive Analysis of Effect Sizes</div>

    The primary purpose of this study was to identify effective characteristics

of professional development since the inception of NCLB. The study yielded a

total of 17 studies for the meta-analysis which included nine research journals or

research articles, five research reports or government reports, two dissertations

and one conference presentation. Many of the studies contained multiple exam

types which resulted in a total of 53 effect size measures from the 17 studies.

There was a student sample size of 69,556 and an overall total of 14 moderators

extracted from the studies. The effect size measures within the study range from -

0.523 to 1.613, yielding a grand mean overall effect size measure ($d = 0.353$) (p

<.001) a significant moderate-to-large effect according to Cohen (1992).

    Forty seven of the 53 effect sizes (89%) that were used in this study were

positive which implies that many of the moderators have a positive impact on

student test scores. Six of the 53 effect sizes (11%) that were used in this study

were negative which implies that few moderators demonstrated little impact on

student test scores. The analyses also revealed that five (29%) of the 17 studies

had a mean effect size of 0.5 or greater which implies that the effects of

professional development on student achievement according to Cohen (1992) is

considered large. Table 1 provides a detailed breakdown of the 17 studies that

met the criteria to be included in the study.

Table 1: The Primary Studies in the Meta-Analysis with Effect Sizes

Study	n of ES	ES range
Bell (2010)	2	-0.094 to 0.084
Bruce (2010)	6	0.013 to 0.301
Burkhouse (2003)	5	0.453 to 0.908
Dash (2012)	1	0.049
Dickson (2002)	6	0.097 to 1.429
Freiberg (2009)	6	0.231 to 0.418
Garet (2001)	1	-0.008
Heller (2007)	1	0.040
Johnson (2010)	4	0.185 to 1.613
Johnson (2007)	3	0.185 to 1.563
McBride (2006)	3	0.080 to 0.290
Meyer (2006)	6	-0.091 to 0.543
Niess (2005)	2	0.465 to 0.786
Ross (2006)	4	-0.121 to 0.000
Santau (2011)	1	-0.523
Scantlebury (2008)	1	0.616
Young	1	0.113

Table 2 provides a box-and-whisker plot of the study weights for the 17

studies that met the criteria to be included in the study.

Table 2: Study Weights of Studies

	Statistics for each study							Std diff in means and 95% CI
	Std diff in means	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value	
Bell1	-0.094	0.125	0.016	-0.338	0.151	-0.752	0.452	
Bell2	0.084	0.106	0.011	-0.123	0.292	0.798	0.425	
Bruce1	0.197	0.155	0.024	-0.107	0.501	1.272	0.204	
Bruce2	0.025	0.155	0.024	-0.278	0.329	0.165	0.869	
Bruce3	0.014	0.155	0.024	-0.290	0.317	0.088	0.930	
Bruce4	0.013	0.155	0.024	-0.290	0.316	0.085	0.932	
Bruce5	0.301	0.156	0.024	-0.004	0.606	1.934	0.053	
Bruce6	0.013	0.155	0.024	-0.290	0.316	0.086	0.932	
Burkhouse1	0.900	0.193	0.037	0.521	1.279	4.657	0.000	
Burkhouse2	0.563	0.190	0.036	0.190	0.935	2.960	0.003	
Burkhouse3	0.908	0.193	0.037	0.529	1.287	4.696	0.000	
Burkhouse4	0.546	0.190	0.036	0.174	0.918	2.874	0.004	
Burkhouse5	0.453	0.189	0.036	0.082	0.824	2.391	0.017	
Dash1	0.049	0.053	0.003	-0.055	0.153	0.922	0.356	
Dickson1	0.430	0.216	0.047	0.007	0.853	1.993	0.046	
Dickson2	0.097	0.230	0.053	-0.353	0.547	0.421	0.674	
Dickson3	0.574	0.321	0.103	-0.055	1.202	1.790	0.074	
Dickson4	0.165	0.353	0.125	-0.528	0.858	0.466	0.641	
Dickson5	0.103	0.245	0.060	-0.377	0.582	0.420	0.675	
Dickson6	1.429	0.792	0.627	-0.123	2.980	1.805	0.071	
Freiberg1	0.264	0.076	0.006	0.115	0.412	3.471	0.001	
Freiberg2	0.320	0.076	0.006	0.171	0.469	4.203	0.000	
Freiberg3	0.343	0.076	0.006	0.194	0.493	4.510	0.000	
Freiberg4	0.418	0.076	0.006	0.268	0.568	5.467	0.000	
Freiberg5	0.343	0.076	0.006	0.194	0.493	4.510	0.000	
Freiberg6	0.231	0.076	0.006	0.082	0.380	3.045	0.002	
Garet1	-0.008	0.015	0.000	-0.037	0.021	-0.520	0.603	
Heller1	0.040	0.008	0.000	0.024	0.056	4.938	0.000	
Johnson1A	0.185	0.090	0.008	0.008	0.362	2.044	0.041	
Johnson1B	1.260	0.107	0.011	1.051	1.469	11.824	0.000	
Johnson1C	1.563	0.111	0.012	1.346	1.781	14.103	0.000	
Johnson1D	1.613	0.123	0.015	1.372	1.854	13.108	0.000	
Johnson3A	0.185	0.090	0.008	0.008	0.362	2.044	0.041	
Johnson3B	1.330	0.108	0.012	1.119	1.540	12.359	0.000	
Johnson3C	1.563	0.111	0.012	1.346	1.781	14.103	0.000	
McBride1	0.080	0.044	0.002	-0.006	0.166	1.818	0.069	
McBride2	0.290	0.050	0.003	0.192	0.388	5.800	0.000	
McBride3	0.250	0.052	0.003	0.148	0.352	4.808	0.000	
Meyer1	0.288	0.137	0.019	0.019	0.557	2.099	0.036	
Meyer2	0.351	0.234	0.055	-0.108	0.809	1.499	0.134	
Meyer3	0.448	0.142	0.020	0.170	0.725	3.161	0.002	
Meyer4	-0.091	0.138	0.019	-0.361	0.179	-0.660	0.509	
Meyer5	0.543	0.116	0.013	0.315	0.770	4.675	0.000	
Meyer6	0.233	0.128	0.016	-0.018	0.485	1.821	0.069	
Niess1	0.786	0.111	0.012	0.568	1.005	7.054	0.000	
Niess2	0.465	0.065	0.004	0.338	0.592	7.191	0.000	
Ross1	-0.056	0.075	0.006	-0.204	0.092	-0.740	0.459	
Ross2	0.000	0.075	0.006	-0.148	0.148	0.000	1.000	
Ross3	-0.121	0.075	0.006	-0.269	0.027	-1.609	0.108	
Ross4	0.000	0.075	0.006	-0.148	0.148	0.000	1.000	
Santau1	-0.523	0.087	0.008	-0.693	-0.354	-6.044	0.000	
Scantlebury1	0.616	0.088	0.008	0.444	0.788	7.032	0.000	
Young1	0.113	0.050	0.003	0.015	0.211	2.253	0.024	
	0.087	0.006	0.000	0.075	0.099	13.946	0.000	

