

TEACHER PERCEPTIONS OF PROFESSIONAL LEARNING AND
MATHEMATICS ACHIEVEMENT FOR STUDENTS WITH IEPs

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Teacher Perceptions of Professional Learning and Math Achievement for Students with IEPs

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Abstract

This mixed method study examined perceptions of general and special education teachers regarding professional learning in regard to the seven professional learning standards as defined by Learning Forward Professional Learning Organization. Furthermore, the study sought to determine what relationship existed between teacher perceptions of professional learning and mathematics achievement for learners with IEPs. Participants included 44 general and special education teachers from grades 4 through 8 who taught mathematics to students with IEPs. Pennsylvania System of School Assessment (PSSA) and Pennsylvania Value Added Assessment System (PVAAS) data were used to separate participants into two groups, *schools demonstrating growth* and *schools not demonstrating growth*. Data was gathered using the *Standards Assessment Inventory 2 (SAI2)* online survey from the Learning Forward Center for Results and personal interviews. The instruments elicited teacher responses regarding their perceptions of professional learning. Pearson's Chi-squared test was performed to determine what relationships existed between teacher perceptions of professional learning and mathematics achievement for learners with IEPs. Results of this study suggested that having supportive leadership in a community of learners was important in increasing student achievement. In addition, using a variety of student and teacher data to plan and evaluate professional learning that is connected with school goals was significant. Finally, participants emphasized the importance of differentiated professional learning options that take into consideration teachers' background and individual needs, as well as the needs of their learners, as a key component to increasing mathematics achievement for students with IEPs.

Dedication

This final step in completing my doctoral program is in memory of my mother, Danna Kaye Livelsberger, who instilled in me the passion to be a lifelong learner and the persistence to attain the high goals I've set for myself. You may not be here physically, but your spirit continues to encourage me!

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Chapter One - Introduction

Overview

According to the U.S. Department of Education (2011b), more than six million public school students, ages six through 21, have disabilities and receive services under the Individuals with Disabilities Education Act (IDEA). IDEA is a law ensuring services to children with disabilities and regulating how states and public agencies provide special education and related services (U.S. Department of Education, 2014). Students with disabilities qualify for an Individualized Education Plan (IEP) that is developed, reviewed, and revised annually in accordance with Sec. 300.320 through 300.32 of IDEA. The IEP must include the child's present levels of academic achievement and functional performance, measurable annual goals, and a statement of the special education and related services, including supplementary aids and services. Additionally, the IEP includes an explanation of the extent to which the child will not participate with nondisabled children and a statement of accommodations necessary to measure the academic achievement and functional performance of the child on state and district-wide assessments (U.S. Department of Education, 2014). According to Wagner, Newman, Cameto, and Levin (2006), national achievement levels for students with disabilities are more than two standard deviations lower than their non-disabled peers.

The No Child Left Behind (NCLB) Act of 2001 applies high standards of academic achievement to all public school students including those with disabilities (Pennsylvania Department of Education, 2005). The movement towards higher standards requires teachers to have knowledge and skills that may not have been taught in their pre-service education. Professional learning plays a vital role in helping teachers attain the

necessary knowledge, skills, and supports to be effective (Desimone, Garet, Birman, Porter, & Yoon, 2003).

In his remarks to the Hispanic Chamber of Commerce, President Obama (2009) identified teachers as the most important factor in a student's school success.

"America's future depends on its teachers" (U.S. Department of Education, 2011a, p. 1).

The Obama Administration's education reform platform called for an "effective, well-supported teacher" for every child (U.S. Department of Education, 2011a, p. 21). The National Council of Teachers of Mathematics' (NCTM) *Principles and Standards for School Mathematics* (2000) emphasized the need for well-prepared and well-supported teachers. Professional learning is the vehicle for providing teachers with the knowledge, skills, and supports necessary to improve student learning (Desimone, 2011).

Furthermore, preparing for and supporting the professional learning of teachers increases student achievement (Blank et al., 2005; Desimone, 2009; Desimone, Smith, & Ueno, 2006; Dingle, Brownell, Leko, Boardman, & Haager, 2011; Sparks, & Hirsh, 1997).

Current educational reform efforts rely heavily on professional learning to assist teachers in improving their practice and increasing student achievement (Desimone, Smith, & Phillips, 2013). In their seminal work, Sparks and Hirsh (1997) discovered that professional development was critical to promoting change in teachers' instructional practices and hence improving student learning. Kennedy's (1998) research was the first to document the relationship between teacher professional development and student achievement. Analyzing studies of mathematics and science professional development programs and their effects on student outcomes, Kennedy concluded that programs that focused on content knowledge of subject matter, curriculum, and how students learn had

the most influence on student learning. Within the last decade, Blank et al. (2005) and Desimone (2009) linked effective professional development to an increase in teacher knowledge and skills, changes in instruction, and improved student learning. Further research by Desimone et al. (2013) found that students whose teachers engaged in high-quality professional development activities scored higher in achievement measures.

NCLB legislation defines "high-quality" professional development activities as those activities that are research-based and increase teacher knowledge and practice, improve student achievement, and align with standards (U.S. Congress, 2001). In addition, the Act requires professional development activities to be evaluated to determine the impact on increased teacher effectiveness and improved student academic achievement. Furthermore, NCLB emphasizes that professional development activities be designed through cooperative efforts between teachers and administrators with the goal of student improvement and increased teacher knowledge of the academic subjects they teach (U.S. Congress, 2001).

In recent years, a new paradigm for professional learning design, including differentiated opportunities, has replaced the traditional in-service staff development model of workshops, seminars, and one-day conferences (Whitcomb, Borko, & Liston, 2009). The National Staff Development Council's (NSDC) *Standards for Staff Development* (1995) developed standards to guide and inform educators in planning staff development initiatives. The standards were organized into three categories: context, process, and content. In 2010, NSDC's name changed to Learning Forward, and the characteristics were revised and renamed *Standards for Professional Learning*. The new standards outline the characteristics of professional learning that lead to effective

teaching practices and increased student results (Learning Forward, 2014; Mizell, 2008). These standards were created to guide and evaluate adult learning based on the premise: “Professional learning occurs within learning communities, requires leadership and resources, uses a variety of data and learning designs, supports implementation and aligns to outcomes” (Denmark & Weaver, 2012, p. 3) for student and teacher performance. Education scholars and practitioners have long recognized the importance of professional learning for improving student achievement.

Need for the Study

In 2012, the Pennsylvania benchmark for mathematics was 78% or more students earning proficient or advanced on the Pennsylvania State System of Assessments (PSSA). Only three school districts in Pennsylvania met this rigorous standard for their IEP subgroup. The state average within the IEP subgroup was 59%. Fewer than 8% of Pennsylvania charter and regular public schools exceeded the state average of 59% on the mathematics assessment (Pennsylvania Department of Education, 2014b). Just as in Pennsylvania, schools across America struggle with improving mathematics learning and achievement for students with disabilities (Wagner et al., 2006).

In order for special education teachers and general education teachers to support mathematics achievement for students with disabilities, it is critical that all teachers have both the content area knowledge and pedagogical knowledge needed to provide high quality instruction. Leko and Brownell (2009) found that traditionally, special education teachers have had broad-based preparation programs spanning several grade levels, focused on general instructional practices and behavior management with more emphasis on instructional strategies for specific disabilities. Conversely, many general education

teachers were minimally trained in teaching children with specific mathematics learning disabilities. Leko and Brownell reported that general education teachers often had more content knowledge than special education teachers and suggested that both collaborate as a way to join the two knowledge bases and grow both teachers and students. While most teachers support high standards for teaching and learning, many are not prepared to implement such standards (Desimone et al., 2006; Nougaret, Scruggs, & Mastropieri, 2005). According to Desimone et al. (2006), the majority of teachers learned mathematics through rote memorization with little emphasis on deeper understanding. Research indicated that both pre-service and in-service elementary teachers lack content knowledge in mathematics (Desimone et al., 2006; National Commission for Teaching America's Future [NCTAF], 1996).

Previous studies have focused on designing and evaluating professional learning opportunities for general education teachers to improve teacher content and pedagogical knowledge (Desimone et al., 2003; Desimone et al., 2006; Dingle et al., 2011; Elliott, Kurz, Tindal, Stevens & Yel, 2009; Fishman et al., 2013; Lee, 2005). However, little research exists on evaluating the quality of professional learning opportunities of teachers who work with children with disabilities. Additionally, there is minimal research in the area of mathematics professional development and its relationship to increasing mathematics achievement for students with IEPs.

Statement of the Problem

Teachers play a critical role in student success. Fishman et al. (2013) found that teachers' instructional practices affect student learning, and when given quality professional learning opportunities, all teachers have the capacity to improve student

achievement. Additionally, Baxter, Ruzicka, Beghetto, and Livelybrooks (2014) discovered that teachers who participated in high quality professional development felt more confident in their ability to engage students in learning, assess students' understanding, and facilitate classroom discussions.

According to the U.S. Department of Education (2011a), professional development is the single largest monetary investment in school reform with millions of dollars spent annually. During the 2013-14 school year, Title II part A provided \$2.21 billion to states and districts to improve teacher quality. The majority of these Title II funds, 44 percent, was used for professional development (U.S. Department of Education, 2014). Given the connection between teachers' professional learning and school improvement efforts, as well as the amount of money spent on professional development at the federal, state, and local levels, increasing the understanding of how best to provide and deliver professional learning is critical (Wayne, Yoon, Cronen, Garet, & Zhu, 2007). Several studies have investigated the relationship between teacher characteristics and student performance (Jacob & Lefgren, 2004; Rockoff, 2004; Walker, 2012; & Weidenbaugh, 2006). The purpose of this study was to examine the teacher perceptions of professional learning opportunities in regard to Learning Forward's seven Standards for Professional Learning in several school districts in Pennsylvania. Furthermore, this study explored the relationship between teacher perceptions of professional learning and mathematics achievement for students with IEPs.

Definition of Terms

For the purpose of this study, the following definitions apply:

Achievement Gap - The difference in the performance between each subgroup within a participating school and the statewide average performance of the subgroups in reading/language arts and mathematics as measured by the assessments required under NCLB (Public Law 107-110, 2002).

Act 48 of 1999 (Act 48) – Pennsylvania’s professional development law, also known as Act 48, applies to all certified professionals and outlines the requirements for said professionals to maintain certification (Pennsylvania Department of Education, 2007).

Average Growth Index (AGI) – The Pennsylvania Value Added Assessment System (PVAAS) measure used to represent growth. The average growth index is a value, based on the average growth measure, which allows comparison among schools (Pennsylvania Department of Education, 2014a).

General Education Teacher – For the purpose of this study, general education teacher will specifically mean a classroom teacher in grades 4 through 8 holding an elementary or mathematics instructional certificate from the Pennsylvania Department of Education in an area other than special education (Pennsylvania Department of Education Bureau of Assessment and Accountability, 2005).

Growth Measure – The growth measure is the average of the individual growth values for each student tested, estimating change in achievement from one grade to the next for the same group of students (Pennsylvania Department of Education, 2014a).

IEP Subgroup - To increase the accountability of at-risk groups of learners, the No Child Left Behind Act (NCLB) requires that school districts and states disaggregate the test results for several subgroups of students. Students with disabilities who are receiving services under the Individuals with Disabilities Education Act (IDEA), or students with IEPs, make up one of the subgroups that must be reported (U.S. Congress, 2001).

Individualized Education Plan (IEP) –The legal document required for children with disabilities that individualizes educational goals and instruction in accordance with IDEA. An IEP must be developed by a team including a local education agency representative (LEA), the student’s teachers, related service providers, and parents (U.S. Department of Education, 2014).

In-Service – For the purpose of this study, in –service will refer to a traditional approach to professional learning that was often provided in a structured setting to further develop technical subject matter competencies, and to keep abreast of and to explore educational and technological content and processes (Learning Forward, 2014).

Learning Forward, formerly known as the National Staff Development Council (NSDC) – The international association and advocacy organization committed to ensuring effective teaching for every student through practice, policy, and research (Learning Forward, 2014).

Local Educational Agency (LEA) - The public board of education or other public authority legally constituted within a state for either administrative control or direction of, or to perform a service function for, public elementary schools or secondary schools (Public Law 107-110, 2002).

Mathematics Benchmark – for the purpose of this study, *mathematics benchmark* will refer to the 2012 Pennsylvania benchmark for mathematics on the Pennsylvania State System of Assessments (PSSA). The 2012 mathematics benchmark was 78% or more students earning proficient or advanced on the PSSA (Pennsylvania Department of Education, 2014b).

No Child Left Behind Act of 2001 (NCLB) - The re-authorization of the “Elementary and Secondary Education Act (ESEA) of 1965” signed into law by President George W. Bush in 2002, commonly referred to as NCLB. The law details the responsibilities of public schools in testing and school accountability (Public Law 107-110, 2002).

Pennsylvania Standard for Academic Growth – The expectation that all students will make one year’s worth of growth from a point in time of one school year to the same point in time one year later (Pennsylvania Department of Education, 2014a).

Pennsylvania Value-Added Assessment System (PVAAS) – The statistical analysis of Pennsylvania state assessment data that provides the Pennsylvania Department of Education and local education agencies with school and student growth information (Pennsylvania Department of Education, 2014a).

Professional Development/ Professional Learning / Staff Development – The comprehensive, sustained, and intensive approach to improving teachers’ effectiveness in raising student achievement (Learning Forward, 2014).

PSSA Results – For the purpose of this study, PSSA results will refer to a district’s 2012 mathematics scores on the Pennsylvania State System of Assessments (PSSA) (Pennsylvania Department of Education, 2014b).

School Districts Demonstrating Growth— For the purpose of this study, school districts demonstrating growth will refer to those school districts that met the mathematics benchmark in the IEP subgroup, based on 2012 PSSA results, and demonstrated significant growth according to 2014 PVAAS projections (Pennsylvania Department of Education, 2014a).

School Districts Not Demonstrating Growth— For the purpose of this study, school districts not demonstrating growth will refer to those school districts that did not meet the mathematics benchmark in the IEP subgroup, based on 2012 PSSA results, and demonstrated significant lack of growth according to 2014 PVAAS projections (Pennsylvania Department of Education, 2014a).

Significant Growth - An Average Growth Index (AGI) score of three or more indicates significant growth, or that the average achieving student in a district/school significantly exceeded the standard for Pennsylvania Academic Growth (Pennsylvania Department of Education, 2014a).

Significant Lack of Growth - An Average Growth Index (AGI) score of negative three or less indicates *significant lack of growth*, or that the average achieving student in a district/school made less than one year's worth of growth and significantly underperformed according to the standard for Pennsylvania Academic Growth (Pennsylvania Department of Education, 2014a).

Special Education Teacher – A teacher who holds an instructional certificate from the Pennsylvania Department of Education in the area of Special Education and whose primary responsibility is direct contact with students in teaching-learning situations (Pennsylvania Department of Education, 2007).

Student Achievement – The measure of a student's performance at one single point in time comparing student performance to a standard. This can include scores on the PSSA assessments as well as other measures of student learning, such as student scores on pre-tests and end-of-course tests; student performance on English language proficiency assessments; and other measures that are considered rigorous and comparable across classrooms (Pennsylvania Department of Education, 2014a).

Student Growth – The measure of a student's progress across time, comparing an individual's current performance to his/her prior performance (Pennsylvania Department of Education, 2014a).

Subgroup – The categories of students identified under the Elementary and Secondary Education Act section 1111(b)(2)(C)(v)(II) including students who are economically disadvantaged; students from major racial and ethnic groups; students with disabilities; and students with limited English proficiency. (Public Law 107-110, 2002).

Limitations

The researcher depended upon volunteers from a limited number of school districts in Pennsylvania identified as showing significant growth or significant lack of growth according to Pennsylvania Value-Added Assessment System (PVAAS) data to participate in the study. Additionally, the study included only teachers' feedback and did not seek input from principals, supervisors, parents, or students. Participation was limited to elementary and middle school general and special education teachers in grades 4 through 8 who are teaching mathematics to students with IEPs. Another limitation to the study was the use of teacher assessments of professional learning, a topic which is subjective in nature. The accuracy of the results of an online survey and interview

questions depended upon the participants being honest in selecting and sharing responses. A final limitation of this study was the examination of only seven areas of professional learning identified in the *Standards for Professional Learning* that may impact student achievement: Learning Communities, Leadership, Resources, Data, Learning Designs, Implementation, and Outcomes (Learning Forward, 2014).

Research Questions

The following research questions guided this study:

1. What are teacher perceptions of professional learning in school districts demonstrating growth in regard to the seven professional learning standards as defined by Learning Forward Professional Learning Organization, formerly known as the National Staff Development Council?
2. What are teacher perceptions of professional learning in school districts not demonstrating growth in regard to the seven professional learning standards as defined by Learning Forward Professional Learning Organization, formerly known as the National Staff Development Council?
3. What relationships exist between teacher perceptions of the seven professional learning standards as defined by Learning Forward and mathematics achievement for students with IEPs?

Summary

Nearly ten percent of school-aged children receive special education services (U.S. Department of Education, 2011b). These students score significantly lower than their peers on standardized tests (Wagner et al., 2006). Research has shown that teacher quality is the most important school-based influence on student achievement. Through

staff development and professional learning opportunities, school leaders can provide teachers with the research-based strategies and supports necessary to improve student learning (Borko, 2004; Sparks & Hirsh, 1997). The purpose of this study was to identify teacher perceptions of professional learning and explore the relationship between the seven standards of professional learning, as defined by Learning Forward, and mathematics achievement for students with IEPs. Chapter Two will review the current body of research and literature pertinent to this study.

Chapter Two – Literature Review

Introduction

The expectations for schools today to hold a much more diverse group of students to higher standards has created greater demands on teachers than ever before. As Drago-Severson (2009) pointed out, “The work of educators is dramatically more complex in the twenty first century” (p. ix). Teaching for problem solving and application of knowledge requires teachers to have knowledge of subject matter and understanding of how to represent ideas in powerful ways (Darling-Hammond, 2000). Today’s teachers are charged with structuring a productive learning process for students from a wide range of instructional levels with diverse degrees of prior knowledge, including students with IEPs. Effective teachers must assess how and what students are learning and adapt instruction to meet a variety of learning styles (Darling-Hammond, 2000).

According to the Study of Personnel Needs in Special Education (SPeNSE), conducted by the U.S. Department of Education, Office of Special Education Programs (OSEP), special education teachers spend an average of 59 hours per year in professional development with general education teachers averaging 65 hours per year (Carlson, Brauen, Klein, Schroll, & Westat, 2002). Research has confirmed that professional learning opportunities and experiences are associated with teacher quality and that teachers are key to student achievement (Desimone, 2009; Feng & Sass, 2013). Feng and Sass (2013) were the first researchers to quantify the relationship between teacher training and student achievement for students with disabilities. Using statewide longitudinal data from the Florida Education Data Warehouse (FLEDW) on over 400,000 students in special education since 1995, Feng and Sass analyzed the impact of pre-

service and in-service training on the ability of teachers to promote academic achievement among students with disabilities. These authors found that achievement for students with disabilities tended to rise based on the professional learning experiences of their teachers.

Similarly, Polly, Neale, and Pugalee (2014) reported that teachers who participated in high quality mathematics professional learning opportunities employed higher level mathematics tasks and questioning in class activities. In their study of over 235 fifth grade teachers, Dash, de Kramer, O'Dwyer, Masters, and Russell (2012) found that students whose teachers had received professional development in working with special populations outperformed peers on mathematics assessments by more than one full grade level. Additionally, Polly et al. (2014) found that for students with disabilities, the understanding of mathematics was positively linked to teachers' mathematics knowledge, use of cognitive-demanding mathematics tasks, and the ability to support mathematical communication during discussions.

Need for Change

According to the 2011 results of the Trends in International Mathematics and Science Study (TIMSS), U.S. students scored low. Administered by the International Association for the Evaluation of Educational Achievement (IEA), an international organization of national research institutions and governmental research agencies, TIMSS assessed the mathematics and science skills of fourth and eighth graders internationally. U.S. fourth grade students scored lower than 10 other participating countries with only 32% of U.S. students in grade 8 scoring at or above the "high" international mathematics benchmark. U.S. students are underperforming in mathematics and science compared to

their peers in other countries (Mullis, Martin, Foy, & Arora, 2012).

Nationally, students with disabilities are also struggling to meet rigorous benchmarks. According to the National Center for Education Statistics (2013), the percentage of students with disabilities who spent 80% or more of their instructional time in general education has increased from 32% in 1990 to 61% in 2010. General education teachers play a significant role in the achievement of students with disabilities.

According to the SPeNSE, general education teachers averaged four students with disabilities on their class roster. The reauthorization of the Individuals with Disabilities Act (IDEA) mandated that students with disabilities have access to the general education curriculum and that students' performance levels be assessed relative to high academic standards of achievement. Additionally, IDEA required that students be provided with appropriate education in the least restrictive environment, including placement in general education settings.

Eckes and Swando (2009) found that the most common cause for schools failing to make adequate yearly progress (AYP) was the number of students with IEPs scoring below grade level and not meeting state proficiency benchmarks. Chudowsky, Chudowsky, and Kober (2009) reported differences of 30 to 40 percentage points between students with disabilities compared to students without disabilities on state large scale assessments of mathematics and reading achievement. Stevens (2013) examined the mathematics achievement growth for a statewide sample of more than 92,000 students taking the North Carolina achievement test in grades 3-7. This researcher reported that students in the disability subgroup showed growth that decelerated over grades indicating that achievement gaps did not diminish over time but rather increased.

Additionally, students with disabilities scored significantly lower at the initial assessment and showed slower rates of growth over time. Stevens pointed out that students in subgroups that perform significantly lower in achievement at the entrance must attain greater rates of growth to meet expectations and close achievement gaps. Similarly, Wei, Lenz, and Blackborby (2013) found that students in the disability subgroup had lower mathematics achievement levels and showed slower mathematics achievement growth during the elementary years. According to the Obama Administration, professional learning programs nationwide have not responded to the need for teachers to be prepared to teach in high needs areas such as teaching students with disabilities (U.S. Department of Education, 2011a).

Wei, Darling-Hammond, and Adamson (2010) reported on trends and challenges in professional learning in the U.S. Utilizing several data sets from the Schools and Staffing Survey (SASS) between 2000 and 2008, these scholars compared over 35,800 teachers' responses to questions about professional learning. The results revealed that professional learning opportunities have been declining in the U.S. In 2008, teachers had fewer opportunities to engage in sustained professional learning than four years prior. Additionally, these scholars found teachers were half as likely to report collaborative efforts in their schools as teachers were in 2000. Similarly, the intensity of professional development has declined in key areas such as teaching students with disabilities. Between 2004 and 2008, fewer than half of the teachers, 42.3% of the more than 24,000 participants, indicated involvement in professional development related to teaching students with disabilities with only 33% feeling there was support for teaching students with special needs. These scholars identified teaching students with special needs as one

of the three highest priorities for further professional learning (Wei et al., 2010).

Professional Learning, The Agent for Change

The professional learning process begins with identifying and analyzing what students need to know and be able to do as well as understanding how students learn (pedagogy). Once student learning needs are determined, educator learning needs are diagnosed. Professional learning establishes what teachers need to know and be able to do to support high levels of student learning. At the core of professional learning are the content knowledge, instructional strategies, and assessment practices that support student learning needs (Learning Forward, 2014). Research has shown that supporting adult learning is positively linked to improved student achievement (Reidell, 2011; Sparks & Hirsh, 1997; Stronge, Ward, & Grant, 2011; Varghese, 2013; Walker, 2012;). Nearly two decades ago in their seminal work, Sparks and Hirsh (1997) and Kennedy (1998) cited effective professional development as an essential element in changing school leaders' and teachers' practices.

Research based on teacher learning and student achievement has fallen into two categories: (a) generic teaching skills and subject matter and (b) student learning. The first wave of teacher effectiveness research involved topics such as maintaining student attention, grouping students, scheduling specific time allotments for various programs, providing clear classroom demonstrations and models, and gaining feedback to assess student understanding while teaching (Holland, 2005). The second wave of teacher effectiveness research shifted the focus from subject matter and student learning to an emphasis on how students reason and problem solve. This shift was confirmed when researchers such as Garet et al. (2001) reported that professional learning opportunities

influence teachers' instructional practices and lead to improved student achievement.

These authors found that professional learning was most influential when it focused on: student learning for particular subject matter, instructional practices specifically related to that subject matter, and teachers' knowledge of subject matter content.

In 1922 the Council for Exceptional Children (CEC) established professional standards and ethics for the field of special education. As a recognized leader in special education, CEC developed these standards and guidelines to assure that individuals with exceptionalities had well-prepared, career-oriented special educators. Today, CEC upholds professional development standards for special education professionals: maintaining a personalized professional development plan designed to advance their knowledge and skills; maintaining current knowledge of procedures, policies, and laws relevant to practice; engaging in evaluation of themselves and programs for the purpose of continuous improvement of professional performance; and advocating for resources for effective professional development (CEC, 2014). Working in tandem with other professional organizations including Learning Forward, formerly known as the National Staff Development Council, it is CEC's goal to ensure that all educators are well prepared to support the learning of individuals with exceptionalities.

Supporting a strong teaching force is a top priority for the Obama Administration. With the goal of every teacher receiving high quality preparation and support so that every student may have effective teachers, making improvements in teacher and leader effectiveness is one of the four pillars of the Administration's educational reform agenda. Through funding opportunities such as Race to the Top and the Elementary and Secondary Education Act (ESEA) Flexibility plans, the Administration has aimed to

ensure that all teachers receive professional development opportunities that are aligned with identified strengths and needs (U.S. Department of Education, 2011a).

Darling-Hammond and McLaughlin (2011) proposed that the “vision of practice that underlies the nation’s reform agenda requires teachers to rethink their own practice, construct new classroom roles and expectations about student outcomes, and teach in ways they have never taught before and probably never experienced as students” (p. 81). Such rethinking of practice requires teachers not only to learn new skills and practices but also to unlearn practices and beliefs about students and instruction that have been the basis of their professional practice. “Change is learning. Change cannot occur without professional learning” (Hall & Hord, 2011, p. 53). Professional learning is the vehicle that will assist teachers’ rethinking of practice.

Characteristics of Effective Professional Learning

Recognizing the lack of quality professional learning opportunities for teachers, the No Child Left Behind Act (NCLB) set forth five criteria for professional development to be considered high quality. According to the provisions of section 9101, Part A of Title IX, activities must: (a) be sustained, intensive, and content focused; (b) be aligned and directly related to state and academic content standards, student achievement standards, and assessments; (c) be designed to improve and increase teacher knowledge of the subjects that they teach; (d) be based on scientific research to advance teachers’ understanding of effective instructional strategies; and (e) be evaluated regularly for effects on teacher effectiveness and student achievement (U.S. Congress, 2001).

In recent years, the term *professional development* has evolved into *professional learning* (Learning Forward, 2014). While both focus on professional learning

experiences that are ongoing and actively engaging, traditionally, *professional development* opportunities were offered in separate settings, removed from the natural classroom setting and schools where teachers normally practice. The underlying assumption was that teachers were deficient in some way and required improvement (Mizell, 2008). Bruce et al. (2010) conceptualized teacher *professional learning* as embedded within classroom contexts. The social context of the classroom has now become the site of teacher professional learning on an ongoing basis, involving teacher planning, practice, and reflection with an emphasis on teacher collaboration. In 2010, with the National Staff Development Council's (NSDC) name change to Learning Forward and the revision of standards, the term *professional learning* became more widely accepted. The new standards and title, *professional learning*, take into account both the context and culture of teacher and student learning (Learning Forward, 2014; Mizell, 2008).

Learning Forward published the *Standards for Professional Learning* outlining characteristics that lead to improved student results. The seven standards include:

- Learning Communities
- Leadership
- Resources
- Data
- Learning Design
- Implementation
- Outcomes

The following sections will describe each of these standards in detail.

Learning communities. Professional learning that increases results for all students occurs within communities of learners (Mizell, 2008). These communities are committed to continuous improvement; they are collaborative and supportive of school and improvement goals (Learning Forward, 2014). Because federal mandates such as IDEA and NCLB require students with disabilities to have access to the general education curriculum and make AYP on state academic standards, special and general education teachers must work together to deliver content area instruction and provide intensive instruction to students with disabilities in order to meet these goals (Leko & Brownell, 2009). Whitcomb, Borko, and Liston (2009) suggested that learning communities support the social nature of learning and allow teachers to enhance their learning through collaboration and reflection.

An integral part of learning communities involves including nonstaff members, such as community members, parents, and even students (Mizell, 2008). Jaquith, Mindich, Wei, and Darling-Hammond (2010) studied four professionally active states: Colorado, Missouri, New Jersey, and Vermont. All four states have professional development standards; induction and mentoring programs for beginning teachers; and a state-level organization that oversees teacher licensing, professional teaching standards; and professional learning opportunities. In addition, Jaquith et al. (2010) suggested working together with professional organizations and local providers in order to meet teacher and student needs. As a result of their review of literature on professional learning in mathematics, Sztajn, Hackenburg, White, and Allestaht-Snyder (2006) emphasized the importance of elementary teachers and university-based mathematics

educators working together to improve mathematics instruction by forming a mathematics education community of learners.

Effective staff development should be collaborative in nature and involve teachers as both learners and teachers (Learning Forward, 2014). Moore, Kochan, Kraska, and Reams (2011) found professional learning most effective when it takes place in vibrant learning communities where a “community of lifelong learners” (p. 74) is created. According to Darling-Hammond and McLaughlin (2011), in order to make the connection between theory and practice, opportunities should be available for teachers to learn by doing, reading, reflecting, and collaborating with others. To facilitate this new structure for learning, traditional in-service training and dissemination must be replaced by opportunities for knowledge sharing anchored in problems of practice. Professional learning opportunities must embrace a range of prospects including, but not limited to, school and university collaboration, teacher-to-teacher and school-to-school networks, partnerships with community organizations, professional organizations, standards boards, “critical friends” groups, and learning communities (Darling-Hammond & McLaughlin, 2011). Moore et al. (2011) highlighted the importance of high quality professional learning that is “collaborative, long-term, consistent with the needs of students and school, and embedded in everyday practice” (p. 76).

Trust. With the increased attention being given to building communities of learners, a critical component to consider when developing collaborative professional learning opportunities is trust. Sztajn et al. (2006) followed 27 teachers in the Project SIPS (Support and Ideas for Planning and Sharing in mathematics education) professional development initiative. These researchers examined the first year of the

project's implementation for factors that supported the development of trust among mathematics teachers and special education teachers utilizing observations, field notes, video tapes of monthly meetings, written reflections from participants, interviews, and focus groups. The professionalism of participants, the organization of the project, and the establishment of relationships were all identified as factors that helped with development of trust which helped teachers feel less vulnerable and more willing to participate (Sztajn et al., 2006). Similarly, Beswick (2014) identified flexibility, respect for teachers' knowledge and experiences, and respect of classroom and school realities as factors in establishing a climate of trust. Finally, Darling-Hammond and McLaughlin (2011) encouraged professional learning developers to create and sustain settings in which teachers "feel safe to admit mistakes, to try (and possibly fail), and to disclose aspects of their teaching" (p. 87). These scholars highlighted the importance of building trust at the start of any collaborative initiative and urged developers to examine critically ways in which caring and trust are built among participants as the foundation for community development.

Leadership. As Kennedy (1963) shared, "Leadership and learning are indispensable to each other" (p. 869). Leaders develop capacity to learn and lead professional learning. Effective leaders advocate for and provide support systems for professional learning and distribute leadership and responsibility for its effectiveness and results (Learning Forward, 2014). In their study of professionally active states, Jaquith et al. (2010) identified infrastructures to support professional learning implementation as one of four keys to success. Infrastructures were described as formal structures such as regional professional development centers as well as informal partnerships with

professional organizations or providers. Desimone et al. (2006) found that there was “substantial room for administrators to shape policy and practice around teachers’ professional development” (p. 192).

Moore et al. (2011) suggested that principals and school leaders who value and implement high quality professional learning opportunities are a factor in positive student achievement. These researchers compared the professional development opportunities in 59 schools in Alabama to the NSDC’s *Standards for Staff Development* and found professional learning to be most effective when there are strong leaders who recognize the value of high quality professional development. Strong leadership is needed to provide high quality professional learning opportunities and to encourage teachers to partake of challenging professional learning opportunities in order to grow professionally and increase student achievement (Moore et al., 2011).

Resources. Given the complex relationship between teaching and learning, it is essential that school leaders find effective ways to support teachers. Resources for professional learning include staff, materials, technology, and time, all dependent on available funding (Mizell, 2008.). Jaquith et al.’s (2010) study of professionally active states pointed out that successful states funded and worked to earmark funds to support and effectively implement instructional improvement efforts. All of the states in Jaquith et al.’s study required induction and mentor programs for teachers and have utilized combinations of federal, state, and local resources and organizations in order to support and sustain professional learning opportunities.

Successful professional learning requires prioritizing, monitoring, and coordinating resources (Learning Forward, 2014). Showers, Joyce, and Bennet (1987)

found that effective professional growth was more successful when teachers tried new strategies with peer supports such as mentor teachers or coaches. Duley (2011) learned that once coaching was added to the professional learning model, 95% of participants were able to apply learning to classroom practice. Lee (2005) proposed including participants as decision makers, recruiting teachers from same contexts (ie: same building, grade level, and content), connecting professional learning with professional practice, and building partnerships with local universities and Local Education Agencies (LEAs) in order to support professional learning. Shared decision-making among a broad group of professionals, including teachers and administrators working together to support and determine how resources are allocated, is a key factor in successful professional learning (Jaquith et al., 2010).

Data. The use of data to plan and evaluate professional learning is critical. Crockett (2007) advocated that formative assessment mediates teaching and learning and the two are “mutually constitutive, inseparable activities” (p. 612). The growing emphasis on student achievement as a result of NCLB and the strong focus on accountability have left schools in the U.S. searching for ways to improve student learning. This emphasis has led to increased accountability for school leaders to develop and implement high-quality professional learning opportunities. Attention has shifted from evaluating professional development by the number of attendees and whether they enjoyed the experience to determining the impact of professional learning experiences on student achievement (Moore et al., 2011).

Rockoff (2004) argued that despite being widely available, objective, and recognized as important indicators of achievement, test scores do not capture all facets of

student learning. Data that enrich decisions about professional learning lead to improved scores for students. The use of multiple sources of data offers a balanced and more comprehensive analysis of student, educator, and system performance (Learning Forward, 2014). Many of the states in Jaquith et al.'s (2010) report had multiple accountability systems in place to monitor the level and quality of professional learning throughout the state. Overlapping systems such as the guidance offered from statewide professional development standards and regulations; state-level professional boards; district and school committees, who oversee professional learning opportunities; and teacher surveys to gauge satisfaction were employed by successful states (Jaquith et al., 2010). Guskey's (2000) work identified five levels of professional learning evaluation that may include both summative and formative measures to indicate whether changes are needed in content, process, or context. Evaluations at the lower levels involve assessing participant reactions and levels of satisfaction as well as participant learning in order to improve program design, delivery, and content. Guskey and Yoon (2009) suggested also assessing the learning culture in order to improve organizational support and the professional learning culture. Finally, evaluators must examine the program's impact on student learning to inform future school change efforts (Guskey, 2000).

Professional learning that increases teacher effectiveness and improves student achievement uses a variety of sources and types of data to plan, assess, and evaluate professional learning (Learning Forward, 2014). Researchers such as Winslow (2009) and Desimone (2009); however, have found that lacking from the professional learning framework is consistency in evaluating professional development and its effects. In Winslow's study of the perceptions of differentiated staff development as an effective

means to increase student achievement, both principals and teachers reported rarely, if ever, utilizing student data to plan professional development opportunities. School leaders must ensure that a variety of data is utilized to plan professional learning opportunities that focus on school improvement and student learning (Mizell, 2008).

Learning design. A critical component of any professional learning program is the learning design (Learning Forward, 2014). The most effective professional learning occurs in the place of implementation, in most cases the classroom, and preferably as part of the regular workday. Learning designs are most effective when they are grounded in the day-to-day teaching practices and are collaborative (Darling-Hammond, 2000; Sparks & Hirsch, 1997). Teachers should have job-embedded professional learning opportunities and differentiated choices for professional learning (Mizell, 2008). In their seminal work, Sparks and Loucks-Horsley (1989) identified the importance of differentiated opportunities and teacher choice where teachers may take active roles in choosing goals and activities for themselves. Demonstrations, opportunities for practice with feedback, trainings that are concrete and ongoing, and supports were identified as possibilities for effective staff development (Sparks & Loucks-Horsley, 1989). Lee (2005) offered similar considerations for professional development, including (a) selection of self-guided staff development, (b) observation, (c) participation in the development and improvement process, and (e) inquiry. Desimone (2009) recommended that professional learning be embedded in teachers' daily lives through opportunities such as co-teaching, mentoring, reflecting, discussing student work, participating in book clubs and teacher networks, and observing others. Offering choice and shared responsibility

for selection of professional learning opportunities improves student learning (Mizell, 2008).

Participation in online professional learning opportunities should be considered as a way to connect with colleagues and to learn from experts (Learning Forward, 2014). Fishman et al. (2013) compared face-to-face professional development to online delivery of professional learning with 49 secondary teachers across the country. With content designed to be the same high quality across both conditions, the authors found no significant difference between face-to-face and online delivery. Nevertheless, presenting in a different modality offered diverse ways to engage participants and better differentiate to meet individual teacher needs. Additionally, these researchers found many potential advantages to the online delivery modes including the ability to accommodate teachers' busy schedules and draw on powerful resources not available locally. Online professional learning increased teacher self efficacy and participants required less time to benefit from materials. Dash et al. (2012) further investigated the impact of online professional development on teacher quality and student achievement in fifth grade mathematics. These researchers followed 235 fifth grade teachers from twelve different states. Similar to Fishman et al.'s (2013) findings, online methods of professional development were championed by teachers as an "anytime, anywhere" (p. 3) desirable option. The authors found additional evidence of significant teacher gains in overall content knowledge and practice of online learning (Fishman et al., 2013). Dash et al. (2012) and Fishman et al. (2013) supported the notion that online professional learning be an option for teachers when designing professional learning opportunities.

Professional learning design should take into consideration teachers' backgrounds and experiences and incorporate theories of adult learning (Mizell, 2008). Delivering professional learning opportunities is a form of teaching. Many of the same instructional practices used with students apply to teaching adults. Effective instruction must respond to the needs of the learner and may take place in different grouping formats. Abilock, Harada, and Fontichiaro (2013) recognized that teachers have unique and useful skills and talents that can enrich professional development. Adult learners, like students, have different needs; therefore professional learning facilitators should adapt and differentiate to meet those needs and should respect different points of view. Desimone et al. (2006) and Liljedahl (2014) suggested scaffolding professional learning opportunities in an effort to better meet the diverse needs and levels of teacher content knowledge. By providing varying degrees of activities targeted to teachers' levels of content knowledge, school leaders are able to challenge and grow all participants. Similarly, Weiss and Pasley (2006) identified modeling and discussing methods of good practice as characteristics of high quality programs. In the teaching of new skills or strategies, modeling or demonstration is also essential. Finally, when teachers are learning new skills, Hasbrouck and Denton (2005) suggested there be opportunities to practice with feedback and support. Researchers have found that professional learning opportunities that respond to the diversity of teachers' background knowledge and experiences leads to increased participation and hence increased student achievement (Abilock et al., 2013; Desimone et al., 2006; Hasbrouck & Denton, 2005; Liljedahl, 2014; Weiss & Pasley, 2006).

Planning is an important part of professional learning design. Researchers have identified three structural and design features associated with high-quality professional learning opportunities (Beswick, 2014; Blank & de las Alas, 2009; Desimone, Smith, & Phillips, 2013; Dingle et al., 2011; Harris & Sass, 2011; Lee, 2005; Marrongelle, Sztajn, and Smith, 2013; Sztajn, Campbell, & Yoon, 2011; Telese, 2012; Yoon, Duncan, Lee, Scarloss, & Shapley, 2007). Structural features include the form, or organization, of the activity such as professional learning communities, study groups, teacher networks, mentorships, committees, internships, etc., as opposed to traditional workshops or conference participation. Duration of the activity, including the total number of contact hours that participants were expected to spend in the activity as well as the time span over which the activity takes place, was a second structural feature. Yoon et al. (2007) found that teachers who received substantial professional development, defined as an average of 49 hours, boosted student achievement by 21 percentile points. The final design characteristic of high-quality professional development was the degree to which the activity emphasized collective participation of groups from the same school, grade, or department, as opposed to participation of individual teachers from many schools. Researchers have found these structural features to be significantly related to increases in teachers' knowledge as well as changes in practice; as such they play an important role in the design of professional learning opportunities (Beswick, 2014; Blank & de las Alas, 2009; Desimone et al., 2013; Dingle et al., 2011; Harris & Sass, 2011; Lee, 2005; Marrongelle et al., 2013; Sztajn et al., 2011; Telese, 2012; Yoon et al., 2007).

Implementation. The primary goal of implementation of professional learning opportunities should be to enhance teaching practices in order to improve student

performance (Learning Forward, 2014). Hasbrouck and Denton (2005) offered the “Three Commandments of Professional Development: (a) focus on student outcomes and plan accordingly, (b) promote instructional practices that are based on the best available research, and (c) plan all aspects of professional learning in a purposeful, unified way.” (p. 69).