-1.00   -0.50   0.00   0.50   1.00

Favours A   Favours B

In the following section are a summary of analysis results across the study characteristics disaggregated for individual analysis and more precise identification of the effective characteristics of professional development on student achievement since the inception of NCLB. Each analysis is used to determine what degree of effect exists among the various moderators.

The tables below break out the mean effect sizes for each level of the moderators in an effort to examine if significance exists by category/code within each moderator and are identified with an asterisk after the mean effect size measure. The 11 primary characteristics (moderators) are displayed first followed by the three secondary characteristics (moderators) which make up the 14 total characteristics used in this study.

<div align="center">Meta-Analysis Results by Moderator and Levels</div>

School Level:

The inquiry of the impact of professional development on student achievement across different school levels reveals that achievement is significantly different across different school levels ($p < .001$). Specifically, the mean effect size of the Middle School and High School level (d = .727) and High School level ($d = .616$) both reveal a large significant effect on achievement. The other levels of school level, Middle School ($d = .352$) Elementary School ($d = 0.265$) and Elementary School and Middle School ($d = 0.244$) are statistically equivalent and all reveal a significant moderate effect. However, the level of Elementary School, Middle School, and High School ($d = .008$) demonstrates no effect. Overall, these results indicate that the impact of professional development on student achievement is likely to be different across different student levels with the level combining Elementary School, Middle School and High School presenting no impact. The results for this analysis can be found in Table 3.

Table 3: School Level

Variables and Categories	Number of Effect Size Measures	With-In Groups Effects	Mean Effect Size
School Level		28.269*	
Elementary School	24		0.265*
Middle School	8		0.352*
High School	1		0.616*
Elementary School & Middle School	8		0.244*
Middle School & High School	10		0.727*
Elementary School, Middle School, & High School	2		0.008

Dosages:

      The inquiry of the impact of professional development on student achievement across different dosages reveals that achievement is significantly different across different dosages of professional development ($p < .001$). Specifically, the mean effect sizes of the levels 6 Months-1 year ($d = .467$) > 1 year ($d = .422$) reveals a significant moderate-to-large effect and 1-6 Months ($d = .254$) reveals a moderate effect. However, the level of < 1 Month ($d = .062$) reveals a small effect. Overall, these results indicate that the impact of professional development on student achievement is likely to be different across different lengths of dosages of professional development with < 1 Month presenting little impact. The results for this analysis can be found in Table 4.