Effective professional learning plans are consistent, span three to five years, and should be aligned to school goals and state standards (Mizell, 2008). Guskey (1995), in his seminal research, suggested that professional learning should have long-term goals based on gradual change at both individual and school levels occurring over time. Desimone (2009) created a conceptual framework and identified five steps in the process of successful implementation of professional learning: (a) teachers experience professional development, (b) participants increase knowledge and skills, (c) attitudes and beliefs change, (d) teachers use new knowledge to improve instruction, and (e) changes in instruction boost student learning. Effective professional learning depends upon the quality of planning, implementation, and evaluation (Duley, 2011). To be effective, professional learning must also provide teachers with a way to apply what is learned to their actual teaching (Mizell, 2008). Garet et al. (2001) found that professional development leads to better instruction and improved student learning when coherent; that is, it builds upon the curriculum materials that teachers use, connects with district and state academic standards, and encourages communication among those striving to reform their instruction in similar ways. Desimone et al. (2006) reminded designers that professional growth opportunities must connect with the school’s vision and goals.

Opportunities for reflection and ongoing feedback are critical to successful implementation of professional learning. Reflective practice has become an important component in educational growth and has been widely discussed in professional development planning (Borko, 2004; Darling-Hammond, 2000). In their case study of five primary mathematics teachers who participated in a collaborative model of professional development, Muñoz-Catalan, Climent, Carillo, and Contreras (2010) discovered that through joint reflection with others and networking, teachers gained competence and self-confidence in both autonomous planning and interaction. Participation in collaborative professional learning opportunities provided teachers with resources and principles upon which to base decisions. Supporting the importance of teacher inquiry and action research, Cwikla (2004) also found productive teacher collaboration to be essential in successful professional learning programs.

Abilock et al. (2013) discussed the importance of creating a reflective and collaborative climate with more explaining and discussing than showing and telling. These authors suggested a shift in focus to non-judgmental, active listening, as well as appreciating that teachers bring valuable knowledge to professional learning. Abilock et al. (2013) suggested participants should listen with an open mind and support one another. Saylor and Johnson (2014) performed a meta-synthesis of 21 articles from 2000-2012 on the role of reflection in teaching mathematics. Findings suggested that the role of reflection in professional growth and development of elementary mathematics teachers includes both formal and informal opportunities to help transform practice. In their seminal research, Showers et al. (1987) obtained evidence that the short-term workshop approach to professional development does not work. For teachers to learn new

instructional practices and apply them successfully in the classroom, these authors suggested there must be opportunities to understand the theory and rationale for the new context and instruction. To increase the relevance and likelihood that change will result in increased student success, Showers et al. recommended observing a model in action, either through video or role playing, and practicing delivery in a safe context with other teachers. Supporting Showers et al.'s suggestions, Darling-Hammond and McLaughlin (2011) advocated that professional development should provide opportunities to reflect critically on practice and deepen the understanding of the teaching and learning process. Similarly, Moore et al. (2011) identified hands-on, collaborative work involving reflection, discussion, and self-monitored practice to have a significant effect on sustainability. The term professional learning should not refer to an event or events, but rather ongoing, sustained, inquiry-based learning.

Outcomes. A final characteristic of effective professional growth involves connecting professional learning with teacher performance standards and outcomes (Mizell, 2008). President Obama (2009) identified teachers as the most important factor in a student's school success. In a longitudinal study involving 14,000 students across 197 elementary schools, Heck (2007) examined the relationship between teacher quality and student learning and growth rates in reading and math. Defining teacher quality as high school-level professional standards (i.e., certification, content knowledge, and performance criteria), Heck (2007) found that collective teacher quality increased student learning rates, especially in targeted subgroups such as English Language Learners (ELL), low socio-economic status (SES), and IEP subgroups.

In 2006, the President created the National Mathematics Advisory Panel to foster greater knowledge of and improved performance in mathematics among American students. The task was to find research studies that examined the most effective instructional practices in mathematics and make recommendations for teacher and student improvement. The panel reviewed more than 16,000 research publications and policy reports, received public testimony from 110 individuals, reviewed written commentary from 160 organizations and individuals, and analyzed survey results from 743 active teachers. Findings reinforced the idea that teaching well requires substantial knowledge and skill. Furthermore, the panel suggested that mathematics preparation of elementary and middle school teachers must be strengthened as one means for improving teachers' effectiveness in the classroom. A critical recommendation was that teachers be given ample opportunities to participate in mathematics professional learning possibilities. In conclusion, the National Mathematics Advisory Panel (2008) reported that teachers who consistently produce significant gains in students' mathematics achievement are the most effective.

Teacher Effectiveness

Recently, policy makers and educational leaders have begun to emphasize the importance of linking teacher effectiveness to various aspects of teacher education and student achievement through value-added measures. Skourdoumbis (2014) and Ross and Bruce (2005) argued that students are only as good as the classroom teacher and his or her teaching practices. Using data from the Early Childhood Longitudinal Study kindergarten cohort (ECLS- K) involving more than 21,000 students, Phillips (2010) found two main trends when examining the relationship between teacher quality and

student achievement: (a) teachers differed substantially in their effectiveness and (b) differences in teacher effectiveness were significantly correlated with student achievement.

Rivkin, Hanushek, and Kain (2005) used longitudinal data including more than 200,000 students in over 3,000 public elementary and middle schools from the University of Texas at Dallas (UTD) Texas Schools Project and found that teachers matter for student achievement. Rivkin et al. (2005) found that achievement gains were systemically related to observable teacher and school characteristics. In their longitudinal study regarding the long-term impact of using value-added measures to assess teachers, Chetty, Friedman, and Rockoff (2012) concurred that teachers matter. Not only did students of high value-added teachers score higher on end-of-year mathematics and reading tests, but also experienced improved outcomes later in life. Increased earnings, less likelihood of teen pregnancy, increased socioeconomic status and 401(k) contributions, reduced crime, and improved citizenship were just a few of the positive outcomes identified by these authors.

In their study of the practices of effective teachers versus less effective teachers, Stronge et al. (2011) examined mathematics and reading achievement scores for 307 fifth grade teachers. The authors found more than a 30 percentile point difference in student achievement in one year based on teacher effectiveness. Stronge et al. (2011) identified characteristics of effective teachers including significantly fewer reports of student disruptive behaviors; better classroom management skills, such as organizational skills, efficiency with routines, and procedures; and higher expectations for all learners; and more positive, encouraging relationships with students. Additionally, effective teachers

possessed more personal qualities of fairness and respect in comparison to those from the lower quartile for effectiveness. While variation in teacher quality is driven by characteristics that are hard to measure and a challenge to separate from classroom-specific factors, raising teacher quality is a key concern in improving student achievement (Chingos & Peterson, 2011).

Standards Assessment Inventory (SAI)

In 2003, the *Standards Assessment Inventory (SAI)* was developed by the Southwest Education Development Laboratory (SEDL) to align schools' professional development programs with the National Staff Development Council's (NSDC) *Standards of Staff Development*. Many professional organizations and departments of education have utilized the *SAI* to assess the quality of professional learning, to plan and implement professional learning opportunities, to increase teacher effectiveness and contribute to increased student learning (Learning Forward Center for Results, 2014). During the 2010-2011 school year, 928 schools nationwide utilized the *SAI* for evaluating staff development and the NSDC standards. The release of Learning Forward's *Standards for Professional Learning* in 2011 necessitated a redesign of the *SAI*. Over 2,000 educators from 121 geographically diverse schools across the country participated in the redesign. Data were collected from the more than 2,000 participants and psychometric analyses were performed in order to examine construct validity, predictive validity, and reliability of the *SAI2* (Learning Forward Center for Results, 2014).

Departments of Education in states across the nation have counted on the *SAI* to provide feedback on professional learning in order to improve student achievement. In New Jersey, 33 public schools have utilized the *SAI* and *SAI2* since 2009 to assess

implementation of state-sponsored professional learning initiatives. Since 2008, over 2,200 schools across more than 225 districts have utilized the *SAI* and *SAI2* through the Arizona Department of Education in order to align programs and inform decisions regarding professional learning. The Duval County Public Schools in Florida have utilized the *SAI* and *SAI2* in more than 187 schools since 2007 to assess alignment to the standards and assist in planning, implementation, monitoring, and evaluating effective professional learning (Learning Forward Center for Results, 2014).

Access to General Education

The *Standards for Professional Learning* identified characteristics that lead to effective teaching practices and improved student results based upon best practices research with an emphasis on professional learning to ensure student achievement. The overarching goal of the *Standards for Professional Learning* and many education reform efforts is high levels of achievement for all students, including those with IEPs (Learning Forward, 2014; Mizell, 2008). Research on access to general education has been conducted using nationally represented large data sets. Studies funded by the U.S. Department of Education Office of Special Education Programs such as the Pre-Elementary Longitudinal Study (PEELS) involving more than 3,000 students, the Special Education Elementary Longitudinal Study (SEELS) involving more than 10,000 participants, and the National Transitional Longitudinal Study 2 (NTLS2), which followed nearly 11,500 students, have indicated positive outcomes for students with disabilities who have been included in the general education setting. Blackorby, Schiller, Knokely, and Wagner (2007) examined the relationship between access to general education and achievement for students in the SEELS data set. These authors found that

students with greater access to general education classes typically scored higher on academic measures than students with less access.

Utilizing data from the NTLS2, Wagner et al. (2006) examined the same relationship between access to general education and achievement for transition-aged students, age 13 through 16, with IEPs. Similarly, these authors found that students with disabilities experienced increased academic success from general education contexts. Reviewing data from the PEELS study for a cross section of 1,300 students, Cosier, Causton-Theoharis, and Theoharis (2013) examined the relationship between hours spent in general education and mathematics and reading achievement for students with disabilities and found a strong relationship between the two. These authors found that students with disabilities achieved higher scores in reading and mathematics with more time spent in general education. Supporting previous researchers, Cosier et al. (2013) suggested movement away from a “continuum of placements towards a continuum of services” (p. 330) that would allow access to general education contexts with high expectations for students with disabilities.

Focus on Curriculum

The last critical component to increasing student achievement is a focus on curriculum and how students learn. In order to better understand professional learning in successful TIMSS countries, Crockett (2007) examined Japanese and U.S. professional development practices and found that in Japan, teaching is directly related to student learning, and in particular, to the ways in which students think about various mathematics topics. A critical conclusion by this author involved the fact that U.S. teachers struggle to view teaching and learning as integrated processes. In examining mathematics

professional development for elementary teachers, Cwikla (2004) highlighted the importance of focusing on both teachers' and students' thinking and learning. A critical substance feature of high-quality professional learning involves the content of the activity, or the degree to which the activity is focused on improving and deepening teachers' content knowledge. Blank and de las Alas's (2009) meta-analysis emphasized the importance of teachers learning specific subject content as well as pedagogical content regarding how to teach the content to students. Professional learning that focuses on curriculum and how teachers and students learn contributes to increased student achievement (Mizell, 2008).

Summary

National expectations to teach diverse groups of learners, including students with IEPs, to higher standards require teachers to have knowledge and skills that may not have been taught in their pre-service education (U.S. Department of Education, 2011a). The increased focus on accountability and achievement in mathematics and science has caused leaders and professional learning designers to examine the effectiveness of professional learning opportunities specific to mathematics. Professional learning is critical to improving mathematics teaching and plays a critical role in helping teachers build the necessary knowledge and skills to increase student achievement (Desimone, 2006).

U.S. students continue to underperform on international assessment measures (Mullis et al., 2012). Students with disabilities continue to significantly underperform compared to their non-disabled peers and fail to meet AYP benchmarks (Eckes & Swando, 2009). According to the Obama Administration, professional learning programs

nationwide have not responded to the need for well prepared well supported teachers, especially those in high needs areas such as the teaching of students with disabilities (U.S. Department of Education, 2011a). School improvement is a careful process of examining student data, selecting areas of need, and establishing goals (U.S. Department of Education, 2011a). Both school improvement and professional learning are about educator change and subsequently student achievement. Professional development is recognized as a vital component of many reform practices and policies, including NCLB (Zehetmeier, 2014).

Research indicates a strong link between professional learning and student achievement (Dash et al., 2012; Feng & Sass, 2013; Polly et al., 2014). Learning Forward's *Standards for Professional Learning* identified seven characteristics of professional learning that lead to increased teacher effectiveness and student learning (Mizell, 2008). Duley (2011) suggested that in order to make the most of professional learning, a shift in thinking must occur from professional development as an event to professional learning as a process driven by comprehensive school plans. The focus of professional learning should shift from planning, attending, and evaluating events to planning, implementing, and evaluating learning changes and educator practices. Professional learning can be a powerful tool in growing individuals and organizations and increasing student achievement (Moore et al., 2011).

In an effort to support educators who teach mathematics to students with IEPs and to increase mathematics achievement for students with IEPs, this study examined teacher perceptions of professional learning and explored their relationship to mathematics achievement. While much research has been done on professional learning and its impact

on student achievement, few studies examine the relationship between the seven standards of professional learning and mathematics achievement for students with IEPs. Chapter Three will explain the methodology of the study in more depth.

Chapter Three – Methods And Procedures

Introduction

The National Center for Education Statistics administers the National Assessment of Educational Progress (NAEP) to report the academic achievements of American students. Often referred to as “The Nation’s Report Card,” NAEP involves assessments of the skills of a nationally representative sample of students in reading, mathematics, science, writing, U.S. history, civics, geography, and the arts (National Center for Education Statistics, 2013). With the No Child Left Behind (NCLB) Act of 2001 setting rigorous benchmarks for student achievement nationwide, the academic performance of students with disabilities has been under scrutiny. In an effort to close achievement gaps, many schools have implemented professional learning initiatives to increase teacher knowledge and raise student achievement (Desimone, 2011; Garcia & Guerra, 2004).

With the goal to provide all students with quality teachers, NCLB and Act 48 of 1999 mandated professional development for educators. According to Leko and Brownell (2009), teachers who work with students with disabilities traditionally have not received adequate preparation to enable them to provide appropriate content area instruction. Both general and special education teachers were surveyed in order to explore characteristics of professional learning in selected schools across Pennsylvania. Additionally, the relationship between the teacher perceptions of the seven standards of professional learning identified by Learning Forward and mathematics achievement for students with IEPs was examined.

Subjects

School districts were selected for participation based on PSSA and PVAAS data. School districts identified as demonstrating growth included those that met the 2012 state average for mathematics score of 59% or more proficient or advanced for their IEP subgroup. In addition, to be labeled as demonstrating growth, districts had to have an AGI indicating *significant growth* according to PVAAS. School districts classified as not demonstrating growth included schools that did not meet the 2012 state average for mathematics score of 59% or more proficient or advanced for their IEP subgroup; these districts had to have an AGI indicating *significant lack of growth* according to PVAAS. In order to narrow the field and find similar districts according to demographics, the district search option was utilized on the PVAAS public site. Additionally, per pupil spending figures were examined to identify districts across Pennsylvania with similar demographics. Twelve districts were identified as not demonstrating growth and 10 districts were identified as demonstrating growth.

Participants included 44 general and special education teachers of grades 4 through 8 from 22 suburban school districts in Pennsylvania. Fifty-two percent of participants (23) identified themselves as general education teachers and 48% (21) identified themselves as special educators. Both middle school and elementary teachers were represented with 59% identifying themselves as elementary level and 41% middle school level. Participant experience levels ranged from one year to more than 25 years of teaching with the majority of teachers, 56%, falling in the five to 15 years of experience range.

Setting

Twenty-two suburban school districts in Pennsylvania participated in the study. Student enrollment ranged between 900 and 5,000 students with per pupil spending ranging between \$11,000 and \$15,000. All schools reported less than 25% economically disadvantaged, less than 2% limited English proficient, and less than 10% minority populations. Graduation rates for all schools were 90% or higher with the percentage of the school population identified as special education falling between 10 and 20%.

Instruments

In 1999, Pennsylvania adopted academic standards for reading, writing, speaking and listening, and mathematics. These standards identified what students should know and be able to do at various grade levels. The annual Pennsylvania System of School Assessment (PSSA) is a standards-based, criterion-referenced assessment used to measure a student's attainment of the academic standards. Every Pennsylvania student in grades 3 through 8 is assessed in reading and math. Individual student scores may be used to assist teachers in identifying students who may be in need of additional educational opportunities. Levels of student performance are reported as advanced, proficient, basic, and below basic (Pennsylvania Department of Education Bureau of Assessment and Accountability, 2005). For purposes of this study, PSSA test scores were utilized to measure student achievement.

The Pennsylvania Value-Added Assessment System (PVAAS) is a statistical analysis of Pennsylvania state assessment data that provides Pennsylvania school districts with growth data in connection with PSSA student achievement data. Made available to districts from the Pennsylvania Department of Education, PVAAS provides educators

with valuable information to ensure they are meeting the academic needs of all students. School districts utilize both PVAAS growth data and student achievement data to make data-informed instructional decisions to ensure the academic growth and achievement of all students (Pennsylvania Department of Education, 2014). PVAAS data were utilized in this study to identify participating districts as demonstrating growth or not demonstrating growth.

In order to gain information about teacher perceptions in regard to the seven standards of professional learning in schools across Pennsylvania, the nationally utilized *SAI2* online survey was administered (Appendix A). This 50-item web-based self-report survey instrument assessed the presence of behaviors at the school level associated with the *Standards for Professional Learning*. Teachers were asked to evaluate current professional learning opportunities in their school within the seven standard areas: Learning Communities, Leadership, Resources, Data, Learning Design, Implementation, and Outcomes. A 6-point frequency response scale of *Don't Know*, *Never*, *Seldom*, *Sometimes*, *Frequently*, and *Always* was used by teachers to rate their experiences.

Besides the *SAI2* online survey, participants were given the opportunity to participate in follow-up interviews. The interview format was purposely selected in order to elicit richer responses and more personal communications regarding teachers' perceptions relating to professional learning. Open-ended interview questions (Appendix C) were developed based upon themes resulting from the *SAI2* and *Standards for Professional Learning*.

Design

Archival PSSA results from 2012 for all districts in Pennsylvania were disaggregated by IEP subgroup in order to determine districts that met or exceeded the state mathematics average of 59% or more students scoring proficient or advanced in mathematics. PVAAS average growth index (AGI) scores were examined to determine districts that have demonstrated significant growth and districts that have demonstrated lack of significant growth. PSSA and PVAAS data were cross-referenced in order to select participants that met the criteria for schools that demonstrated success and schools that did not demonstrate success.

This study utilized a mixed method approach employing both qualitative and quantitative methodology in order to provide a better understanding of the seven specific areas of effective professional learning and how they relate to mathematics achievement for students with IEPs. Rossman and Rallis (2003) defined qualitative research as being empirical, natural, and focused on people: “Qualitative researchers seek answers to their questions in the real world. They gather what they see, hear, and read from people and places and from events and activities. They do research in natural settings.” (p. 4). The qualitative portion of research for this study involved teacher survey input and personal interviews in order to gain a deeper understanding of individual teachers’ perceptions in regard to professional learning.

Creswell (2008) defined quantitative studies as those that collect quantifiable data from participants and analyze these numbers using statistics. The quantitative portion of this study involved using the rating scores from the survey and overall school district PSSA scores disaggregated by IEP subgroup in order to perform a Chi-squared statistical

analysis. In a quantitative study, the Chi-squared test is applied with categorical variables from a population and used to determine whether there is a significant association between the variables, that is *SAI2* scores and PSSA results. A primary purpose of utilizing the Chi-squared test is to examine whether two variables are independent or not; in other words, are they related? In the present study, in order to determine the relationship among teacher perceptions of the seven standards of professional learning and school achievement measures, the quantitative Chi-squared statistical analysis was utilized.

Reliability and validity

Reliability in qualitative research refers to the degree of consistency in which findings might be repeated by different researchers in different settings. To strengthen the reliability of this study, the process of collecting data was described in detail and followed throughout the data collection process to assure credibility with readers as well as to enhance the generalizability of the study. To design a research study using multiple sources of data collection is viewed as a means of strengthening the transfer of the study design, methodology, and findings to other settings (Creswell, 2008). This study involved collection of survey data as well as personal interviews and open-ended questions. In order to enhance the study, the researcher triangulated the data. Creswell (2008) defined the process of triangulation as “corroborating evidence from different individuals, types of data, or methods of collection in descriptions and themes in qualitative research” (p. 266). Participant interviews were utilized to further examine survey findings and trends. Furthermore, a variety of data collection methods were employed, including examining PSSA scores and PVAAS data. Final results of the study

were compared to current literature about characteristics of professional learning and student achievement.

The Pennsylvania Department of Education Bureau of Assessment and Accountability has performed numerous quantitative validity and reliability tests on the PSSA (Pennsylvania Department of Education, 2014a). The usual measure of reliability is test-retest reliability, or an indication of how similar a student's scores on an assessment would be if that student took the test multiple times. Reliability is largely concerned with the consistency of an assessment. According to traditional reliability statistics from the Data Recognition Corporation (DRC), the PSSA is a measurement instrument with high reliability coefficients of greater than 0.9 for PSSA reading and mathematics tests (Pennsylvania Department of Education Bureau of Assessment and Accountability, 2005). Validity involves examining whether an assessment measures what it purports to measure. One type of validity is convergent validity, or the relationship between two separate tests of student ability for the same subject matter. DRC provides convergent validity evidence for PSSA mathematics with convergent validity coefficients around 0.8. The higher the coefficient, the better the evidence for both reliability and validity. In conclusion, the PSSA is a highly reliable and valid measurement of student achievement to utilize in the present study (Pennsylvania Department of Education Bureau of Assessment and Accountability, 2005).

Psychometric analyses performed by AdvancEd deemed the SAI2 measure as a reliable and valid measure with significant associations to student academic achievement of construct validity and reliability (Denmark & Weaver, 2012).

Procedure

IEP subgroup PSSA scores for mathematics from the 2012 school year were examined to determine school districts that met or exceeded the state average of 59% of students proficient or advanced. Districts were then cross-referenced with PVAAS Average Growth Index (AGI) data to identify evidence of *significant growth* or evidence of *lack of significant growth*. Schools were placed into two categories: “demonstrating growth” and “not demonstrating growth.” By means of the district search feature of the PVAAS website, districts with similar demographics were identified. Eighty-one school districts in Pennsylvania were invited to participate; 35 were identified as “demonstrating growth” and the remaining 46 were identified as “not demonstrating growth.” Letters were sent to the superintendents of schools requesting permission to conduct this research study with teachers in grades 4 through 8 who teach mathematics to students with IEPs.

The collection of data began upon approval of the University Research Ethics Review Board (RERB) (Appendix B). Follow-up contacts were made with participating school districts, based on superintendent approval, to discuss the research study in further detail, select dates for dispersal, and obtain contacts who would disseminate the on-line survey link with staff. The Learning Forward Center for Results shared a link to the purchased *SAI2* online survey (Appendix B) which was forwarded to identified district contacts along with a Statement of Consent. The consent form included the purpose of the study, time-line for data collection, procedure, and benefits and risks of the study.

Subjects were given eight weeks to complete the online questionnaire. According to Learning Forward and interview input, average completion time was approximately 15 minutes and the survey could be taken from any Internet-compatible device. Learning

Forward's Center for Results forwarded all responses to the researcher. Responses were then reviewed and separated according to characteristics of professional learning related to the seven standards. Next, data was statistically analyzed utilizing a Chi-squared method to determine if there was a relationship between the mathematics achievement of learners with IEPs in schools identified as demonstrating growth and those identified as not demonstrating growth.

Upon survey submission, participants had the opportunity to contact the researcher if they were willing to participate in an interview. Seven participants, three from schools demonstrating growth and four from schools demonstrating a lack of growth, volunteered for individual dialogue and questioning with the researcher. Interviews took the format of face-to-face meetings. Prior to interviewing, the researcher informed participants that the interviewee's identity would not be revealed and that the subject may end the interview at any time. Participants were also told that the research would be coded to ensure privacy and anonymity. Participants were assured that all data would remain confidential and were asked to sign an Interview Consent prior to the start of the interview. When contacting participants to arrange the interview, the researcher emailed this consent form and had participants bring it to the interview meeting. Interview sessions lasted between 25 and 40 minutes. Interview responses were recorded and transcribed. Upon transcription, responses were further analyzed to identify patterns and trends. A copy of the transcribed notes were shared with the interviewee for a member check review for accuracy prior to finalizing.

Data Analysis

The researcher triangulated the data collected from electronic surveys, interviews, and statistical analyses to compare the findings to current research in the field of professional learning. Data were statistically analyzed utilizing a Chi-squared method to examine the relationship between professional learning characteristics in schools “demonstrating growth” and “not demonstrating growth” and mathematics achievement for students with IEPs. All responses were reviewed and data coded in order to form broad descriptions and identify patterns and common themes in the seven areas of professional learning and the relationship with mathematics achievement for students with disabilities. The researcher then organized and prepared data collected into tables to further illustrate the results of the study. A final report was shared with participating school districts. Upon analysis of data, all materials were stored in a locked box to be shredded after five years.

Summary

The purpose of this mixed method study was to explore the relationship between teacher perceptions of the seven standards of professional learning defined by Learning Forward and mathematics achievement for students with IEPs. The qualitative portion of the study examined teacher perceptions of the characteristics of professional learning in schools across Pennsylvania. Quantitatively, the relationship between teacher perceptions of the seven standards of professional learning and mathematics achievement of students with disabilities was statistically examined. Forty-four teachers, 20 from schools demonstrating growth and 24 from schools not demonstrating growth participated in the study, which took place in 22 suburban school districts in Pennsylvania. The

researcher utilized archived PSSA and PVAAS data as well as the online *SAI2* survey and interviews to collect data. Data acquired through this study provided insight into the research questions including identifying teacher perceptions of professional learning in schools that demonstrated growth as well as those that had not demonstrated growth. Additionally, the relationship between teacher perceptions of the seven professional learning standards and mathematics achievement for students with IEPs was examined. Chapter Four further describes the findings of the study.

Chapter Four – Results

Introduction

The purpose of this mixed method study was to identify teacher perceptions of the seven professional learning standards in school districts that have demonstrated growth and those that have not demonstrated growth as determined by PSSA scores and PVAAS data. Additionally, this researcher sought to determine if any relationship existed between teacher perceptions of the professional learning standards and mathematics achievement for learners with IEPs.

Qualitative data was collected through an online survey, the *Standards Assessment Inventory 2 (SAI2)* by Learning Forward, formerly known as the National Staff Development Council. The online survey instrument consisted of 50 Likert Scale questions assessing the seven standards of professional learning. Response options included: don't know, never, seldom, sometimes, frequently, and always. Survey data were compared and analyzed to identify emerging trends and themes regarding participant perceptions of the seven professional learning standards based upon the research questions that guided this study. Personal interviews were conducted to follow up on the trends and themes identified. Interviews were completed in person and lasted between 25 and 40 minutes. With consent of the participant, each interview was recorded and later transcribed in order to compare interview input with findings from the survey. Respondents' anonymity was ensured and all notes and recordings were coded in the numerical order in which the interviews occurred. A further quantitative assessment of the data was performed utilizing Pearson's Chi-squared test in order to determine if each

of the seven professional learning standards were related to mathematics achievement for learners with IEPs.

The data represented in this chapter depict teacher perceptions of professional learning in regard to the seven professional learning standards set forth by Learning Forward. Additionally, descriptive statistics for each standard are presented in order to determine whether a relationship exists between each of the standards and mathematics achievement for learners with IEPs. Results are divided into three parts: 1) a description of survey participants, 2) survey and interview results as they relate to the first two research questions, and 3) a statistical analysis of the Chi-squared results to address the third research question.

Survey Participants

Participants were separated into two categories, teachers who were from schools demonstrating growth according to PVAAS and teachers from schools not demonstrating growth according to PVAAS, to be referred to from this point forward as Growth Group and No Growth Group. Twenty general and special education teachers from grades four through eight completed the online *SAI2* for the Growth Group and 24 teachers represented the No Growth Group. Fourteen participants identified themselves as general education teachers and six participants classified themselves as special education teachers in the Growth Group. In the No Growth Group, nine teachers identified themselves as general education teachers and 15 participants identified themselves as special education teachers. The Growth Group consisted of 16 elementary teachers and four middle school teachers, while the No Growth Group was comprised of 10 elementary teachers and 14 middle school teachers. All teachers were from public schools across the state of

Pennsylvania. Table 4.1 and 4.2 present information related to participants' experience and years at their current school.

Table 4.1

Experience Level

Experience Level of Teachers	Number of Teachers (Growth Group N = 20)	Number of Teachers (No Growth Group N = 24)
1-4 Years	2 (10%)	5 (21%)
5-10 Years	8 (40%)	8 (33%)
11-16 Years	4 (20%)	5 (21%)
17-25 Years	2 (10%)	5 (21%)
> 25 Years	4 (20%)	1 (4%)

Note. N=44. The percent of *sample size* for each question is in parenthesis.

Table 4.2

Years at Current School

Years at Current School	Number of Teachers (Growth Group N = 20)	Number of Teachers (No Growth Group N = 24)
0-1 Year	2 (10%)	3 (13%)
2-4 Years	6 (30%)	6 (25%)
5-9 Years	4 (20%)	5 (21%)
10-20 Years	4 (20%)	8 (33%)
> 20 Years	4 (20%)	2 (8%)

Note. N=44. The percent of *sample size* for each question is in parenthesis.

As evidenced by Tables 4.1 and 4.2, the distribution of participants resulted in a sampling of at least one individual in each of the demographic categories. Respondents' experience levels for both groups were evenly distributed. The Growth Group averaged 50% of participants having 10 or fewer years of experience and 50% having more than 10 years' experience. In the No Growth Group sample, 54% of participants reported having 10 or fewer years of experience with 46% having more than 10 years' experience. Similarly, both groups reported nearly identical number of years at their current school were. The Growth Group demographics indicated 40% of participants reported five or fewer years in their current setting and 60% reported more than five years at their current school. The No Growth sample indicated 38% of participants had five or fewer years in their current setting and 62% reported more than five years.

Survey and Interview Results

Outcomes for research question one. The first research question examined teacher perceptions of professional learning in school districts demonstrating growth in regard to the seven professional learning standards as defined by the Learning Forward Professional Learning Organization. Data provided in Table 4.3 establishes the average standard values calculated from the question responses compared to Learning Forward's expected national standard averages. Through teacher reports, both the Growth Group and the No Growth Group perceived their schools' professional learning in regard to Learning Forward's seven professional learning standards as lower than the nationally expected responses. Further review of individual survey question averages revealed similar results indicating participants' perceptions across all questions to be lower than national benchmarks.

Table 4.3

Average Standard Values

Professional Learning Standard	Expected Standard Average	Standard Average Growth Group	Standard Average No Growth Group
Learning Communities	3.88	3.4	3
Leadership	4.22	3.3	3.4
Resources	3.68	2.8	2.9
Data	3.81	3.1	2.9
Learning Design	3.60	2.4	2.9
Implementation	4.08	3.4	3.3
Outcomes	4.14	3.5	3.3

Note. The range of responses was 0-5. 0 = Don't Know, 1 = Never, 2 = Seldom, 3 = Sometimes, 4 = Frequently, 5 = Always.

A comparison of the average standard values in Table 4.3 indicated that teachers in this study perceived their schools' professional learning to be lower than expected in all seven standard areas. For the purpose of this study, scores that differed by more than 0.5 from Learning Forward's national benchmarks were considered significant.

Responses from teachers in schools demonstrating growth with regard to the Learning Community standard were similar to what would be expected nationally, a difference of .48. However, averages for teachers in the Growth Group in the standard areas of Leadership, Resources, Data, Learning Design, Implementation, and Outcomes were significantly lower than national expectations. A more detailed discussion of results for each of the above six standards follows.

Leadership. School leaders play a key role in improving student learning and promoting professional learning (Rivkin et al., 2005). With regard to the Leadership standard, both survey and interview results indicated that teachers in schools

demonstrating growth perceived Leadership in their schools lower than expected. Table 4.4 represents teacher responses to the Leadership standard.

Table 4.4

Growth Group Responses Leadership Standard

	DK	N	Se	So	F	A
Leaders provide equitable resources to support professional learning.	3 (15%)	0 (0%)	5 (25%)	6 (30%)	6 (30%)	0 (0%)
School leaders actively participate in professional learning.	4 (20%)	0 (0%)	2 (10%)	9 (45%)	4 (20%)	1 (5%)
Leaders advocate for resources to fully support professional learning.	3 (15%)	0 (0%)	4 (20%)	7 (35%)	4 (20%)	2 (10%)
School leaders regard professional learning as a priority for all staff.	3 (15%)	0 (0%)	4 (20%)	6 (30%)	5 (25%)	2 (10%)
Leaders cultivate a positive culture, collaboration, high expectations, respect, trust, and constructive feedback.	3 (15%)	0 (0%)	4 (20%)	6 (30%)	5 (25%)	2 (10%)
School leaders speak about relationship between professional learning and improved student achievement.	3 (15%)	0 (0%)	3 (15%)	7 (35%)	5 (25%)	2 (10%)
Leaders consider all staff members capable of being a professional learning leader.	3 (15%)	0 (0%)	3 (15%)	5 (25%)	5 (25%)	4 (20%)

Note. N=20. DK = Don't Know, N = Never, Se = Seldom, So = Sometimes, F = Frequently, A = Always. The percent of *sample size* for each question is in parentheses.

As can be seen in Table 4.4, 45% of teachers (9) perceived their schools' leaders frequently or always considered all staff members capable of being professional learners. A lower percentage of participants, between 25% (5) and 35% (7), perceived their schools' leadership within the frequently or always range for the remaining six indicators in the Leadership standard. The lowest perceived indicator for participants in the Growth Group, was the second indicator, with 25% of teachers (5) reporting that their leaders frequently or always actively participated in professional learning.

Interview results confirmed the above observations with all three participants indicating their school leaders did not actively participate in professional learning with

staff. Additionally, while all interview respondents from the Growth Group felt their school leadership was supportive, they did not feel the culture in their schools embraced collaboration and constructive feedback as much as it could.

Resources. Effective professional learning requires fiscal, human, material, and technology resources (Shulte & Stevens, 2014). Table 4.5 presents responses for the Growth Group in regard to the Resources standard.

Table 4.5

Growth Group Responses Resources Standard

	DK	N	Se	So	F	A
Practicing and applying new skills is regarded as important.	2 (10%)	0 (0%)	3 (15%)	3 (15%)	5 (25%)	7 (35%)
Teachers are involved in monitoring the effectiveness of professional learning resources.	4 (20%)	0 (0%)	3 (15%)	6 (30%)	5 (25%)	2 (10%)
Expenses (i.e.: registration fees, staff, materials) are openly discussed.	3 (15%)	8 (40%)	5 (25%)	3 (15%)	1 (5%)	0 (0%)
Time is available during the school day for professional learning.	2 (10%)	4 (20%)	9 (45%)	3 (15%)	1 (5%)	1 (5%)
Decision-making about how resources are allocated includes teacher input.	2 (10%)	4 (20%)	7 (35%)	5 (35%)	2 (10%)	0 (0%)
Professional learning is available at various times (i.e.: job-embedded, before or after school, summer hours).	3 (15%)	0 (0%)	6 (30%)	8 (40%)	3 (15%)	0 (0%)
Various technology resources are available for professional learning.	2 (10%)	0 (0%)	4 (20%)	8 (40%)	5 (25%)	1 (5%)

Note. N=20. DK = Don't Know, N = Never, Se = Seldom, So = Sometimes, F = Frequently, A = Always. The percent of *sample size* for each question is in parentheses.

In Table 4.5, which represents the responses of participants in schools demonstrating growth, 60% (12) felt practicing and applying participants' skills were frequently or always regarded as important. Ten percent of teachers (2) indicated that decision-making about how professional learning resources were allocated frequently or always included teacher input. Ninety-five percent of participants (19) reported that professional learning expenses, such as registration and consultant fees, staff, and

materials, were sometimes, seldom, or never discussed in their schools. With regard to the resource of time, 80% of teachers (16) reported time was sometimes, seldom, or never available during the school day for professional learning. Similarly, 70% of participants (14) described professional learning at various times, such as job-embedded experiences, before or after school hours, and summer hours was sometimes, seldom, or never available.

Interview data indicated mixed results regarding the Resources standard. While all three interviewees from the Growth Group sensed that budgetary constraints and deadlines significantly restricted this standard, one respondent perceived Resources as a strength in his district. The largest Resource need identified by all Growth Group interviewees was time allotment for professional learning, such as having the resource of time for collaboration and discussion built into the school day. Growth Group interview participants indicated that they spent an average of seven hours of time per month outside of school preparing and growing themselves professionally for their learners.

Data. Guskey and Yoon (2009) suggested the use of multiple sources of data to plan and evaluate professional learning as a critical component. Assessing the learning culture in order to improve organizational support and examining the program's impact on student learning help to inform future school change efforts. Table 4.6 presents responses from teachers in the Growth Group in regard to the Data standard.

As evidenced by the higher *Don't Know* responses in Table 4.6, respondents in the Growth Group were often unsure of their schools' practice with regard to the role of data in professional learning. Of the participants from schools demonstrating growth 65% (13) reported sometime, seldom, or never having had the opportunity to evaluate

professional learning to determine its impact on student learning. While 40% of teachers (8) were unsure if how to assess the effectiveness of professional learning experiences was determined prior to implementation, 50% (10) felt a plan for evaluating professional learning was sometimes, seldom, or never determined in advance. Well-designed evaluation of professional learning provides necessary information needed to increase the quality and effectiveness of programs and opportunities (Guskey & Yoon 2009).

Table 4.6

Growth Group Responses Data Standard

	DK	N	Se	So	F	A
Programs are continuously evaluated to ensure quality results.	5 (25%)	0 (0%)	6 (30%)	7 (35%)	2 (10%)	0 (0%)
Experiences are evaluated for their impact on student learning.	6 (30%)	0 (0%)	3 (15%)	9 (45%)	2 (10%)	0 (0%)
Various data is used to plan professional learning.	6 (30%)	0 (0%)	2 (10%)	7 (35%)	5 (25%)	0 (0%)
A variety of student achievement data is used to plan professional learning.	5 (25%)	0 (0%)	1 (5%)	9 (45%)	4 (20%)	1 (5%)
Teachers use what is learned to adjust and inform practices.	4 (20%)	0 (0%)	4 (20%)	5 (25%)	5 (25%)	2 (10%)
A variety of data are used to assess the effectiveness of professional learning.	5 (25%)	1 (5%)	3 (15%)	4 (20%)	6 (30%)	1 (5%)
How to assess the effectiveness of professional learning experiences is determined prior to being implemented.	8 (40%)	0 (0%)	4 (20%)	6 (30%)	2 (10%)	0 (0%)

Note. N=20. DK = Don't Know, N = Never, Se = Seldom, So = Sometimes, F = Frequently, A = Always. The percent of *sample size* for each question is in parentheses.

Interview results regarding the Data standard concurred with the survey results reported in Table 4.6. One interviewee indicated her district evaluates professional learning programs on a continual basis; however, all three participants felt their experiences were never evaluated for their impact on student learning. Two of the three respondents shared that their district could do a better job of using student data to guide professional learning designs and opportunities. All three of the interview participants

felt their district could do a better job in collecting teacher data to determine professional learning needs.

Learning design. The Learning Design standard focuses on the how of professional learning. Through applying learning theories, research, and promoting active engagement school leaders create a learning plan to assist teachers in gaining knowledge, skills, and practices and transferring those new practices into their daily work (Learning Forward, 2014). Table 4.7 depicts Growth Group teacher responses to the Learning Design standard.

Table 4.7

Growth Group Responses Learning Design Standard

	DK	N	Se	So	F	A
Teacher backgrounds, experience levels, and needs are considered when planning and designing opportunities.	6 (30%)	2 (10%)	7 (35%)	5 (25%)	0 (0%)	0 (0%)
The use of technology is evident in professional learning.	3 (15%)	0 (0%)	6 (30%)	6 (20%)	4 (20%)	1 (5%)
Teachers are responsible for selecting professional learning to enhance skills.	4 (20%)	3 (15%)	4 (20%)	8 (40%)	1 (5%)	0 (0%)
Professional learning includes various forms of support to apply new practices.	3 (15%)	1 (5%)	6 (30%)	9 (45%)	1 (5%)	0 (0%)
Participation in online opportunities is considered as a way to connect and learn from experts.	5 (25%)	4 (20%)	5 (25%)	6 (30%)	0 (0%)	0 (0%)
Opportunities to observe others are available as one type of job-embedded professional learning.	4 (20%)	2 (10%)	7 (35%)	7 (35%)	0 (0%)	0 (0%)
Teacher input is considered when planning school-wide opportunities.	4 (20%)	3 (15%)	9 (45%)	3 (15%)	1 (5%)	0 (0%)

Note. N=20. DK = Don't Know, N = Never, Se = Seldom, So = Sometimes, F = Frequently, A = Always. The percent of *sample size* for each question is in parentheses.

According to the data in Table 4.7, with regard to the Learning Design standard for teachers in schools demonstrating growth, none of participants perceived that teacher backgrounds, experience levels, and learning needs were frequently or always considered

when planning or designing professional learning. One respondent felt his input was frequently taken into consideration when planning professional learning. Likewise, one teacher respondent perceived that teachers were frequently responsible for selecting their own professional learning. In schools demonstrating growth, none of the teachers perceived participation in online professional learning was a way to connect with colleagues and learn from experts in education. Additionally, none of the respondents reported teachers frequently or always had opportunities to observe each other.

Interview responses concurred with survey results. Two of the three interview contributors indicated there were limited design opportunities with the majority of options taking the form of traditional in-service formats, such as one-day workshops or presentations with no follow up. Job-embedded opportunities, such as instructional coaching, mentoring, or observing others, were non-existent according to two of the three interviewees. According to all interview participants, technology played a limited role in the Growth Group's Learning Design.

Implementation. Effective professional learning sustains support for the implementation of new practices, policies, and procedures for long-term change. The Implementation standard includes providing supportive and ongoing feedback (Learning Forward, 2014). Table 4.8 shows teacher responses to indicators associated with the Implementation standard.

Based on the data shared in Table 4.8, 50% of respondents (10) from schools demonstrating growth perceived that always or frequently a primary goal for professional learning in their school was to enhance teaching practices in order to improve student performance.