Table 4: Dosage

Variables and Categories	Number of Effect Size Measures	With-In Groups Effects	Mean Effect Size
Dosage		19.973*	
< 1 Month	8		0.062
1-6 Months	10		0.254*
6 Months-1 Year	18		0.467*
> 1 Year	17		0.422*

Delivery:

The inquiry of the impact of professional development on student achievement across different deliveries reveals that achievement is significantly different across different deliveries ($p < .001$). Specifically, the mean effect size of the Face-to-Face and Online level ($d = .613$) reveals significant large effect on achievement. The other level of Face-to-Face ($d = .348$) reveals a significant moderate effect. The level of Online ($d = .049$) reveals no effect. Overall, these results indicate that the impact of professional development on student achievement is likely to be different when the delivery differs with online presenting no impact, and mixed delivery revealing a large impact, however these results must be considered cautiously due to the over representation by the Face-to-Face delivery level. The results for this analysis can be found in Table 5.

Table 5: Delivery

Variables and Categories	Number of Effect Size Measures	With-In Groups Effects	Mean Effect Size
Delivery		24.856*	
Face-to-Face	50		0.348*
Online	1		0.049
Face-to-Face & Online	2		0.613*

Sample Size:

The inquiry of the impact of professional development on student achievement across different sample sizes reveals that achievement is significantly different across different sample sizes ($p = .009$). Specifically, the mean effect size of the levels >1000 ($d = .467$) 750-1000 ($d = .465$) are approaching a significant large effect and the mean effect size of the levels 1-250 ($d = .345$) 500-750 ($d = .257$) and 250-500 ($d = .238$) reveal approximate significant moderate effects. Overall, these results indicated that the impact of professional development on student achievement is likely to be different when extracting information from different sample size groups with 750 and greater revealing the largest impacts. Overall, these results indicate that the impact of professional development on student achievement is significant across different sample sizes. The results for this analysis can be found in Table 6.

Table 6: Sample Size

Variables and Categories	Number of Effect Size Measures	With-In Groups Effects	Mean Effect Size
Sample Size		13.552*	
1-250	10		0.345*
250-500	6		0.238*
500-750	12		0.257*
750-1000	1		0.465*
>1000	24		0.467*

Subject Area:

The inquiry of the impact of professional development on student achievement across different subject areas reveals that achievement is significantly different across different subject areas ($p = .003$). Specifically, the

mean effect size of the Science level ($d = .653$) reveals a significant large effect on achievement. The other levels of Reading ($d = .392$) reveals a moderate-to-large effect and Math ($d = .192$) reveals a small-moderate effect. Overall, these results indicate that the impact of professional development on student achievement may be different across different subject areas with Science revealing the largest impact. The results for this analysis can be found in Table 7.

Table 7: Subject Area

Variables and Categories	Number of Effect Size Measures	With-In Groups Effects	Mean Effect Size
Subject Area		11.818*	
Math	32		0.192*
Reading	5		0.392*
Science	16		0.653*

Programs:

The inquiry of the impact of professional development on student achievement across different programs reveals achievement is significantly different across different programs ($p < .001$). Specifically, the mean effect size of the Packaged level ($d = .513$) reveals a significant large effect on achievement. The other level or Not Packaged ($d = .139$) reveals a significant small-to-moderate effect. Overall, these results indicate that the impact of professional development on student achievement is likely to be different across different programs with Packaged programs presenting the largest impact. The results for this analysis can be found in Table 8.

Table 8: Programs

Variables and Categories	Number of Effect Size Measures	With-In Groups Effects	Mean Effect Size
Programs		20.595*	
Packaged	28		0.513*
Not Packaged	25		0.139*

Strategy:

The inquiry of the impact of professional development on student achievement across different strategies revealed that achievement is significantly different across different strategies ($p < .001$). Specifically, the mean effect size of the levels Pedagogy ($d = .461$) and Content & Pedagogy ($d = .382$) reveal a significant moderate-to-large effect and Other ($d = .317$) reveals a moderate effect. The level of Efficacy ($d = .070$) demonstrates no effect. Overall, these results indicate that the impact of professional development on student achievement is different across different strategies with Efficacy based professional development demonstrating no impact on achievement. The results for this analysis can be found in Table 9.

Table 9: Strategy

Variables and Categories	Number of Effect Size Measures	With-In Groups Effects	Mean Effect Size
Strategy		27.101*	
Pedagogy	28		0.461*
Content & Pedagogy	5		0.382*
Efficacy	8		0.070
Other	12		0.317*

Providers:

The inquiry of the impact of professional development on student achievement across different providers revealed that achievement is significantly different across different providers ($p < .001$). Specifically, the mean effect size of the level External ($d = .455$) reveals a significant moderate-to-large effect and the level of Both ($d = .191$) reveals a significant small-to-moderate effect. The level of Internal ($d = -.003$) demonstrates no effect. Overall, these results indicate that the impact of professional development on student achievement is different across providers with External providers demonstrating the largest effect. The results for this analysis can be found in Table 10.

Table 10: Providers

Variables and Categories	Number of Effect Size Measures	With-In Groups Effects	Mean Effect Size
Providers		45.778*	
Internal	5		-0.003
External	38		0.455*
Both	10		0.191*

Funding:

The inquiry of the impact of professional development on student achievement across different funding sources revealed that achievement is not significantly different across different funding sources ($p = .744$). The level of Internal ($d = .550$ reveals a significant large effect and the levels of External ($d = .332$) and Mixed ($d = .295$) reveal a significant moderate effect. The level of No Information ($d = .046$) demonstrates no effect; this result is likely mitigating the non-significant difference. Overall, these results indicate that the impact of

professional development on student achievement is not different across different

funding structures but that Internal funding reveals the largest impact. The results

for this analysis can be found in Table 11.

Table 11: Funding

Variables and Categories	Number of Effect Size Measures	With-In Groups Effects	Mean Effect Size
Funding		1.237	
No Info	2		0.046
Internal	8		0.550*
External	37		0.332*
Mixed	6		0.295*

Attendance:

The inquiry of the impact of professional development on student

achievement across different attendance requirements reveals that achievement is

significantly different across different attendance requirements ($p < .001$).

 Specifically, the mean effect size of the Mandatory level ($d = .734$) reveals a

significant large effect. The other level of Voluntary ($d = .236$) reveals a

significant small-to-moderate effect, and the level of Both ($d = -.003$)

demonstrates no effect. Overall, these results indicate that the impact of

professional development on student achievement is significantly different

depending on the attendance requirements. The results for this analysis can be

found in Table 12.

Table 12: Attendance

Variables and Categories	Number of Effect Size Measures	With-In Groups Effects	Mean Effect Size
Attendance		33.628*	
Voluntary	35		0.236*
Mandatory	13		0.734*
Both	5		-0.003

Exam Type:

The inquiry of the impact of professional development on student achievement across different exam types revealed achievement is significantly different across different exam types ($p < .001$). Specifically, the mean effect size of the Commercial level ($d = 1.012$) reveals a significant large effect. The level of State ($d = .361$) reveals an effect approaching a significant moderate-to-large and Any Combination ($d = .306$) reveals a moderate effect. The levels of National ($d = .073$) and Local ($d = -.037$) reveal no significant effects. Overall, these results indicate that the impact of professional development on student achievement is likely to be different when extracting information from different exam types, with Commercial presenting the largest impact and National and Local presenting no effect. The results for this analysis can be found in Table 13.

Table 13: Exam Type

Variables and Categories	Number of Effect Size Measures	With-In Groups Effects	Mean Effect Size
Exam Type		45.876*	
Local	6		-0.037
State	24		0.361*
National	8		0.073
Any Combination	9		0.306*
Commercial	6		1.012*

Location:

The inquiry of the impact of professional development on student

achievement across different locations reveals that achievement is significantly

different across different locations ($p < .001$). Specifically, the mean effect size

of the State level ($d = .578$) reveals a significant large effect. The other levels of

Multiple States ($d = .050$) and, Out of the USA ($d = -.008$) demonstrate no effects.

Overall, these results indicate that the impact of professional development on

student achievement is likely to be different when extracting information from

different locations, with one state presenting the largest impact. The results for

this analysis can be found in Table 14.

Table 14: Location

Variables and Categories	Number of Effect Size Measures	With-In Groups Effects	Mean Effect Size
Location		47.037*	
1 State	33		0.578*
Multiple States	10		0.050
Out of the USA	10		-0.008

Publication Year:

The inquiry of the impact of professional development on student

achievement across different publication years reveals that achievement is not

significantly different across different publication years ($p = .092$). Even though

the level of 2005 and Older ($d = .491$) reveals a significant effect approaching

large and 2006 and Newer ($d = .317$) reveals a significant moderate effect, the

measures between levels are not significantly different. Overall, these results

indicate that the impact of professional development on student achievement is

not significant across the different year levels. The results for this analysis can be found in Table 15.

Table 15: Publication Year

Variables and Categories	Number of Effect Size Measures	With-In Groups Effects	Mean Effect Size
Publication Year		2.847	
2006 & Newer	39		0.317*
2005 & Older	14		0.491*

Source:

The inquiry of the impact of professional development on student achievement across different data sources reveals that achievement is significantly different across different data sources ($p = .022$). Specifically, the mean effect size of the Conference Level ($d = .616$) reveals a significant large effect on achievement. It is likely that this large effect size provided by one study is mitigating the significant difference found in this moderator. The other levels of Source, Research Journal or Research Article ($d = 0.343$) Research Report or Government Report ($d = 0.333$) and, Dissertation ($d = 0.296$) are statistically equivalent, and all present a significant moderate effect. Overall, these results indicate that the impact of professional development on student achievement is likely to be different when extracting information from different sources, with Conference presentations presenting the largest impact. The results for this analysis can be found in Table 16.