Table 4.8

Growth Group Responses Implementation Standard

	DK	N	Se	So	F	A
Enhancing teaching practices to improve student achievement is a goal.	5 (25%)	0 (0%)	1 (5%)	4 (20%)	8 (40%)	2 (10%)
Teachers receive on-going support in various ways to improve teaching.	4 (20%)	0 (0%)	3 (15%)	9 (45%)	3 (15%)	1 (5%)
A consistent learning plan is in place for three to five years.	10 (50%)	0 (0%)	1 (5%)	4 (20%)	4 (20%)	1 (5%)
The school's professional learning plan is aligned to school goals.	10 (50%)	0 (0%)	0 (0%)	4 (20%)	5 (25%)	1 (5%)
Teachers individually reflect on teaching practices and strategies.	6 (30%)	0 (0%)	1 (5%)	5 (25%)	5 (25%)	3 (15%)
Experiences are planned based on research about effective school change.	8 (40%)	0 (0%)	1 (5%)	6 (30%)	4 (20%)	1 (5%)
Teachers give frequent feedback to colleagues to refine implementation of instructional strategies.	4 (20%)	4 (20%)	5 (25%)	2 (10%)	4 (20%)	1 (5%)

Note. N=20. DK = Don't Know, N = Never, Se = Seldom, So = Sometimes, F = Frequently, A = Always. The percent of *sample size* for each question is in parentheses.

As illustrated in Table 4.8's *Don't Know* column, 50% of teachers (10) were unsure if their school had a consistent professional learning plan in place for three to five years. Similarly, 50% of participants (10) were unsure if professional learning was aligned to their schools' goals. Likewise 40% of respondents (8) were unsure if research about effective school change played a role in planning professional learning in their schools.

In reference to Implementation, the three interview respondents did not feel that their professional learning directly impacted their students' achievement as much as it could, due to having too many "new things" presented each year. Participant Six indicated that, "They give us 35 new things each year and I try to take one or two and spend hours getting good at just them."

Outcomes. Connecting teacher outcomes with student learning goals links professional learning and student achievement (Szajtn, Campbell, & Yoon, 2011). Table 4.9 presents Growth Group teacher responses to the Outcomes standard.

Table 4.9

Growth Group Responses Outcomes Standard

	DK	N	Se	So	F	A
Professional learning focuses on the curriculum and how students learn.	4 (20%)	0 (0%)	3 (15%)	5 (25%)	8 (40%)	0 (0%)
Professional learning contributes to increased student achievement.	7 (35%)	0 (0%)	2 (10%)	5 (25%)	6 (30%)	0 (0%)
Experiences connect with teacher performance standards.	8 (40%)	0 (0%)	1 (5%)	6 (30%)	5 (25%)	0 (0%)
All professional staff members are held to high standards to improve student learning.	4 (20%)	0 (0%)	1 (5%)	2 (10%)	8 (40%)	5 (25%)
Professional learning supports teacher to develop and expand new learning over time.	4 (20%)	0 (0%)	4 (20%)	7 (35%)	4 (20%)	1 (5%)
Student learning outcomes are used to determine professional learning plan.	8 (40%)	0 (0%)	0 (0%)	5 (25%)	6 (30%)	1 (5%)
Teacher professional learning this year is connected to previous year learning.	6 (30%)	0 (0%)	3 (15%)	3 (15%)	8 (40%)	0 (0%)

Note. N=20. DK = Don't Know, N = Never, Se = Seldom, So = Sometimes, F = Frequently, A = Always. The percent of *sample size* for each question is in parentheses.

As illustrated table 4.9, in the Growth Group, 65% of teachers (13) perceived that staff members were always or frequently held to high standards to increase student learning. Forty percent of teachers (8) perceived that teacher professional learning in their schools' was always or frequently focused on curriculum and how students learn. Similarly, 40% of respondents (8) indicated that their professional learning this year was frequently connected to the previous year's learning. When examining the *Don't Know* column, 35% of teachers (7) reported they were unsure if professional learning in their schools contributed to increased student achievement. Forty percent of the respondents (8) were unsure if student learning outcomes were used to determine professional

learning in their schools. Likewise, 40% of respondents (8) did not know if professional learning connected with teacher performance standards in their schools.

In regard to the Outcomes standard, interview respondents from the Growth Group were able to articulate their school goals and connect their professional learning plans with these goals. However, all participants commented on the broad nature of their districts' goals, ie: data based decision-making, or increased student achievement. Interviewee Two felt that, "We need to dive in deeper to find out why our students aren't grasping a concept, or achieving, and be more focused in our expected outcomes."

In conclusion, while teachers in schools demonstrating growth perceived their schools' professional learning lower than Learning Forward's national benchmarks in all seven standard areas, responses in the standards of Leadership, Resources, Data, Learning Design, Implementation, and Outcomes differed by more than 0.5 from national expectations. Responses with regard to the Learning Community standards were similar to what would be expected nationally with a difference of less than 0.5.

Outcomes for research question two. The second research question examined teacher perceptions of professional learning with regard to the seven professional learning standards in school districts not demonstrating growth. Data provided in Table 4.3 established the average standard values calculated from the question responses. Averages that differed from Learning Forward's national benchmarks by greater than 0.5 were considered significant for the purpose of this study. Similar to the Growth Group, a comparison of the average standard values indicated that teachers in this study perceived their schools' professional learning lower than expected in all seven standard areas. The standard averages for Learning Communities, Leadership, Resources, Data, Learning

Design, Implementation, and Outcomes were all significantly lower (differed from national benchmarks by more than 0.5) for teachers in the No Growth Group. Interview results confirmed survey data and the standard averages presented in Table 4.3. A discussion follows with regard to each of the seven standards.

Learning communities. Professional learning communities provide the setting in which staff members develop new knowledge and classroom skills. Learning communities foster collaborative, job-embedded, ongoing learning among professionals that supports the use of new strategies to benefit student learning (Learning Forward, 2014). Table 4.10 reports teacher responses to questions regarding the Learning Communities standard.

Table 4.10

No Growth Group Responses Learning Communities Standard

	DK	N	Se	So	F	A
Policies and procedures support learning communities.	4 (17%)	0 (0%)	5 (21%)	2 (8%)	5 (21%)	8 (33%)
Learning communities meet several times per week.	2 (8%)	6 (25%)	3 (13%)	7 (29%)	3 (13%)	3 (13%)
Responsibility to improve student learning is shared by all.	2 (8%)	3 (13%)	2 (8%)	8 (33%)	7 (29%)	2 (8%)
Non-staff members (i.e.: parents and community members) are included.	3 (13%)	7 (29%)	7 (29%)	4 (17%)	2 (8%)	1 (4%)
Learning communities are structured to engage in continuous improvement cycle.	2 (8%)	4 (17%)	3 (13%)	6 (25%)	5 (21%)	4 (17%)
Members demonstrate effective communication and relationship skills.	3 (13%)	4 (17%)	2 (8%)	8 (33%)	5 (21%)	2 (8%)

Note. N=24. DK = Don't Know, N = Never, Se = Seldom, So = Sometimes, F = Frequently, A = Always. The percent of *sample size* for each question is in parentheses. Percentages are rounded to the nearest whole number.

As depicted in Table 4.10, of the 24 participants from the No Growth Group, 54% (13) felt their schools had policies and procedures in place to support learning communities. With regard to including non-staff members, 75% of respondents (18)

reported that their schools sometimes, seldom or never involved parents and community members. Fifty-four percent of teachers (13) in the No Growth Group sensed their schools learning communities were sometimes, seldom, or never structured to engage in a cycle of continuous improvement.

With regard to the Learning Communities standard, interview responses were mixed. Three of the four volunteers were unsure if their school had policies and procedures regarding professional learning and sensed a disconnect between professional learning and the cycle of continuous improvement. All four participants indicated that while there may be some form of learning communities in their schools, non-staff members were seldom, if ever involved.

Leadership. According to Learning Forward (2014), effective professional learning requires school leaders who develop capacity, advocate, and create support systems. Effective leaders consider professional learning a priority and distribute leadership and responsibility holding all staff members to high standards. Table 4.11 illustrates the No Growth Group responses to the Leadership standard.

As can be seen in Table 4.11, of the 24 teachers in the No Growth Group, one felt her leaders were always or frequently active participants in her school's professional learning. Likewise, 46% (11) perceived their schools' leaders always or frequently cultivated a positive climate conducive to collaboration. Additionally, 46% of respondents (11) sensed their schools' leaders frequently or always advocated for resources to support professional learning. Conversely, 54% of teachers (13) felt their schools' leaders sometimes or seldom provided equitable resources. Sixty-two percent of

participants (15) indicated that their principals sometimes, seldom, or never talked about the important relationship between professional learning and student achievement.

Table 4.11

No Growth Group Responses Leadership Standard

	DK	N	Se	So	F	A
Leaders provide equitable resources to support professional learning.	2 (8%)	0 (0%)	4 (17%)	9 (38%)	8 (33%)	1 (4%)
School leaders actively participate in professional learning.	3 (13%)	0 (0%)	4 (17%)	6 (25%)	8 (33%)	3 (13%)
Leaders advocate for resources to fully support professional learning.	2 (8%)	0 (0%)	2 (8%)	9 (38%)	8 (33%)	3 (13%)
School leaders regard professional learning as a priority for all staff.	2 (8%)	0 (0%)	3 (13%)	10 (42%)	4 (17%)	5 (21%)
Leaders cultivate a positive culture, collaboration, high expectations, respect, trust, and constructive feedback.	1 (4%)	2 (8%)	3 (13%)	7 (29%)	9 (38%)	2 (8%)
School leaders speak about relationship between professional learning and improved student achievement.	1 (4%)	1 (4%)	6 (25%)	8 (33%)	6 (25%)	2 (8%)
Leaders consider all staff members capable of being a professional learning leader.	3 (13%)	0 (0%)	3 (13%)	5 (21%)	5 (21%)	4 (17%)

Note. N=24. DK = Don't Know, N = Never, Se = Seldom, So = Sometimes, F = Frequently, A = Always. The percent of *sample size* for each question is in parentheses. Percentages are rounded to the nearest whole number.

With regard to Leadership, three of the four interviewees felt their school leaders had “too much on their plates.” Respondent One shared, “My school leaders are willing to support my professional learning but they don’t broadcast it. I have to seek them out.” Interviewee Three felt only one of his administrators was supportive of his professional learning because, “She’s the one responsible for professional learning. They have to divide and conquer.” In response to Leadership, Participant Seven commented, “They try to be supportive [of professional learning] but we have so many needs, it feels like professional learning is the least of their worries.” Three of the four respondents

indicated that their school leaders did not participate with staff in professional learning opportunities.

Resources. Effective professional learning requires many resources and supports (Skourdoumbis, 2014). Table 4.12 represents teacher responses from the No Growth Group in regard to the Resources standard.

Table 4.12

No Growth Group Responses Resources Standard

	DK	N	Se	So	F	A
Practicing and applying new skills is regarded as important.	1 (4%)	0 (0%)	0 (0%)	3 (13%)	16 (67%)	4 (17%)
Teachers are involved in monitoring the effectiveness of professional learning resources.	2 (8%)	0 (0%)	4 (17%)	11 (46%)	6 (25%)	1 (4%)
Expenses (i.e.: registration fees, staff, materials) are openly discussed.	2 (8%)	7 (29%)	9 (38%)	6 (25%)	0 (0%)	0 (0%)
Time is available during the school day for professional learning.	2 (8%)	8 (33%)	7 (29%)	3 (13%)	3 (13%)	1 (4%)
Decision-making about how resources are allocated includes teacher input.	1 (4%)	6 (25%)	9 (38%)	7 (29%)	1 (4%)	0 (0%)
Professional learning is available at various times (i.e.: job-embedded, before or after school, summer hours).	1 (4%)	2 (8%)	3 (13%)	11 (46%)	3 (13%)	4 (17%)
Various technology resources are available for professional learning.	1 (4%)	0 (0%)	7 (29%)	4 (17%)	6 (25%)	6 (25%)

Note. N=24. DK = Don't Know, N = Never, Se = Seldom, So = Sometimes, F = Frequently, A = Always. The percent of *sample size* for each question is in parentheses. Percentages are rounded to the nearest whole number.

As presented in Table 4.12, of the 24 teachers in schools not demonstrating growth, 83% (20) reported that practicing and applying new skills was always or frequently regarded as important in their schools. Additionally, 50% of respondents (12) indicated that various technology resources were frequently or always available for their professional learning. In the No Growth Group, 92% (22) indicated teachers were sometimes, seldom, or never involved in decision-making about professional learning resources. None of the participants indicated that fiscal resources, such as expenses, staff,

and materials, were frequently or always openly discussed. Seventy-five percent of respondents (18) felt there was sometimes, seldom, or never time available within the school day for professional learning.

Interview participants in the No Growth Group concurred that the challenging budgetary situations and the annual timelines for submitting budget requests substantially impacted the Resources standard. Respondent Five indicated, “Whether it be materials or time, I often have to find it or make it myself.” Three of the four interviewees indicated that resources were identified by administrators in a “top down” fashion with little input from staff. In the same way, respondents from the Growth Group identified that the resource of time for professional learning was not built into the daily schedule, participants from the No Growth Group interviews reported spending an average of 15 hours of time outside of school per month on their own professional learning.

Data. Many forms of data are required to plan, monitor, and evaluate professional learning (Learning Forward, 2014). Table 4.13 shows teacher responses from schools demonstrating no growth.

As can be seen in Table 4.13, of the 24 teachers in the No Growth Group, 67% (16) perceived professional learning programs in their school were sometimes, seldom, or never continuously evaluated to ensure quality programs. Likewise, 71% of participants (17) sensed programs were sometimes, seldom, or never evaluated for their impact on student learning.

Table 4.13

No Growth Group Responses Data Standard

	DK	N	Se	So	F	A
Programs are continuously evaluated to ensure quality results.	5 (21%)	4 (17%)	4 (17%)	8 (33%)	3 (13%)	0 (0%)
Experiences are evaluated for their impact on student learning.	2 (8%)	2 (8%)	6 (25%)	9 (38%)	5 (21%)	0 (0%)
Various data is used to plan professional learning.	6 (25%)	2 (8%)	6 (25%)	8 (33%)	1 (4%)	1 (4%)
A variety of student achievement data is used to plan professional learning.	3 (13%)	1 (4%)	4 (17%)	9 (38%)	5 (21%)	2 (8%)
Teachers use what is learned to adjust and inform practices.	3 (13%)	0 (0%)	5 (21%)	7 (29%)	8 (33%)	1 (4%)
A variety of data are used to assess the effectiveness of professional learning.	4 (17%)	2 (4%)	3 (13%)	9 (38%)	5 (21%)	1 (4%)
How to assess the effectiveness of professional learning experiences is determined prior to being implemented.	5 (21%)	0 (0%)	7 (29%)	9 (38%)	2 (8%)	1 (4%)

Note. N=24. DK = Don't Know, N = Never, Se = Seldom, So = Sometimes, F = Frequently, A = Always. The percent of *sample size* for each question is in parentheses. Percentages are rounded to the nearest whole number.

Sixty-seven percent of teachers (16) from schools not demonstrating growth perceived their schools sometimes, seldom, or never used a variety of data to plan professional learning. Furthermore, 58% of respondents (14) felt that a variety of student data were sometimes, seldom, or never used when planning professional learning opportunities. Sixty-seven percent of teachers (16) perceived that their schools sometimes, seldom, or never determined how to assess professional learning prior to implementation. Finally, 50% of participants (12) in the No Growth Group indicated that teachers in their schools sometimes, seldom, or never used what was learned from professional learning to adjust and inform practices.

Interview responses concurred with survey results in regard to the Data standard with two of the four participants sharing that data were not consistently utilized to plan, assess, and evaluate professional learning. Interviewee One stated that his district was in

the beginning stage of utilizing data for planning, assessing, and evaluating, while Respondent Seven identified her district as “stalled” in the use of data to drive professional learning. The remaining two participants were unsure if their district utilized data to plan, assess, and evaluate professional learning.

Learning design. The Learning Design standard involves the plan of how teachers will gain the knowledge, skills, and strategies to improve their practice (Mizell, 2008). Table 4.14 illustrates the No Growth Group’s responses in regard to the Learning Design standard.

Table 4.14

No Growth Group Responses Learning Design Standard

	DK	N	Se	So	F	A
Teacher backgrounds, experience levels, and needs are considered when planning and designing opportunities.	3 (13%)	2 (8%)	7 (29%)	10 (42%)	2 (8%)	0 (0%)
The use of technology is evident in professional learning.	2 (8%)	0 (0%)	2 (8%)	4 (17%)	9 (38%)	7 (29%)
Teachers are responsible for selecting professional learning to enhance skills.	3 (13%)	3 (13%)	5 (21%)	8 (33%)	3 (13%)	2 (8%)
Professional learning includes various forms of support to apply new practices.	2 (8%)	0 (0%)	9 (38%)	7 (29%)	4 (17%)	2 (8%)
Participation in online opportunities is considered as a way to connect and learn from experts.	2 (8%)	1 (4%)	7 (29%)	7 (29%)	4 (17%)	3 (13%)
Opportunities to observe others are available as one type of job-embedded professional learning.	3 (13%)	5 (21%)	7 (29%)	7 (29%)	0 (0%)	2 (8%)
Teacher input is considered when planning school-wide opportunities.	3 (13%)	2 (8%)	7 (29%)	9 (38%)	3 (13%)	0 (0%)

Note. N=24. DK = Don’t Know, N = Never, Se = Seldom, So = Sometimes, F = Frequently, A = Always. The percent of *sample size* for each question is in parentheses. Percentages are rounded to the nearest whole number.

As seen in table 4.14, of teachers in the schools not demonstrating growth, 67% (16) indicated the use of technology was frequently or always evident in their professional learning opportunities. However, 79% of participants (19) perceived their

individual learning needs and experiences were sometimes, seldom, or never considered when planning and designing professional learning opportunities. Furthermore, 75% of respondents (18) felt teacher input was sometimes, seldom, or never considered. Sixty-seven percent of participants (16) shared that teachers were sometimes, seldom, or never responsible for selecting their own professional learning. Of the 24 respondents in the No Growth Group, 67% (16) reported various supports and forms of differentiated professional learning were sometimes, seldom, or never available in their schools. Sixty-three percent of respondents (15) reported that opportunities for online participation were sometimes, seldom, or never available. Lastly, 79% of participants (19) shared that opportunities to observe others as a form of job-embedded professional learning, was sometimes, seldom, or never available in their schools.

With regard to the Learning Design standard, all of the interview contributors indicated there were limited design opportunities, with the majority taking the form of one-day workshops or presentations with little follow up. Similar to the Growth Group, job-embedded opportunities, such as instructional coaching, mentoring, or observing others were limited to non-existent according to two of the three interviewees. While three interviewees indicated technology was available, its role in the No Growth Group's learning design was limited.

Implementation. The Implementation standard entails providing supports and feedback to sustain long-term change (Mizell, 2008). Table 4.15 presents teacher responses from the No Growth Group in regard to the Implementation standard.

Table 4.15

No Growth Group Responses Implementation Standard

	DK	N	Se	So	F	A
Enhancing teaching practices to improve student achievement is a goal.	3 (13%)	0 (0%)	1 (4%)	6 (25%)	9 (38%)	5 (21%)
Teachers receive on-going support in various ways to improve teaching.	2 (8%)	2 (8%)	3 (13%)	9 (38%)	8 (33%)	0 (0%)
A consistent learning plan is in place for three to five years.	8 (33%)	1 (4%)	2 (8%)	5 (21%)	6 (25%)	2 (8%)
The school's professional learning plan is aligned to school goals.	7 (29%)	0 (0%)	2 (8%)	3 (13%)	7 (29%)	5 (21%)
Teachers individually reflect on teaching practices and strategies.	2 (8%)	1 (4%)	4 (17%)	6 (25%)	6 (25%)	5 (21%)
Experiences are planned based on research about effective school change.	5 (21%)	0 (0%)	4 (17%)	11 (46%)	3 (13%)	1 (4%)
Teachers give frequent feedback to colleagues to refine implementation of instructional strategies.	3 (13%)	4 (17%)	9 (38%)	6 (25%)	1 (4%)	1 (4%)

Note. N=24. DK = Don't Know, N = Never, Se = Seldom, So = Sometimes, F = Frequently, A = Always. The percent of *sample size* for each question is in parentheses. Percentages are rounded to the nearest whole number.

As depicted in Table 4.15, according to the No Growth Group 58% (14) felt that enhancing teaching practices to improve student learning was always or frequently a primary goal of their schools' professional learning plan. Of the participants from schools not demonstrating growth, 33% of teachers (8) were unsure if their school had a consistent three to five year plan for professional learning. While 50% of respondents (12) reported that their professional learning plan always or frequently aligned to their school goals, 29% of teachers (7) were unsure if their school goals and professional learning were connected. With regard to using research about effective school change, 63% of teachers (15) thought their professional learning sometimes, seldom, or never considered research when planning opportunities. Fifty-eight percent of respondents (14) felt teachers sometimes, seldom, or never received ongoing support to improve their

teaching and 79% of participants (19) reported sometimes, seldom, or never giving or receiving frequent feedback to colleagues.