Table 16: Source

Variables and Categories	Number of Effect Size Measures	With-In Groups Effects	Mean Effect Size
Source		9.614*	
Research Journal or Research Article	28		0.343*
Research Report or Government Report	12		0.333*
Dissertation	12		0.296*
Conference	1		0.616*

Publication Bias

The basic issue of publication bias is that not all completed studies are published, and the selection process is not random, hence the bias. Rather, studies that report relatively large treatment effects are more likely to be submitted and/or accepted for publication than studies which report more modest treatment effects.

Since the treatment effect estimated from a biased collection of studies would tend to overestimate the true treatment effect, it is important to assess the likely extent of the bias, and its potential impact on the conclusions (Egger, Smith, Schneider, & Minder, 1997; Sterne & Egger, 2001).

Funnel Plot

The funnel plot is a plot of a measure of *study size* (usually standard error or precision) on the vertical axis as a function of *effect size* on the horizontal axis.

Large studies appear toward the top of the graph, and tend to cluster near the mean effect size. Smaller studies appear toward the bottom of the graph, and since there is more sampling variation in effect size, estimates in the smaller studies will be dispersed across a range of values. (Egger et al., 1997; Sterne &

Egger, 2001). The funnel plot examining publication bias for the current
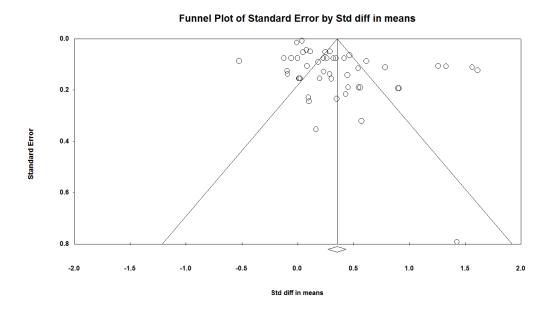
investigation is presented in Figure 1.

Funnel Plot of Standard Error by Std diff in means

Figure 1. Funnel Plot

For the nonexistence of any publication bias the studies should be

distributed symmetrically about the combined effect size. Contrarily, if bias

exists, the bottom of the plot would reflect a higher cluster of studies on one side

of the center line than the other.

For this investigation, there is a symmetrical inverted funnel shape with a

vertical descending pattern. The cluster of the studies is generally equally

distributed on both sides of the mean.

From the 17 studies used in the meta-analysis, nine studies were published

and eight studies were unpublished. This reflects a reasonably equal balance of

sources meta-analyzed in which supports less of a probability of bias. Though,

essential to this study is the limitation mentioned in Chapter One about the limited

availability of data and available studies that examine the impact of professional

development since the inception of NCLB. Also, the exhaustive and extensive

search used to identify the sample of studies used in this investigation explained

in Chapter Three lessens the probability of the file drawer problem which occurs

with the inclusion of predominantly published studies in favor of unpublished

studies.

Begg and Mazumdar Rank Correlation Test

Begg and Mazumdar, (1994) suggested an inverse correlation approach as

a statistical test for publication bias. Concretely, they suggest computing the rank

order correlation (Kendall's tau b) between the treatment effect and the standard

error which is driven primarily by sample size. A non-significant correlation can

be taken as evidence that bias is absent, unless low power is suspected.

The current investigation reveals a Begg and Mazumdar Rank Correlation,

($\tau = .103$) ($p = .279$) revealing a non-significant correlation and the large sample

size of the study supports that publication bias is absent. However, although

Begg and Mazumdar Rank Correlation Test is not statistically significant,

practically speaking, the funnel plot suggests slight publication bias may exist.

Summary of Meta-Analysis Results

The purpose of this study was to investigate the effective characteristics of

professional development in K-12 education since the inception of NCLB. The

study utilized meta-analysis on a group of 17 studies that individually investigated

the effectiveness of 14 professional development moderators against the

dependent variable of student achievement. The above tables and analyses

disaggregated each level of the investigated moderators.

The two broad inquiries that framed this study were:

1. What is the impact of professional development on student achievement since the implementation of NCLB (2002)?

2. What aspects of professional development are found to have the greatest impact on student achievement?

Overall, it was determined by the meta-analysis that the impact of professional development on student achievement since the implementation of NCLB is significant ($d = 0.353$). Also, it was determined by the meta-analysis that the aspects of school level, dosage, delivery, sample size, subject area, programs, strategy, providers, attendance, exam type, location and source all reflect significant impacts on student achievement whereas the aspects of funding and publication year have no significant impact. The results from this analysis can be found in Figure 2.
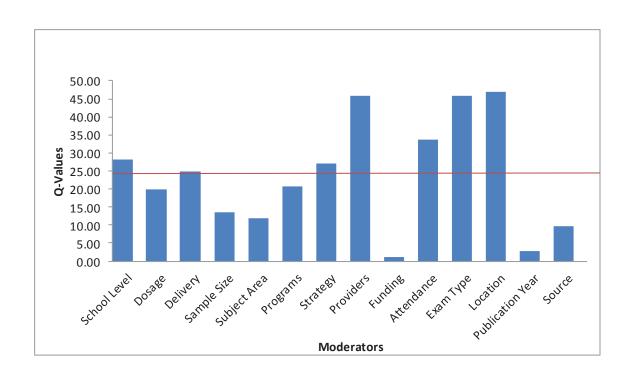
Figure 2. Bar Graph of Overall Q-Values