In response to the Implementation standard, three of the four interview participants felt their professional learning had little impact on their students' learning. Interviewee Four indicated that, "While it's our job as professionals to find one small take away, even with just one kid, and be open minded to try new things, sometimes the offerings are a stretch." Contributor One shared that many of the professional learning options were not applicable to his needs or related to his students' needs. Respondent Six shared, "Our professional learning is not systematic or research based and maybe sometimes it directly impacts my students; but most of the time, I feel not." Finally, three of the four interview participants reported that they did not feel teachers in their schools received follow up to their professional learning. Interviewee One described the lack of on-going support, "It's frustrating! There never seems to be follow through or supports when we come back and implement into our classrooms."

Outcomes. The Outcomes standard involves the building of coherence between teacher learning and student learning. Teacher learning and student learning become connected when professional learning content integrates student learning and educator performance standards. Table 4.16 shows the responses for teachers in the No Growth Group with respect to the Outcomes standard.

As shown in Table 4.16, of the 24 teachers from schools not demonstrating growth, 58% (14) felt all professional members in their schools were always or frequently held to high standards to increase student achievement.

Table 4.16

No Growth Group Responses Outcomes Standard

	DK	N	Se	So	F	A
Professional learning focuses on the curriculum and how students learn.	2 (8%)	0 (0%)	2 (8%)	9 (38%)	10 (42%)	1 (4%)
Professional learning contributes to increased student achievement.	4 (17%)	1 (4%)	1 (4%)	12 (50%)	4 (17%)	2 (8%)
Experiences connect with teacher performance standards.	6 (25%)	1 (4%)	1 (4%)	11 (46%)	4 (17%)	1 (4%)
All professional staff members are held to high standards to improve student learning.	2 (8%)	0 (0%)	3 (13%)	5 (21%)	9 (38%)	5 (21%)
Professional learning supports teacher to develop and expand new learning over time.	3 (13%)	1 (4%)	5 (21%)	8 (33%)	5 (21%)	2 (8%)
Student learning outcomes are used to determine professional learning plan.	4 (17%)	1 (4%)	3 (13%)	8 (33%)	6 (25%)	2 (8%)
Teacher professional learning this year is connected to previous year learning.	4 (17%)	1 (4%)	5 (21%)	5 (21%)	8 (33%)	1 (4%)

Note. N=24. DK = Don't Know, N = Never, Se = Seldom, So = Sometimes, F = Frequently, A = Always. The percent of *sample size* for each question is in parentheses. Percentages are rounded to the nearest whole number.

Of respondents from the No Growth Group, 58% (14) perceived that professional learning in their schools sometimes, seldom, or never contributes to increased student achievement. Fifty percent of participants (12) believed that student learning outcomes were sometimes, seldom, or never used to determine the professional learning plan in their schools. Similarly, 58% of teachers (14) from the No Growth Group sensed that professional learning opportunities sometimes, seldom, or never supported and extended their new teacher learning. While 54% of respondents (13) reported that their experiences sometimes, seldom, or never connected with teacher performance standards, 25% of participants (6) were unsure if professional learning and teacher performance were connected in their schools. Finally, 46% of teachers (11) from the No Growth

Group perceived that their professional learning this year was not connected with previous years' professional learning.

Finally, in response to the Outcomes standard, three of the interview participants were unable to articulate their school goals and as such could not say if they were connected to student and teacher outcomes and professional learning plans. All respondents felt their schools' professional learning opportunities were "isolated from, rather than connected to" overall school goals.

To conclude, teachers in schools demonstrating no growth perceived their schools' professional learning lower than expected in all seven standard areas, in addition, responses to all seven of the standards were more than 0.5 lower than national expectations.

Descriptive Statistics

Outcomes for research question three. The third research question examined what relationships exist between teacher perceptions of the seven professional learning standards as defined by Learning Forward and mathematics achievement for students with IEPs. This researcher performed the Chi-squared test to determine if the variation in teachers' perceptions of professional learning and a school's growth or lack of growth in mathematics achievement for learners with IEPs were due to chance or if the two were statistically related. Using national averages provided by Learning Forward, the researcher compared the actual observed survey responses for the *SAI2* with Learning Forward's suggested expected responses to determine if the two variables were related to each other. Specifically, Chi-squared (χ^2) values for the Growth Group were determined by comparing the actual survey responses from teachers in schools demonstrating growth

(as determined by PVAAS) and Learning Forward's national benchmarks. Likewise, χ^2 values for the No Growth Group were determined by comparing the survey responses from teachers in schools not demonstrating growth (according to PVAAS) and Learning Forward's national expectations. A lower χ^2 value would indicate participant responses were similar to the expected values identified by Learning Forward in their technical report of the SAI2. Higher χ^2 values indicated more variation in responses when compared with the expected values identified by Learning Forward (Denmark & Weaver, 2012). Employing a 99% confidence level, the p -value would indicate the percent chance that the specific question area was not related to mathematics achievement for students with IEPs.

The use of p -value statistics was popularized by Ronald Fisher in 1925. Fisher proposed (as cited in Ling, 2008) the level $p = 0.05$, or a one in 20 chance of being exceeded by chance, as a limit for statistical significance. Hence, for this study, a p -value below .05 was considered a very low probability that the responses were due entirely to chance and as such was said to be statistically significant, or related. Tables 4.17 – 4.23 identify the χ^2 values and p -values for each standard delineated by each survey question.

Learning communities. Professional learning communities provide a setting in which staff members develop new knowledge and classroom skills. Learning communities foster collegial support for implementing new strategies to benefit student learning. The Learning Communities standard focuses on continuous improvement, collective responsibility, and

accountability (Learning Forward, 2014). Table 4.17 presents the descriptive statistics (χ^2 and p -values) for teacher responses to survey questions related to the Learning Community standard.

As can be seen by the p -values in Table 4.17, having policies and procedures that support learning communities and including non-staff members as part of the community of learners were statistically significant for the Growth Group. According to teacher responses from the Growth Group, the remaining four indicators related to Learning Communities showed no relationship to mathematics achievement for learners with IEPs.

Table 4.17

Descriptive Statistics for the Learning Communities Standard

LEARNING COMMUNITIES STANDARD	Growth Group		No Growth Group	
Survey Question	χ^2	p -value	χ^2	p -value
Policies and procedures support learning communities.	11.92	.036	27.7	.001
Learning communities meet several times per week.	9.35	.096	14.07	.015
Responsibility to improve student learning is shared by all.	5.22	.39	140.44	.001
Non-staff members (i.e.: parents and community members) are included.	15.02	.010	20.58	.001
Learning communities are structured to engage in continuous improvement cycle.	9.60	.088	135.04	.001
Members demonstrate effective communication and relationship skills.	7.34	.197	33.82	.001

Note. Confidence interval of .01. P -values <.05 are considered statistically significant.

Within the No Growth Group, all areas indicated significant p -values (less than .05). Additionally, the higher χ^2 values indicated participant responses varied considerably from Learning Forward's national benchmarks. The data in Table 4.17 suggested that for schools not demonstrating growth a relationship exists between all indicators of the Learning Community standard and mathematics achievement for

learners with IEPs. To conclude, descriptive statistics for four of the six indicators for the Growth Group and six of the six indicators for the No Growth Group implied a relationship exists with mathematics achievement for students with IEPs.

Leadership. Learning communities promote collective responsibility for student learning. Collective responsibility among teachers and school leaders focuses efforts on improving classroom instruction to promote student achievement. The Leadership standard is based on the premise that improvements in student learning are preceded by building the capacity of the adults that work with students (Learning Forward, 2014).

Table 4.18 presents the descriptive statistics for the Leadership standard.

Table 4.18

Descriptive Statistics for the Leadership Standard

LEADERSHIP STANDARD		Growth Group		No Growth Group	
Survey Question	χ^2	p -value	χ^2	p -value	
Leaders provide equitable resources to support professional learning.	27.86	.001	20.04	.001	
School leaders actively participate in professional learning.	25.23	.001	16.60	.005	
Leaders advocate for resources to fully support professional learning.	26.55	.001	15.22	.009	
School leaders regard professional learning as a priority for all staff.	31.07	.001	28.45	.001	
Leaders cultivate a positive culture, collaboration, high expectations, respect, trust, and constructive feedback.	16.63	.005	19.73	.001	
School leaders speak about relationship between professional learning and improved student achievement.	24.55	.001	59.38	.001	
Leaders consider all staff members capable of being a professional learning leader.	9.69	.085	10.76	.056	

Note. Confidence interval of .01. P -values <.05 are considered statistically significant.

As evidenced by the higher χ^2 values in Table 4.18, teacher responses for both groups varied significantly from national benchmarks. Similarly, p -value data suggested

a significant relationship exists between the Leadership standard and mathematics achievement for students with IEPs. While teachers in both groups felt that their school leaders considered all staff members capable of being professional learning leaders, the remaining six indicators for the Leadership standard were related to mathematics achievement for students with IEPs. To summarize, scores for six of the seven indicators for the Leadership standard for both groups implied that a relationship exists between Leadership and mathematics achievement for learners with IEPs.

Resources. Advocating for professional learning resources is a critical component to effective professional learning. Successful school leaders understand that resources are essential to support needed changes in schools (Mizell, 2008). Table 4.19 reports the descriptive statistics for the Resources standard.

The higher χ^2 values for the Growth Group, as can be seen in Table 4.19, indicated teacher perceptions with regard to five of the indicators for the Resources standard varied considerably from national benchmarks. Lower p -values (less than .05) for the Growth Group in these five indicators suggested that a significant relationship exists between regarding practicing and applying new skills as important, discussing expenses, providing time during the school day, offering various times, and supplying technology resources for professional learning and mathematics achievement for learners with IEPs.

With regard to teachers having an active role in decision-making and monitoring resources for professional learning, Table 4.19 shows an extreme difference between group perceptions with lower χ^2 values for participants in the Growth Group and drastically higher χ^2 values for participants from the No Growth Group.

Table 4.19

Descriptive Statistics for the Resources Standard

RESOURCES STANDARD	Growth Group		No Growth Group	
Survey Question	χ^2	p -value	χ^2	p -value
Practicing and applying new skills is regarded as important.	16.63	.005	11.49	.042
Teachers are involved in monitoring the effectiveness of professional learning resources.	3.16	.068	16.56	.005
Expenses (i.e.: registration fees, staff, materials) are openly discussed.	28.09	.001	40.58	.001
Time is available during the school day for professional learning.	21.31	.001	44.23	.001
Decision-making about how resources are allocated includes teacher input.	10.79	.056	448.39	.001
Professional learning is available at various times (i.e.: job-embedded, before or after school, summer hours).	31.04	.001	38.39	.001
Various technology resources are available for professional learning.	23.09	.001	36.38	.001

Note. Confidence interval of .01. P -values <.05 are considered statistically significant.

The Growth Group χ^2 values indicated participant scores were similar to Learning Forward's national benchmarks. The No Growth Group's higher χ^2 values signified responses were considerably different than national expectancies. Corresponding p -values suggested a significant relationship exists between teacher input in the decision-making process for allocating professional learning resources for and mathematics achievement for learners with IEPs from schools not demonstrating growth. The No Growth Group's lower p -values (less than .05) in Table 4.19 suggested that all seven of the indicators for the Resources standards are related to mathematics achievement for students with IEPs. In summary, five out of the seven indicators for the Growth Group and all seven indicators for the No Growth Group signal a relationship exists between Resources and mathematics achievement for learners with IEPs.

Data. Monitoring the effectiveness of professional learning is critical to successful schools. Many forms of data are required to set goals for, plan, monitor, and evaluate professional learning. The Data standard focuses on analyzing student, educator, and system data, assessing the progress of professional learning content and process, and evaluating professional learning results (Learning Forward, 2014). Table 4.20 presents the descriptive statistics for the Data standard.

Table 4.20

Descriptive Statistics for the Data Standard

DATA STANDARD	Growth Group		No Growth Group	
Survey Question	χ^2	p -value	χ^2	p -value
Programs are continuously evaluated to ensure quality results.	14.71	.012	16.85	.005
Experiences are evaluated for their impact on student learning.	14.93	.011	13.83	.017
Various data is used to plan professional learning.	9.33	.097	23.60	.001
A variety of student achievement data is used to plan professional learning.	21.74	.001	34.31	.001
Teachers use what is learned to adjust and inform practices.	29.30	.001	38.10	.001
A variety of data are used to assess the effectiveness of professional learning.	9.83	.08	18.67	.002
How to assess the effectiveness of professional learning experiences is determined prior to being implemented.	9.06	.107	20.99	.001
Teachers use what is learned to adjust and inform practices.	10.33	.066	15.89	.007

Note. Confidence interval of .01. P -values <.05 are considered statistically significant.

As displayed in Table 4.20, according to the lower p -values, four out of the eight indicators for the Data standard signal data are utilized more in schools demonstrating growth than those not demonstrating growth. Further examination of the Growth Group statistics suggested that the two indicators of evaluating programs for quality and

evaluating experiences for their impact on student learning were statistically significant. In other words, in schools demonstrating growth, evaluating professional learning is related to mathematics achievement for students with IEPs. Additionally, utilizing student achievement data to plan professional learning and using what is learned to adjust and inform teacher practices were statistically significant, implying a relationship to mathematics achievement for learners with IEPs.

Teachers in the No Growth Group perceived all eight areas of the Data standard much differently than expected as evidenced by the higher χ^2 values in Table 4.20. Significantly low p -values ($>.05$) indicated that using a variety of data to plan, evaluate, and adjust professional learning and practice is related to mathematics achievement for learners with IEPs in schools not demonstrating growth. While the Growth Group perceived only four of the eight indicators as significant, the No Growth Group responses showed that in schools not demonstrating growth, the use of data to plan, assess, and evaluate professional learning is related to mathematics achievement for students with IEPs.

Learning design. Utilizing a variety of data to plan professional learning is a key component in successful programs. The first step within the cycle of school improvement is to utilize data to identify educator and student learning needs. This data analysis helps to determine professional learning goals, which in turn helps define the design of professional learning (Guskey & Yoon, 2009). Learning Design entails how educators gain knowledge, skills and practices, and transfer those new practices into their daily work. The Learning Design standard focuses on applying learning theories and research, selecting learning designs, and promoting active engagement (Mizell, 2008).

Table 4.21 presents descriptive statistics for the Learning Design standard.

Table 4.21

Descriptive Statistics for the Learning Design Standard

LEARNING DESIGN STANDARD Survey Question	Growth Group		No Growth Group	
	χ^2	p -value	χ^2	p -value
Teacher backgrounds, experience levels, and needs are considered when planning and designing opportunities.	22.93	.001	19.26	.002
The use of technology is evident in professional learning.	31.15	.001	1.60	.90
Teachers are responsible for selecting professional learning to enhance skills.	19.11	.002	12.75	.026
Professional learning includes various forms of support to apply new practices.	23.74	.001	31.02	.001
Participation in online opportunities is considered.	19.58	.001	8.76	.119
Opportunities to observe others are available as one type of job-embedded professional learning.	8.02	.155	8.95	.111
Teacher input is considered when planning school-wide opportunities.	24.74	.001	11.65	.04

Note. Confidence interval of .01. P -values <.05 are considered statistically significant.

As pointed out in Table 4.21 for the Growth Group, six of the seven indicators for the Learning Design standard had high χ^2 values and low p -values (less than .05), indicating a relationship exists between Learning Design and mathematics achievement for students with IEPs. Considering teacher backgrounds, needs, and experiences and affording teachers the responsibility in selecting their own professional learning were related to mathematics achievement or students with IEPs. Likewise, providing various forms of support and online opportunities were also related to mathematics achievement for learners with IEPs in schools demonstrating growth. According to teacher responses from the Growth Group, opportunities to observe others were available as a form of job-embedded professional learning.

In regard to the Learning Design standard and teacher perceptions from the No Growth Group as presented in Table 4.21, four of the seven indicators for the Learning Design standard signified a relationship with mathematics achievement for learners with IEPs. Similar to the Growth Group, low p -values ($<.05$) for considering teachers' experiences and needs, teachers selecting their own professional learning, providing various forms of support to apply new practices, and considering teacher input were all statistically significant. Based on teacher reports and scores similar to national benchmarks regarding technology and online options as well as job-embedded opportunities, there does not appear to be a relationship between these indicators and mathematics achievement for students with IEPs in schools not demonstrating growth. To conclude, a relationship was found between six of the seven indicators in the Learning Design standard and mathematics achievement for students with IEPs in the Growth Group. However, only four of the seven indicators showed an association among mathematics achievement for students with IEPs and professional learning designs for schools not demonstrating growth.

Implementation. School improvement efforts begin with an assumption that current practices, policies, and/or procedures are not producing the desired results (Abilock, Harada, & Fontichiaro, 2013). The indicators presented in Table 4.21 illustrate how professional Learning Design links with school improvement to provide educators with opportunities to gain knowledge, skills, and practices to utilize in the classroom. The goal of professional learning is high-quality implementation of new practices that will improve student learning (Hall & Hord, 2011). The Implementation standard focuses on applying change research, sustaining implementation, and providing

constructive feedback. Table 4.22 presents the descriptive statistics for the Implementation standard.

Table 4.22

Descriptive Statistics for the Implementation Standard

IMPLEMENTATION STANDARD	Growth Group		No Growth Group	
	χ^2	p -value	χ^2	p -value
Enhancing teaching practices to improve student achievement is a goal.	16.42	.006	15.86	.007
Teachers receive on-going support in various ways to improve teaching.	14.50	.013	19.92	.001
A consistent learning plan is in place for three to five years.	10.45	.063	8.93	.112
The school's professional learning plan is aligned to school goals.	20.51	.001	11.37	.045
Teachers individually reflect on teaching practices and strategies.	6.94	.225	19.62	.001
Experiences are planned based on research about effective school change.	14.47	.013	42.08	.001
Teachers give frequent feedback to colleagues to refine implementation of instructional strategies.	20.45	.001	27.02	.001

Note. Confidence interval of .01. P -values <.05 are considered statistically significant.

As indicated in Table 4.22, Implementation standard statistics, five of the seven indicators suggested a relationship exists between Implementation and mathematics achievement for learners with IEPs in schools demonstrating growth. Descriptive statistics for schools not demonstrating growth indicated that a relationship exists among six of the seven indicators. Based upon the perceptions of teachers in both the Growth Group and No Growth Group, there appear to be consistent plans for learning in place for three to five years, similar to the national benchmarks. Participants in the Growth Group also indicated that teachers reflect on their teaching practices and strategies and, as such, this indicator was not significantly related to mathematics achievement for learners with

IEPs. However, there were five other areas of Implementation that were significant: having a goal of enhancing teaching practices to increase student achievement, receiving ongoing support, aligning school goals and professional learning, incorporating research on school change, and providing opportunities for frequent feedback. Lower p -values (less than .05) for these five indicators signaled that a relationship exists with mathematics achievement for students with IEPs in schools demonstrating growth.

Table 4.22 presents the No Growth Group statistics according to teacher perceptions regarding the Implementation standard. With the exception of having a consistent learning plan in place, all indicators for the Implementation standard showed significant p -values (less than .05) indicating a relationship exists between the implementation of professional learning and mathematics achievement for learners with IEPs in schools not demonstrating growth. The remaining six indicators that appeared to be related to mathematics achievement for students with IEPs in schools not demonstrating growth were: setting a goal of enhancing teaching practices, receiving ongoing support to improve teaching, aligning professional learning plans to school goals, reflecting on teaching practices and strategies, applying research about school change during planning of professional learning, and providing frequent feedback to refine implementation. In summary, the Implementation standard yielded significant results in five of the seven indicators for the Growth Group and six out of the seven indicators for the No Growth Group indicating a relationship exists among implementation of professional learning and mathematics achievement for learners with IEPs.

Outcomes. According to Learning Forward (2014), standards are established to define a desired level of excellence or competence. Teacher learning and student

learning become connected when professional learning content integrates student learning and educator performance standards. The Outcomes standard focuses on meeting teacher performance standards, addressing student learning outcomes, and building coherence. Table 4.23 presents the descriptive statistics for the Outcomes standard.

Table 4.23

Descriptive Statistics for the Outcomes Standard

OUTCOME STANDARD	Growth Group		No Growth Group	
Survey Question	χ^2	p -value	χ^2	p -value
Professional learning focuses on the curriculum and how students learn.	20.45	.001	19.32	.002
Professional learning contributes to increased student achievement.	16.79	.005	29.99	.001
Experiences connect with teacher performance standards.	13.09	.023	22.37	.001
All professional staff members are held to high standards to improve student learning.	4.41	.049	16.65	.005
Professional learning supports teacher to develop and expand new learning over time.	20.81	.001	26.46	.001
Student learning outcomes are used to determine professional learning plan.	11.79	.038	26.07	.001
Teacher professional learning this year is connected to previous year learning.	11.93	.036	15.93	.007

Note. Confidence interval of .01. P -values <.05 are considered statistically significant.