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CHAPTER V

Discussions

Chapter Five summarizes the findings from the investigation of the

effective characteristics used in professional development in traditional public

schools grades kindergarten through twelve. Specific topics derived from the

investigation include a summary of findings, analysis of moderator variables,

understanding and implementing effective variables, future research and

concluding thoughts.

Summary of Findings

This investigation examined the effectiveness of 14 moderators derived

from the studies of the characteristics used in professional development. The

dependent variable of student achievement was selected as the measure of the

effect, if any, of each moderator. Overall, the investigation included 17 research

studies for inclusion in the meta-analysis in which 14 moderators were identified.

Within these 17 studies were 53 effect size measures. The overall student sample

size was 69,556. Forty two of the 53 effect sizes yielded significant positive

results. Of the 14 moderators, 12 revealed significant results.

Analysis of Moderator Variables

The moderator variables of funding and publication year revealed that

achievement is not significantly different across different funding levels or

publication years. Contrary to these findings, the moderator variables of school

level, dosage, delivery, sample size, subject area, programs, strategy, providers,

attendance, exam type, location and source revealed a significant effect across all

levels. Correspondingly, some levels within the significant moderators revealed a

large significant effect that is relevant and necessary to consider when developing

professional development models. Other levels that typically heed attention did

not measure up to expectations. Analyses of the studies provided in this

investigation and research from other sources present a clearer understanding

about the findings of the current investigation.

The Levels of Efficacy, Content and Pedagogy

During the review of research for this investigation, there was a resonant

presence of variables of teacher and student efficacy. For this investigation,

teacher efficacy involves the teachers' "…belief or conviction that they can

influence how well students learn, even those who may be difficult or

unmotivated" (Guskey & Passaro, 1994, p. 628). Specifically, Huffman and

Thomas (2003), McBride (2006), Ross and Bruce (2007), and Ross et al., (2006)

suggest that PD focusing on efficacy can have some positive impact on student

achievement. Due to these connotations, the level of efficacy under the moderator

of strategies was included as part of the meta-analysis. The results of the meta-

analysis revealed that under the moderator of *Strategy*, the level of *Efficacy* ($d =$

.070) ($p <$.001) had no effect on student achievement when examined

comprehensively across the included studies.

Contrary to the level of *Efficacy*, the moderator of *Strategy* revealed the

mean effect size of the levels *Pedagogy* ($d = $.461) and *Content & Pedagogy* ($d =$

.382) suggest a significant moderate-to-large effect. These two levels represent

the importance of in-depth knowledge of content areas (Birman et al., 2000;

Bruce et al., 2010; Darling-Hammond & McLaughlin, 1995; Jeanpierre et al., 2005; Johnson, 2010; Lieberman, 1995; Little,1997; Niess, 2005; Scantlebury, 2011) combined with the art of teaching are likely to have a positive impact on student achievement (Birman et al., 2000; Burkhouse et al., 2003; Garet et al., 2001; Guskey, 2002; Hill et al., 2005; Yoon et al., 2007).

With the heightened focus of teacher accountability in relation to student test scores since the inception of NCLB, states and districts were positioned to make a swift shift in focus and begin to hold educators more accountable for student results (Smith, 2007; Blank & Alas, 2009; Wilson & Berne, 1999). As a result, school leaders were presented with the daunting task to design professional development programs for teachers in a strategic manner. A clearer quantified understanding of the impact of teacher and student efficacy in the specific subject areas and instructional strategies would provide much needed insight about the types of targeted professional development that would assist teachers to attain improved student results. Some studies suggested that there is a logical and sense of intuitive connectedness between professional development and student achievement (Borko, 2004; Loucks-Horsley & Matsumoto, 1999). This investigation reveals that effects that occur in efficacy may not be sustained or powerful enough to impact student learning. Other studies of professional development caution that effects of efficacy has not been examined in a manner that is quantitative and replicable (Desimone et al., 2002). Therefore, teacher and student efficacy is a variable worthy of further investigation as the nation rapidly shifts toward data driven results to measure success.

The Levels of Face-to-Face and Online

Today's leaders and educators are faced with obstacles, such as time and funding, when developing and implementing professional development programs. Compounded by these obstacles and the statute of NCLB requiring high quality professional development (NCLB, Title IX, Section 9101(34)), the delivery method of online training is an emerging practice. In this investigation, the moderator of *Delivery* revealed that achievement is significantly different across the three levels, with the level *Online* having no impact. These results are consistent with the study of Dash (2012) regarding the level of Online as flat. Darling and Hammond (2005) suggest that two key features that are present in highly effective professional development include collaboration and teacher reflection. When compared with traditional professional development, online professional development lacks these two key components. Also, this may be the result of the use of online delivery being rather infantile. With time this delivery model can improve. Further, when compounded with other factors such as lack of technology literacy, poor infrastructures, participant technology experiences that interfere with independent learning and availability of specifically targeted topics or groups, it is evident through this investigation why the level of *Online* is flat (Armstrong et al. 2000; Stanford-Bowers, 2008; Tyler-Smith, 2006; Collins & Berge, n.d; Dede, 2006; Galley, 2002).

Contrary to using online strategies as a solitary method of professional development, the traditional method of face-to-face is recommended. In this investigation the mean effect size of the level of *Face-to-Face* and *Online (d =*

.613) reveals significant large effect on achievement. Even with the large effect, only two effect size measures support this anomaly. Therefore, it is reasonable to suggest that there is insignificant research available to justify a combination of the two levels. The other level of *Face-to-Face* (*d* = .348) reveals a significant moderate effect. Respectively, face-to-face is more than justified as an essential characteristic considering 50 effect size measures make up this level. Specifically, this investigation supports Pritchard and Marshall's (2002) claims that leaders who embed teacher training during the work day increase the probability of increased student achievement.

The Levels of Math, Reading and Science

Since the onset of high stakes testing, many leaders believed that professional development focused on reading as a strategy to increase test scores across all subject areas. Specifically every core subject area tested involved the ability to comprehend and analyze literature. A national study about the implementation of NCLB at the state and local levels reported that 80 % of elementary teachers participated in 24 hours of PD of reading instruction or less during the 2003–2004 school year (U.S. Department of Education, 2007). According to reading experts, this dosage level raises concerns that the level of reading is not intensive enough to have an impact and that it does not focus enough on subject-matter knowledge (Cohen & Hill, 2001; Fletcher & Lyon, 1998; Foorman & Moats, 2004; Garet et al., 2001). This investigation supports these findings under the moderator of *Subject Area* and the level of *Reading* (*d* = .392) revealing a moderate-to-large effect. The idea that an emphasis on reading

improves mathematics speaks at length about the impact of reading on mathematics (Larwin, 2010) but falls short of the expectation with this investigation revealing the level of *Math* (*d* = .192) having a small-moderate effect.

Noteworthy, is the mean effect size of the *Science* level (*d* = .653) which reveals a significantly large effect on achievement. At the onset of NCLB, the testing movement focused primarily on reading and mathematics. States were required by the 2005-06 school year to measure all students' progress in reading and math in grades three through eight and at least once in grades10 through 12. More recently, states were required by the 2007-2008 school year to have in place science assessments to be administered at least once during grades three through five, grades six through nine and grades 10 through 12. The shift of focus from the subjects of reading and math to science, compounded with the evolution of healthy professional development practices and focus on pedagogy (Desimone et al., 2002) suggests support for the large effect size measure.

The Levels of External and Internal

The moderator of *Providers* revealed that the mean effect size of the level *External* (*d* = .455) reveals a significant moderate-to-large effect. Amazingly, this supports a shift in philosophy that professional development be implemented in-house with existing staff. Contrary to what is often practiced in schools, this investigation reveals that the level of *Internal* has no effect.

A recent study examining the effectiveness of PDS looked specifically at using external experts at the university level for training purposes (Creasy, 2011).

Creasy found that, "Classroom teachers and teacher preparation institutions have identified a gap between research and practice. Teachers and university personnel in professional development school settings seek to build the bridges that allow schools and universities to benefit from this mutual relationship" (p. 19). This idea of reconnecting practitioners with external theorists over an extended time period (French, 2007) can reinvigorate the identification of effective methodologies and lead to teacher change.

Overall, when considering the levels within the 14 moderators that are meta-analyzed, it is determined that the impact of professional development on student achievement since the implementation of NCLB is significant ($d = 0.353$). This significance level alone is a phenomenon that warrants acknowledgement. Generally, it is rare in the field of research to show an impact on student achievement with interventions that are not directly delivered to the student. Even so, it is imperative to reiterate that student test scores are not always considered the best measure of student achievement (Bell, 2010; Coleman et al., 1979; Jencks et al., 1972; Popham, 2001); however, this is the reality of our current educational system.

Understanding and Implementing Effective Characteristics

It is imperative that when considering the optimal research based professional development program, efficacy should not be considered an integral component of the overall design except for the sake of maintaining staff morale and motivation. There are specific primary characteristics that should be considered and included in all programs. A realistic professional development

program example would resemble the following scenario embedding the characteristics that revealed large effects. By no means should this example be considered a professional development panacea for every school or scenario. Just as the make-up of the students across the country varies, every school has specific needs that in no situation should be generalized.