The higher χ^2 values in Table 4.23 indicate significantly different responses from the national averages in regard to the Outcomes standard for both groups. While teachers in the Growth Group scored closer to expectancies than No Growth teachers (as evidenced by slightly lower χ^2 values), p -values from both groups indicate a significant relationship between all seven of the indicators for the Outcomes standard and mathematics achievement for learners with IEPs. Areas such as focusing professional

learning on curriculum and how students learn, supporting teachers to develop and expand new learning over time, and ensuring that professional learning contributes to increased student achievement were shown to be related to mathematics achievement for learners with IEPs in both groups of schools. Additionally, connecting professional learning experiences with student learning outcomes and teacher performance standards and ensuring consistency with previous years' professional learning were related to mathematics achievement for students with IEPs. Finally, a relationship was indicated between holding all professional staff members to high standards to improve student learning and mathematics achievement for learners with IEPs. To summarize, all indicators in the Outcomes standard were statistically significant for both schools demonstrating growth and schools not demonstrating growth, indicating that a relationship exists between the Outcomes standard and mathematics achievement for learners with IEPs.

Interview Findings

In addition to utilizing the Chi-squared test to determine relationships, a final open-ended interview question asked participants what areas they felt were related to or had the most impact on the mathematics achievement of their learners with IEPs. To begin, five of the seven respondents had no idea that the professional learning standards existed. The remaining two interviewees indicated "some" familiarity with the standards as Participant Four shared, "I think I've heard about them in grad class, but to be truthfully honest, I couldn't tell you what they are." A review of responses identified common themes: Learning Design, Data, and Resources were the three most significant areas that respondents perceived impacted mathematics achievement for their learners

with IEPs. The need for equitable resources, especially time to collaborate and co-plan with co-teachers, was consistent across 100% of participants in both the Growth Group and the No Growth Group interviewees. As Interviewee Seven shared, “We are given training with these new strategies, or programs, but then there’s no support to help us implement them or time to work with our teams!” All participants felt that professional learning opportunities that took into consideration teacher background knowledge and experience levels along with individual learning needs, strongly related to their students’ mathematics achievement. Three of the seven interviewees felt that their needs as a teacher were not taken into consideration when planning professional learning. Respondent Six indicated that she felt content knowledge of the teacher and experience impacted her students with IEPs’ mathematics achievement. “But we need more time and training with the new content.” Similarly, five of the seven participants suggested explicit instruction was most beneficial to their learners with IEPs, thus requiring teachers to have a strong content knowledge. All respondents alluded to the importance of communication between all stakeholders as a critical factor in mathematics achievement for learners with IEPs. Participant Five shared, “I think administration knows in their mind where they want to go and what they want to do with professional learning but they either don’t know how to get there or don’t communicate clearly with us!” In regard to communication, Respondent Seven disclosed. “We both [teacher and principal] know we need to improve student scores, but sometimes I feel like we as teachers are on one page and he [the principal] is on another. We really need to do a better job of communicating for the sake of our learners!” Finally, the use of data to drive decision-making to identify both teacher and student learning needs was a common

theme perceived by both groups of interviewees as being related to mathematics achievement for students with IEPs. Five of the seven respondents shared that their district could do a better job of using student data to guide professional learning designs and opportunities and hence increase student mathematics achievement for learners with IEPs. All seven participants felt their district could do a better job in collecting teacher data to determine professional learning needs which would in turn increase mathematics achievement for their students with IEPs. As Participant Three shared, “We do these district surveys to find out what our [teacher] needs are, but I’m not really sure they use them. At least they ask, but why ask if you aren’t really going to use them.”

Summary

Data from this study consisted of 44 teachers’ self-reported perceptions of the seven professional learning standards as set forth by Learning Forward in both school districts that have demonstrated growth according to PVAAS and those that have not demonstrated growth according to PVAAS. Additionally, this researcher employed Pearson’s Chi-squared test to determine if any relationship existed between teacher perceptions of the professional learning standards and mathematics achievement for learners with IEPs. The *Standards Assessment Inventory 2 (SAI2)* online survey by Learning Forward along with open-ended interview questions were utilized to gather teacher perceptions. Data and participant input were organized according to each research question. A comparison of the average standard values in the Growth Group indicated responses to the Leadership, Resources, Data Learning Design, Implementation, and Outcomes standards to be lower than the national benchmarks. Interview responses confirmed these findings, indicating that teachers in the Growth Group perceived their

schools' professional learning as lower than expected in the aforementioned standards. With regard to the No Growth Group, average standard scores were lower than expected in the standards of Learning Communities, Leadership, Resources, Data, Learning Design, Implementation, and Outcomes. Again interview data concurred with the above findings, signaling lower perceptions of professional learning in all seven standards.

Descriptive statistics resulting from the Chi-squared test signaled whether a relationship existed among the indicators for each standard and mathematics achievement for learners with IEPs. For schools demonstrating growth, two of the six indicators in the Learning Communities standard were significant. Six of the seven indicators in the Leadership and Learning Design standards were statistically significant. *P*-values for five of the seven Resource and Implementation standards' indicators suggested a relationship with mathematics achievement for students with IEPs. Four of the eight Data indicators proved to be significantly related to mathematics achievement for learners with IEPs. Finally, all seven of the indicators for the Outcomes standard suggested a relationship exists with mathematics achievement for learners with IEPs in schools demonstrating growth. Chi-squared statistics also suggested relationships exist between the standards and mathematics achievement for students with IEPs in schools not demonstrating growth. Four of the seven indicators in the Learning Design standard and six of the seven indicators in the Implementation and Leadership standards were significant. All of the indicators in the remaining four standards (Learning Communities, Resources, Data and Outcomes) were statistically significant. Further analysis and discussion of the results and their relationship to other research will be presented in Chapter Five.

Chapter Five – Discussion

Summary of the Study

Nationwide and locally, students with IEPs struggle to make Adequate Yearly Progress (AYP) and meet rigorous benchmarks in mathematics (Wagner et al., 2006). In 2012, only three school districts in Pennsylvania met AYP benchmarks for mathematics achievement among their IEP subgroup. Less than 8% of Pennsylvania schools exceeded the state average of 59% proficient or advanced in mathematics for their IEP subgroup (Pennsylvania Department of Education, 2014b). According to Schleicher (2011), teachers around the world reported a high level of need for more professional learning in teaching students with special needs.

The purpose of this mixed-method study was to examine the teacher perceptions of professional learning opportunities in 22 school districts in Pennsylvania. Furthermore, this study sought to explore the relationship between teacher perceptions of professional learning and mathematics achievement for students with IEPs. The study examined teacher perceptions of professional learning in school districts demonstrating growth and school districts not demonstrating growth (as determined by the PVAAS Average Growth Index) in regard to the seven professional learning standards defined by Learning Forward. Furthermore, the study sought to determine if relationships exist between teacher perceptions of the seven professional learning standards and mathematics achievement for students with IEPs. Specifically, this study may have importance for school leaders who are seeking to improve professional learning opportunities in an effort to increase mathematics achievement for learners with IEPs.

Participants included 44 general and special education teachers from grades 4 through 8 from 22 suburban school districts in Pennsylvania. Districts were identified as demonstrating growth or not demonstrating growth according to their PSSA scores and PVAAS Average Growth Index. Twelve districts were identified as not demonstrating growth and 10 districts were identified as demonstrating growth.

The *Standards Assessment Inventory 2 (SAI2)* and personal interviews were utilized to assess teacher perceptions of professional learning and address the first two research questions that guided this study. The Chi-squared test was then applied to each standard indicator to determine if the standards were related to mathematics achievement for learners with IEPs in order to answer the third research question.

In Chapter Four, results of the study were outlined summarizing participant responses to the survey and individual interviews. An examination of data collected from the survey and one-on-one personal interviews was conducted to explore common themes and trends. While the online surveys and interviews provided valuable insight into teachers' perceptions regarding the seven standards of professional learning, the Chi-squared analyses offered insight into the association between each standard area and mathematics achievement for learners with IEPs. Chapter Five includes a discussion of both qualitative and quantitative findings, limitations of the study, connections to other research and recommendations for future research.

Analysis of the Results

This study was conducted to examine teacher perceptions of professional learning in regard to the seven professional learning standards as defined by Learning Forward and determine whether any relationship existed between the standards and mathematics

achievement for students with IEPs. Data were collected, reported, and analyzed relevant to each of the three research questions.

Research questions one and two. Research question one explored teacher perceptions of professional learning in schools demonstrating growth while research question two examined teacher perceptions of professional learning in schools not demonstrating growth. According to survey responses, the average standard scores from both the Growth Group and the No Growth Group for all seven standards were lower than national benchmarks. Perhaps the fact that many participants, including the five out of seven interviewees, were not familiar with the seven standards of professional learning. The following sections will compare teacher perceptions of Learning Forward's seven standards in schools demonstrating growth and schools not demonstrating growth.

Learning communities. Professional learning communities provide the setting in which staff members develop new knowledge and classroom skills. Learning communities foster a collaborative culture with ongoing learning among professionals in order to support the use of new strategies to benefit student learning (Learning Forward, 2014). Teacher perceptions regarding the Learning Communities standard in schools demonstrating growth were similar to Learning Forward's national expectations while perceptions in schools not demonstrating growth showed some concerns. A majority of the respondents from the No Growth Group shared that non-staff members such as parents and community members were not included in learning communities at their school. Additionally, teachers from schools not demonstrating growth did not feel that their schools' professional learning was connected to a cycle of continuous improvement. While both groups' respondents reported policies and procedures for supporting

professional learning, interview participants were unsure if their schools had such policies and procedures and felt a disconnect between their schools' professional learning and continuous improvement. To summarize, teacher perceptions suggested that having policies and procedures to support professional learning and including non-staff members were important for successful professional learning.

Leadership. School leaders are critical in promoting the importance and value of effective professional learning (Rivkin et al., 2005). As advocates for professional learning, school leaders must make their own learning visible to others by participating in professional learning within and beyond their own work environment. (Learning Forward, 2014). Participants from schools not demonstrating growth felt their schools' leaders advocated for resources to support professional learning and promoted a climate conducive to collaboration. However, teachers in both schools demonstrating growth and school not demonstrating growth perceived their leaders as not being active participants in professional learning. Respondents from schools not demonstrating growth felt their school administrators only minimally promoted professional learning and its relationship to student achievement. Additionally, participants from schools not demonstrating growth thought school leaders could do a better job at providing equitable resources for professional learning. Based on interview responses, teachers in the No Growth Group perceived their school leaders as supportive advocates for improving student achievement. However, the majority of interviewees felt that their administrators were overextended and as such, struggled to support professional learning. In summary, teacher perceptions from both groups of schools emphasize the importance of school leaders who actively participate in professional learning. In schools not demonstrating growth, teacher

participants emphasized the necessity for school leaders to provide equitable resources to staff to support professional learning.

Resources. Effective professional learning requires resources such as staff, materials, technology and time to improve student achievement. Allocation of resources affects the quality and results of professional learning (Shulte & Stevens, 2014). Participants in both schools demonstrating growth and schools not demonstrating growth viewed practicing and applying new skills as an important characteristic in their schools. Teacher perceptions of the allocation of resources from both the survey and the interviews in both groups of schools were poor. Only three participants from both groups of schools indicated that teachers were frequently involved in decision-making about professional learning. Likewise, interview participants indicated resources were often identified and monitored “from the top down.” Additionally, teachers in both the Growth Group and No Growth Group reported that there was not enough variety in the opportunities for professional learning available to them. Responses from all seven of the personal interviews confirmed the need for additional time and for a variety of professional learning options to be provided to teachers. For the past two decades, school leaders have encouraged teachers to differentiate learning opportunities based on the needs of the learner (Abilock, Harada, & Fontichiaro, 2013). Based on the responses in this study, school leaders are not applying this theory to the adult learners. In addition, the teacher participants communicated a desire to participate in decision-making regarding allocation of resources. To summarize, teacher perceptions from both groups promoted the concept that time be provided during the school day for professional learning and that differentiated options for professional learning also be made available.

Leaders were also urged to include teachers in the decision-making process with regard to professional learning.

Data. The use of multiple sources of data to plan and evaluate professional learning is critical (Guskey & Yoon 2009). Remarkably, the percentage of *Don't Know* scores from the Growth Group with regard to indicators in the Data standard ranged from 25% – 40%. Similarly, six of the seven interview participants from both groups were unsure of their schools' use of data when planning and assessing professional learning. Participants from both groups of schools reported that professional learning programs were not consistently evaluated. Of considerable concern is the notion from both groups of participants that professional learning was rarely assessed for its impact on student achievement. The majority of teachers from schools not demonstrating growth reported that teachers sometimes or seldom use what is learned from professional learning to adjust and inform their practice. To summarize, respondents from both groups of schools felt their schools could do a better job of utilizing data to plan and assess professional learning. All contributors from the interviews indicated that they personally utilized data to drive their instruction and practice; however many felt that school-wide, this was an area of weakness. This may suggest that professional learning developers be encouraged to promote the connection between professional learning and student achievement by utilizing data to evaluate the impact of professional learning on student learning.

Learning design. Several factors influence decisions about learning designs, including the characteristics of the learners. Educators' backgrounds, experiences, beliefs, motivation, and interests affect how they approach professional learning and should also be considered when determining a learning design (Marrongelle et al., 2013). Teachers

in both schools demonstrating growth and schools not demonstrating growth felt their learning needs and input were only minimally considered in designing learning opportunities. The participants also reported that teachers were rarely responsible for selecting their own professional learning plan. Interestingly, participants from both groups of schools shared that differentiated opportunities and the various supports necessary to gain the skills and strategies necessary to improve student learning were limited. While teachers in the No Growth Group indicated technology resources, including online options, were available to support professional learning, teachers from the Growth Group believed technology could play a more active role in professional learning design in their schools. A majority of survey respondents and six of the seven interviewees shared that technology was available for professional learning but online opportunities, while offered, were limited. In review, teacher perceptions from both groups of schools regarding the Learning Design standard supported the notion that teacher backgrounds, experiences and learning needs must be taken into consideration when designing professional learning opportunities. Additionally, the responses indicated that a variety of time and differentiated professional learning options should be available to support participants. Finally, teachers especially from schools not demonstrating growth, supported the use of technology and advocated having technology resources available as part of the professional learning plan.

Implementation. Effective professional learning sustains support for the implementation of new practices, policies, and procedures for long-term change (Learning Forward, 2014). The Implementation standard involves providing supportive and ongoing feedback. Teachers from both groups of schools reported that enhancing

teaching practices to improve student achievement was a primary goal in their schools. A positive practice of the Implementation standard that was consistent across all interviews and indicated by nearly half of the survey respondents was that they frequently reflected about their teaching practices and strategies. Of particular interest was the notion that a majority of participants from both groups were unsure if their school had a consistent three to five year professional learning plan. If teachers are unaware of the plan, it is difficult to implement that plan effectively. This researcher was concerned by the lack of connection participants made between learning and student achievement. In fact, both survey and interview participants did not feel their professional learning directly impacted their students' achievement. Two of the seven interviewees identified too many new initiatives as one possible cause of this disconnect. Additionally, many teachers from both groups did not feel they received the ongoing support and feedback necessary to improve their students' learning. Only about half of the survey respondents reported their school goals and professional learning plans were linked; in fact, five of the seven interviewees felt that their professional learning opportunities were "isolated from" their school goals. In brief, survey results and interview responses supported the idea that professional learning implementers from both groups of schools need to connect professional learning and school goals to promote the concept that teacher professional learning can increase student achievement. Additionally, in order for professional learning to be effective, leaders should be encouraged to provide the ongoing supports and feedback necessary for teachers to improve their practice.

Outcomes. Teacher learning and student learning become connected when professional learning content integrates student learning and educator performance

standards (Learning Forward, 2014). The Outcomes standard focuses on meeting teacher performance standards, addressing student learning outcomes, and building coherence. Based on interview and survey data, the majority of teachers in both groups of schools felt that all staff members were held to high standards in order to increase student learning. Nearly half of the survey participants from schools demonstrating growth perceived that their professional learning focused on curriculum and how students learn. Participants from both groups felt that student learning goals and teacher outcomes were only minimally considered when determining professional learning plans. A small percentage of teachers reported that the professional learning opportunities in which they participated seldom extended their learning and as such did not increase student achievement as much as they believed it could. Interview participants indicated that their school goals were too broad and as such made linking professional learning and school objectives challenging. In summary, teacher perceptions from both groups of schools suggested that student learning goals should be used to determine professional learning. Participants from the Growth Group supported the idea that professional learning should focus on curriculum and how students learn. Finally, both groups advocated for teacher supports to extend their new learning and to connect professional learning with previous years' goals.

To improve student learning, teachers and professional learning must be held to high standards (Stronge et al., 2011). Interestingly, five of the seven interview participants had never heard of Learning Forward's seven professional learning standards. To conclude, teachers in schools demonstrating growth perceived their schools' professional learning to be lower than expected in all seven standard areas. Specifically,

the Leadership, Resources, Data, Learning Design, Implementation, and Outcomes standards were lower than national benchmarks (differed by more than 0.5). Growth Group responses to the Learning Community standard indicators were similar to expectations and did not stand out in this study. While teachers in schools not demonstrating growth also perceived their schools' professional learning to be lower than expected in all seven standard areas, responses to the indicators in all seven of the standards differed from Learning Forward's national expectations by more than 0.5.

Descriptive statistics. The third research question examined what relationships existed between teacher perceptions of the seven professional learning standards as defined by Learning Forward and mathematics achievement for learners with IEPs. Pearson's Chi-squared test was employed to determine if teachers' perceptions of professional learning and math achievement for learners with IEPs were actually unrelated or if an association existed between the two variables. The indicators for each standard were individually analyzed for independence in order to determine if the variation in teachers' perceptions of professional learning and a school's growth or no growth in mathematics achievement for learners with IEPs were statistically related. Using national averages provided by Learning Forward, the researcher compared the actual observed survey responses for the *SAI2* with Learning Forward's suggested expected responses to determine if the two variables were related to one another. Specifically, χ^2 values for the Growth Group were determined by comparing the actual survey responses from teachers in schools demonstrating growth (as indicated by the PVAAS Average Growth Index) and Learning Forward's national benchmarks. Similarly, χ^2 values for the No Growth Group were determined by comparing the survey responses

from teachers in schools not demonstrating growth (according to their PVAAS Average Growth Index) and Learning Forward's national expectations.

Learning communities. Results of the Chi-squared test indicated a relationship between two of the six indicators in the Learning Communities standard for schools demonstrating success. Teachers agreed that having policies and procedures in place to support professional learning communities was critical. Additionally, survey results confirmed the belief that including non-staff members, such as parents and community members, in the community of learners nurtures a sense of collective responsibility for student achievement. For schools not demonstrating growth, all of the indicators in the Learning Communities standard were statistically significant. Higher χ^2 results for all six indicators for the Learning Community standard indicated considerably different responses from what was predicted nationally. This data suggested an association between Learning Communities and mathematics achievement for students with IEPs in those schools demonstrating no growth. While newer teachers, those with less than 10 years' experience, scored their schools slightly higher, teachers from all levels of experience responded similarly regarding the lack of Learning Community indicators. In the same way, both general and special education teachers felt similarly about the lack of commitment to learning communities in their schools. In contrast to the qualitative results in research question two, which examined benchmark and actual standard averages, a statistical analysis of the Learning Community standard indicated a significant relationship between all indicators in the Learning Community standard and mathematics achievement for learners with IEPs. Due to the fact that the national benchmark for Learning Communities was 3.88 and the actual No Growth Group average

response was 3.0, both groups scored in the “Sometimes” range. However, a closer look at the quantitative data indicated considerably different responses than expected and as such identified a significant relationship between the Learning Community standard and mathematics achievement for students with IEPs.

Leadership. While teachers in both groups felt their leaders considered all staff members capable of being professional learning leaders, descriptive statistics for both the Growth Group and No Growth Group in the remaining six indicators in the Leadership standard were statistically significant. That is, data from both groups indicated a 99% chance that Leadership is related to mathematics achievement for learners with IEPs. Teachers with more than 10 years experience responded slightly more negatively about their schools’ leadership than teachers with less than 10 years in teaching. General education teachers felt their leaders advocated more vigorously for resources and more effectively cultivated a positive culture encouraging communication and relationship skills. Special education teachers tended to feel their leaders spoke considerably about increasing student achievement, but rarely made the connection with professional learning.

Resources. Participants in the Growth Group perceived teachers as playing an active role in decision making and monitoring of resources for professional learning. *P*-values for five of the seven Resource standards’ indicators suggested a relationship between Resources and mathematics achievement for learners with IEPs. All seven of the indicators from the Resources standard were related to mathematics achievement for learners with IEPs for schools demonstrating growth. Results confirmed the belief that practicing and applying new skills is important to teachers at all experience levels and

across general and special education. Generally, teachers wanted more involvement in decision-making and monitoring of resources.