A principal of a small school comprised of grades six through twelve wants to improve student test scores across the subject areas of reading, math and science. Prior years afforded the staff no specific professional development opportunities with which to enhance their skills to in the classroom. Even though there is several capable staff apt to provide the training, the student scores across local exams do not support a confident selection of individuals to lead the training.

The principal should consider the following characteristics when creating and implementing an on-going professional development program:

- Implement the training for the level of Middle School and High School (d = .727) ($p < .001$);

- Utilize a delivery of training that involves the level of Face-to-Face and Online learning ($d = .613$) ($p < .001$);

- Focus on the subject area of the level of Science ($d = .653$) ($p < .001$). The subject of science typically involves mathematics and reading comprehension and the focus on this subject area may have residual effects on other subject areas;

- Research the different professional development programs available that support the level of Packaged ($d = .513$) ($p < .001$);

- Communicate that the attendance for staff supports the level of Mandatory ($d = .734$) ($p < .001$);

- Use data collected from an exam type that supports the level of Commercial ($d = .1.012$) ($p < .001$) that ensures identified needs are valid and reliable.

Even though this is an example, individual schools need to put forth the strategic planning efforts to identify specific targeted areas to develop their multi-year professional development programs. There are several levels within the 12 moderators that revealed a significant effect that should be considered concurrently when attempting to create and implement a professional development program that will increase the probability of improving student achievement. Even though some of the levels are categorized as large effect sizes, there are extenuating circumstances that contribute to this such as the low numbers of studies. Also, many of the characteristics that revealed a medium effect size are substantiated by the large amount of studies that increase the power of such characteristics just as some of the large effect sizes are supported by few studies. It is recommended to consider all the different moderators and variables and caution against trying to embed every characteristic which would be overbearing, unreasonable and convolute the effectiveness of individual designs.

Future Research

The current investigation provides a glimpse of the effective characteristics of professional development since the inception of NCLB but further research is needed to provide a deeper understanding about how to maximize student achievement.

First, multi-year studies should be conducted within grade levels and across schools in target regions that consist of similar student demographics and needs. Questions investigating moderators of participating populations in urban, suburban and rural samples are deserving of further research. An investigation of this type supports a clearer focus of professional development based on student needs (Vescio et al., 2008). Research questions, though similar in nature, should be broken down to reflect the multitude of variables that potentially contribute to the improvement in student achievement.

Second, additional research is needed in order to better exemplify the wide range of needs, barriers and current strategies that schools are implementing in order to address the current mandate of the Common Core Standards. To date, 46 out of the 50 states have adopted the Common Core Standards, which will enable extrapolation of the findings and thus narrow the identification of fewer moderators and levels.

Next, with the rapid expansion of student enrollment in cyber schools, more studies are needed to investigate the effectiveness of the online delivery system. The results from this investigation suggests that merging some of the "best practice" ideas from online delivery instruction into the practices of online

delivery in professional development may result in increased student achievement. The trend of a blended curriculum, both synchronous and asynchronous learning, could identify evidence of effective teaching strategies that are not typically present in traditional public schools. These characteristics may provide an in-depth investigation across multiple states that can be expanded to reach the needs of teachers on a large scale.

Finally, as mentioned in the Literature Review, the emergence and wide-spread growth of online professional development presents the opportunity to investigate this moderator as a primary variable. Considering the few studies that do exist about the effectiveness of online professional development, residual effects may occur and inadvertently shift the paradigms of how teachers are trained and the impact on student achievement.

Overall, qualitative and quantitative studies that exemplify effective characteristics will have a resounding impact on teachers in the effort to attain a global understanding of the most effective ways to increase student achievement.

Conclusion

Examining ways to improve student achievement by using professional development in this investigation and the countless hours spent reading and discoursing with colleagues, it seems that many would like to find a "magic bullet"- a single variable- that increases student achievement. This investigation overwhelmingly supports the claim that improving student achievement is a multi-faceted issue and the answers are equally as complex.

Appendix

Institutional Review Board (IRB)

The research collection and analysis for this dissertation is a meta-analysis. Considering that the data collected already exists and involves no interaction with human subjects, a Claim of Exemption form was submitted to the Institutional Review Board on August 15, 2012. The following response to the waiver was sent via E-mail on September 06, 2012 by the IRB chairperson, Dr. Cathy Bieber Parrott. "The IRB has determined your project 'Effective strategies of professional development in traditional schools grades K-12'to not require IRB oversight. Your collection of data from published articles isn't regulated by IRB even though the original data was collected from human subjects. Best wishes on the completion of your study."

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References marked with an asterisk (*) indicate studies included in the meta-analysis.

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