Data. Overall, results suggested that utilizing a variety of data to plan, assess, and evaluate professional learning is critical. Four of the seven Data indicators proved to be significantly related to mathematics achievement for learners with IEPs in schools demonstrating growth. All of the indicators in the Data standard were statistically significant for the No Growth Group. Teachers across all levels of experience responded similarly in their districts' use of data.

Learning design. Similar to the qualitative perceptions of Learning Design, a statistical analysis of this professional learning standard indicated a significant relationship among six of the seven indicators for Learning Design and mathematics achievement for learners with IEPs for the Growth Group. Four of the seven indicators in the Learning Design standard were significant for schools not demonstrating growth. The data from the No Growth Group indicated that a relationship existed between these four indicators of Learning Design and mathematics achievement for students with IEPs. While there were no significant differences between general and special education teacher responses, participants with less than five years responded slightly higher than their veteran partners with regard to the perception that teacher backgrounds were considered and that various forms of support were available. Interestingly, interview results contradicted the survey findings; interview respondents reported having limited job-embedded opportunities yet survey participants indicated options to observe others as being available. As best explained by Interviewee Three, "Opportunities to observe

colleagues are available, but no one takes advantage of them because it's too difficult to find coverage and prepare for a sub."

Implementation. Participants in the Growth Group sensed that teachers reflect about their practices and strategies. Five of the seven Implementation standards' indicators indicated a relationship with mathematics achievement for students with IEPs in schools demonstrating growth. Similarly, six of the seven indicators in the Implementation standard were significant, or related to mathematics achievement for learners with IEPs in schools not demonstrating growth. Implementation areas such as teachers giving frequent feedback to colleagues to refine implementation of instructional strategies and teachers receiving ongoing support to improve their practice were shown to be significantly associated with mathematics achievement for learners with IEPs for both groups. According to survey responses, general education teachers felt they received more ongoing support than special education teachers. Similarly, newer teachers, with less than 10 years' experience, scored their schools slightly higher in Implementation than their more experienced peers.

Outcomes. Results of the Chi-squared test for both the Growth Group and the No Growth Group indicated a significant relationship between all seven of the indicators for the Outcomes standard and mathematics achievement for learners with IEPs. These findings confirm the belief that student achievement and teacher learning are connected in both schools demonstrating growth and those not demonstrating growth. The notion that all teachers felt their professional learning did not impact their students' learning is significant. The fact that teachers felt student learning outcomes were not always used to

determine professional learning plans could have something to do with their feeling of disconnect between professional learning and student learning.

In conclusion, while all areas of professional learning are important to student learning, the standards of Leadership, Resources, Learning Design, Implementation, and Outcomes were more strongly related to mathematics achievement for learners with IEPs than the others. Additionally, for schools not demonstrating growth, the Learning Community standard was also related to student mathematics achievement for students with IEPs.

Limitations of the Study

A critical limitation to this study involved the low number of participant responses and limited sample size. The fact that a limited number of districts met the state mathematics average for their IEP subgroup significantly limited the pool of participating school districts. Despite numerous attempts and follow up contacts, sample sizes of less than 30 participants were obtained for both groups. Likewise, finding interview participants to further explore perceptions of professional learning was challenging. Due to the limited number of participants in each group, the findings of this study should be interpreted cautiously. Recognizing the complexity of the educational system and acknowledging that a variety of factors contribute to changes in teaching and learning, professional learning leaders should take caution when generalizing the results of this study.

Relationship to Other Research

This study confirmed the findings of Darling-Hammond, Wei, Andree, Richardson, and Orphanos (2009), Dash et al. (2012), and Feng and Sass (2013) who

indicated that quality professional learning for teachers is related to student achievement gains. In particular, the areas of Learning Communities, Leadership, Resources, Data, Learning Design, Implementation, and Outcomes were examined. The findings relating mathematics achievement for learners with IEPs in the No Growth Group with cultivating a climate conducive to communication and collaboration, concurred with Darling-Hammond and McLaughlin (2011), Sztajn et al. (2006), and Whitcomb et al.'s (2009) suggestions that professional learning is most effective when collaborative and reflective in a culture of shared responsibility. The findings on Leadership support that of Desimone et al. (2006); Jaquith et al. (2010); and Moore et al. (2011) regarding the importance of principals and school leaders who support, value, and implement high quality professional learning opportunities. As Desimone et al. (2006) posited, findings from this study also supported the substantial role that administrators play in shaping policy and practice around professional learning. Finally, this study found, as Jaquith et al. (2010) concluded, that having infrastructures to support professional learning are critical to school success.

Similar to Jaquith et al.'s (2010) and Lee's (2005) findings on resources necessary to support professional learning, results of this study supported the idea that including participants and teachers as decision makers is a key factor in successful programs. Teachers in the Growth Group were far more likely to be involved in monitoring professional learning resources and in making decisions about how resources are allocated than were those in the No Growth Group. Both groups concurred with Bruce et al.'s (2010) findings that professional learning should be embedded in the classroom context within the school day.

Guskey (2000), Moore et al. (2011), and Rockoff (2004) proposed utilizing multiple sources of data when planning and evaluating professional learning. Findings from this study indicated a lack of staff opportunities to utilize data to plan and evaluate professional learning as a weakness for the No Growth Group. The data also showed a significant association between use of data to evaluate, plan for, and make adjustments to practice, and mathematics achievement for learners with IEPs. A similar weakness in the Growth Group concurred with Desimone's (2009) and Winslow's (2009) findings on the importance of a framework for evaluating professional learning and its effects on student learning.

When designing professional learning, consideration of teacher backgrounds, experience levels, and needs should be considered (Mizell, 2008). Sparks and Loucks - Horsley (1989) identified the importance of differentiating options and teacher choice with regard to professional learning. Findings from this study concurred with these seminal researchers and others who suggested including various opportunities and forms of support to teachers as they apply new practices (Abilock et al., 2013; Desimone, 2006, 2009; Liljedahl, 2014; and Winslow, 2009). Just as Desimone (2009) and Mizell (2008) found, this study supported job-embedded opportunities such as observing others. Findings from the No Growth Group on utilizing technology and having online opportunities for professional learning supported Dash et al.'s (2012) and Fishman et al.'s (2013) findings on the many advantages of online delivery modes including the ability to accommodate teachers' busy schedules and draw on powerful resources not available locally.

Seminal researchers such as Showers et al. (1987) proposed that effective professional growth was more successful with peer supports. Two areas from this study showing significant relationships with mathematics achievement for learners with IEPs included teachers giving frequent and supportive feedback to colleagues to refine implementation of instructional strategies and teachers receiving ongoing support to improve teaching. Additionally, as Borko (2004), Darling-Hammond (2000), and Münez-Catalan, et al. (2010) proposed, this study confirmed the importance of teachers reflecting on their own professional practice and strategies. A final Implementation consideration that was consistent in the results of this study included the importance of professional learning plans aligning with school goals as outlined by Desimone et al. (2006), Garet et al. (2010), and Guskey (1995).

Skourdoumbis (2014) found that achievement gains were related to observable teacher characteristics. Similarly, Chety et al. (2012), Mizell (2008), Phillips (2010), and Rivkin et al. (2005) suggested that teachers matter and that student scores increased when teacher professional learning opportunities increased. Results of the statistical analyses on the Outcomes standard indicated a significant relationship between professional learning and mathematics achievement for learners with IEPs in both groups of schools.

Recommendations for Further Research

Due to the nature of education and the many confounding variables that impact both teacher and student learning, findings and conclusions of professional learning perceptions are certain to be tentative and speculative. While relationships and associations were identified between specific indicators and standards for schools

demonstrating growth and schools not demonstrating growth, one cannot say with certainty this relationship is causal. Recommendations for further research include:

- Conduct additional research on teachers' and school districts' awareness and knowledge of the seven professional learning standards as defined by Learning Forward to help school leaders identify potential gaps in their schools' professional learning plans. Awareness of the standards will lead to more informed decision making and planning.
- Research the issues studied in this dissertation but with a larger sample in order to better understand characteristics of professional learning in schools demonstrating growth with their learners with IEPs.
- Further investigate the strategies and indicators for each of the seven standard areas to support schools in providing professional learning opportunities that improve mathematics achievement for learners with IEPs. Specifically based on the results of the current study, this researcher would recommend further studies focusing on the Leadership, Resources, Data, Learning Design, Implementation, and Outcome standards.
- Examine student and/or administrator perceptions of teachers' professional learning and its impact on student learning.
- Utilize the *SAI2* for individual school districts to assess the pre and post professional learning plan strengths and needs. By focusing on one district, more individualized professional learning and student achievement data may be explored and analyzed.

Conclusion

This mixed method study was designed to investigate teacher perceptions of professional learning in schools demonstrating growth and schools not demonstrating growth. Additionally, this researcher sought to determine if the two variables of teacher perceptions of professional learning and mathematics achievement for learners with IEPs were related.

The results of the statistical analyses supported the concept that quality professional learning experiences are related to mathematics achievement for students with IEPs. Specifically, the results supported the idea that the professional learning standards of Leadership, Resources, Data, Learning Design, Implementation, and Outcomes are critical to success in schools demonstrating growth. For schools not demonstrating growth, all seven of the professional learning standards are critical to success. The fact that both special education and general education teachers from all levels of experience perceived their schools' professional learning similarly leads this researcher to believe professional learning is a school and/or system challenge. Results of the survey and open-ended interview questions confirmed that teacher professional learning is important to student learning in both schools demonstrating growth and those not demonstrating growth.

With more than six million school-aged students across the country qualifying for IEPs and NCLB's high standards of academic achievement for all public school students, including those with disabilities, teachers are expected to continually evaluate and update their knowledge and practice (U.S. Department of Education 2011b). In order for special education teachers and general education teachers to support mathematics achievement

for students with disabilities, a community of learning with shared responsibility to improve student achievement must be established. Having policies and procedures in place to support learning communities in a continuous cycle of improvement is essential. School leaders play a significant role in promoting the relationship between professional learning and student achievement and as such need to be advocates for equitable resources and they need to be active participants in professional development. Involving teachers in the decision making and monitoring of resources is also important. Professional learning opportunities must be evaluated for their impact on student achievement and utilized to guide practice and change instruction. When designing opportunities for professional learning, it is imperative to consider both teacher and student learning needs and offer a variety of differentiated options, including job-embedded opportunities. Technology can play an integral part in professional learning designs as a way to connect with colleagues and experts worldwide. Providing ongoing support in order to improve teaching during the implementation phase is vital. Giving and receiving feedback for the purpose of refining implementation of instructional strategies is essential to sustaining long-term change. Finally, building coherence between teacher learning and student learning is crucial.

Increasing the understanding of how best to provide and deliver professional learning is critical (Wayne, Yoon, Cronen, Garet, & Zhu, 2007). High-performing educational settings rely on ongoing professional learning to update educators' subject matter knowledge, skills and approaches in light of new teaching techniques, new circumstances, and new research. Professional learning enables teachers to develop and apply new strategies and teaching practices and supports teachers in applying these

changes to their current practices. Opportunities for professional learning promote the exchange of information and expertise among teachers and other professionals (Schleicher, 2011). This research adds to the limited body of knowledge that currently exists regarding the instructional practices necessary to improve mathematics scores of students with IEPs. Overall, the implications of this study suggest that supportive leadership, equitable resources, multiple sources of data, and differentiated learning designs are associated with schools demonstrating growth with their learners with IEPs. Similarly, relationships exist between math achievement for students with IEPs in schools that are not demonstrating growth and supportive leadership, equitable resources, and the use of data to plan, evaluate, and connect professional learning with school goals. Providing ongoing support and building coherence between teacher and student learning were related to math achievement for learners with IEPs in both schools demonstrating and schools not demonstrating growth. In this age of accountability where schools are challenged to find resources and effective strategies to meet the specific needs of a diverse population of students, the results of this study may assist educational leaders in planning, implementing and evaluating professional learning opportunities that increase mathematics achievement for students with IEPs.

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Appendix A

SAI2 Survey**Information About You**

Learning Forward has launched new Standards for Professional Learning! We want to know about your professional learning experience at your school. Please choose the responses that most accurately reflect your own experiences at your school.

1. Role

*Content Area Teacher**Support Teacher**Elective or Special Area Teacher*

2. Experience Level as a Teacher

*Less than 1 year**1–4 years**5–10 years**11–16 years**17–25 years**More than 25 years*

3. Years at Current School

*0–1 years**2–4 years**5–9 years**10–20 years**21 or more years*

4. School Setting

*Career/Technical**College Preparatory**Early Learning Center**Early Childhood**Elementary**Middle**High*

5. School Governance

Corporation

Faith-Based

Private, Non-Faith-Based

Private Charter

Public

Public Charter

Learning Communities

Standard: Professional learning that increases educator effectiveness and results for all students occurs within learning communities committed to continuous improvement, collective responsibility, and goal alignment.

Please rate the following items:

Always Frequently Sometimes Seldom Never Don't Know

1. My school's learning communities are structured for teachers to engage in the continuous improvement cycle (i.e. data analysis, planning, implementation, reflection, and evaluation).
2. Learning community members in my school believe the responsibility to improve student learning is shared by all stakeholders, such as all staff members, district personnel, families, and community members.
3. My school system has policies and procedures that support the vision for learning communities in schools.
4. All members of the learning communities in my school hold each other accountable to achieve the school's goals.
5. Learning communities in my school meet several times per week to collaborate on how to improve student learning.
6. In my school, some of the learning community members include nonstaff members, such as students, parents, or community members.
7. In my school, learning community members demonstrate effective communication and relationship skills so that a high level of trust exists among the group.

Leadership

Standard: Professional learning that increases educator effectiveness and results for all students requires skillful leaders who develop capacity, advocate, and create support systems for professional learning.

Please rate the following items:

Always Frequently Sometimes Seldom Never Don't Know

8. My school's leaders consider all staff members to be capable of being professional learning leaders.
9. My school's leaders regard professional learning as a top priority for all staff.

10. My school's leaders cultivate a positive culture that embraces characteristics such as collaboration, high expectations, respect, trust, and constructive feedback.
11. My school's leaders are active participants with other staff members in the school's professional learning.
12. My school's leaders advocate for resources to fully support professional learning.
13. My school's leaders provide teachers with equitable resources to support our individual and collaborative goals for professional learning.
14. My school's leaders speak about the important relationship between improved student achievement and professional learning.

Resources

Standard: Professional learning that increases educator effectiveness and results for all students requires prioritizing, monitoring, and coordinating resources for educator learning.

Please rate the following items:

Always Frequently Sometimes Seldom Never Don't Know

15. In my school, time is available for teachers during the school day for professional learning.
16. Professional learning is available to me at various times, such as job-embedded experiences, before- or after-school hours, and summer experiences.
17. Practicing and applying new skills with students in my classroom are regarded as important learning experiences in my school.
18. Teachers in my school have access to various technology resources for professional learning.
19. Professional learning expenses, such as registration and consultant fees, staff, and materials, are openly discussed in my school.
20. Teachers in my school are involved with monitoring the effectiveness of the professional learning resources.
21. Teachers in my school are involved with the decision making about how professional learning resources are allocated.

Data

Standard: Professional learning that increases educator effectiveness and results for all students uses a variety of sources and types of student, educator, and system data to plan, assess, and evaluate professional learning.

Please rate the following items:

Always Frequently Sometimes Seldom Never Don't Know

22. My school uses a variety of student achievement data to plan professional learning that focuses on school improvement.

23. My school uses a variety of data to monitor the effectiveness of professional learning.
24. In my school, teachers have an opportunity to evaluate each professional learning experience to determine its value and impact on student learning.
25. A variety of data are used to assess the effectiveness of my school's professional learning.
26. In my school, various data, such as teacher performance data, individual professional learning goals, and teacher perception data, are used to plan professional learning.
27. In my school, teachers use what is learned from professional learning to adjust and inform teaching practices.
28. Some professional learning programs in my school, such as mentoring or coaching, are continuously evaluated to ensure quality results.
29. In my school, how to assess the effectiveness of the professional learning experience is determined before the professional learning plan is implemented.

Learning Designs

Standard: Professional learning that increases educator effectiveness and results for all students integrates theories, research, and models of human learning to achieve its intended outcomes.

Please rate the following items:

Always Frequently Sometimes Seldom Never Don't Know

30. In my school, teachers have opportunities to observe each other as one type of job-embedded professional learning.
31. Teachers in my school are responsible for selecting professional learning to enhance skills that improve student learning.
32. Professional learning in my school includes various forms of support to apply new practices.
33. The use of technology is evident in my school's professional learning.
34. In my school, teachers' backgrounds, experience levels, and learning needs are considered when professional learning is planned and designed.
35. Teachers' input is taken into consideration when planning schoolwide professional learning.
36. In my school, participation in online professional learning opportunities is considered as a way to connect with colleagues and to learn from experts in education.

Implementation

Standard: Professional learning that increases educator effectiveness and results for all students applies research on change and sustains support for implementation of professional learning for long-term change.

Please rate the following items:

Always Frequently Sometimes Seldom Never Don't Know

37. A primary goal for professional learning in my school is to enhance teaching practices to improve student performance.
38. Professional learning experiences planned at my school are based on research about effective school change.
39. My school has a consistent professional learning plan in place for three to five years.
40. Teachers in my school receive ongoing support in various ways to improve teaching.
41. In my school, teachers give frequent feedback to colleagues to refine the implementation of instructional strategies.
42. My school's professional learning plan is aligned to school goals.
43. In my school, teachers individually reflect about teaching practices and strategies.

Outcomes

Standard: Professional learning that increases educator effectiveness and results for all students aligns its outcomes with educator performance and student curriculum standards.

Please rate the following items:

Always Frequently Sometimes Seldom Never Don't Know

44. Professional learning experiences in my school connect with teacher performance standards (e.g. teacher preparation standards, licensing standards, etc.).
45. Student learning outcomes are used to determine my school's professional learning plan.
46. My professional learning this school year is connected to previous professional learning.
47. All professional staff members in my school are held to high standards to increase student learning.
48. Professional learning at my school focuses on the curriculum and how students learn.
49. Professional learning in my school contributes to increased student achievement.
50. In my school, professional learning supports teachers to develop new learning and then to expand and deepen that learning over time.

**IMMACULATA UNIVERSITY RESEARCH ETHICS REVIEW BOARD
REQUEST FOR PROTOCOL REVIEW--REVIEWER'S COMMENTS FORM
(R1297)**

Name of Researcher: Jennifer Beth Leese

Project Title: The Relationship Between Teacher Perceptions of Professional Learning and Mathematics Achievement for Students with IEPs

Reviewer's Comments

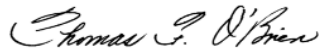
Your proposal is **Approved**. You may begin your research or collect your data.

PLEASE NOTE THAT THIS APPROVAL IS VALID FOR ONE YEAR **(365 days)** FROM DATE OF SIGNING.

Reviewer's Recommendations:

☐ Exempt
☐ Expedited
☐ Full Review

☒ **Approved**
☐ Conditionally Approve
☐ Do Not Approve



December 22, 2014

Thomas F. O'Brien, Ph.D., Ed.D.
Chair, Research Ethics Review Board

DATE

Appendix C

Interview Questions

1. Please state your position and professional experiences?
2. Prior to your participation in this study, were you familiar with the *Standards for Professional Learning*? (Learning Communities, Leadership, Resources, Data, Learning Design, Implementation and Outcomes)
3. Tell me about how communities of learners in your district / school are committed to continuous improvement and collective responsibility. (**Std #1 - Learning Communities**)
 - a. Tell me about the role of non staff members (parents, students, community members, and / or business partners) in professional learning for your school / district.
4. Tell me about the leadership capacity to advocate and support professional learning in your school / district. (**Std #2 - Leadership**)
 - a. Do your school leaders consider professional learning a priority and do they actively participate in professional learning opportunities with staff?
 - b. Do leaders in your school cultivate a positive culture that embraces characteristics such as collaboration, respect, trust, constructive feedback and high expectations?
 - c. Do your schools' leaders advocate for resources and provide teachers with equitable resources to support your professional learning goals?
5. Tell me about how resources, including time, materials, technology and money, are coordinated, prioritized and monitored in your school / district. (**Std #3 - Resources**)

- a. Who identifies what resources, including time, materials, technology and money, are needed for professional learning in your school?
 - b. Is time available during the day, before or after school hours and during the summer for professional learning experiences?
6. Tell me how data is utilized to plan, assess and evaluate professional learning in your school / district. **(Std #4 – Data)**
 - a. What sources and types of teacher and student data does your school / district use for planning, assessing and evaluating professional learning?
7. Tell me about various opportunities for professional learning available in your district. **(Std. #5 – Learning Designs)**
 - a. Please share any job-embedded opportunities (such as time to observe others, instructional coaching, mentoring, etc.) for professional learning.
 - b. What role does technology play in your school's professional learning plan?
8. Do you feel that your professional learning experiences directly impact your students' achievement? How so? **(Std. #6 –Implementation)**
 - a. About how many hours would you estimate you spend on professional learning in a month?
9. Can you articulate your school's goals? What role do professional learning opportunities play in those goals and student learning outcomes? **(Std. #7 – Outcomes)**
10. What areas do you feel positively impact mathematics achievement for students with IEPs in your school / district?