

Running head: STUDENT ACHIEVEMENT AND FORMATIVE ASSESSMENT

THE IMPACT ON STUDENT ACHIEVEMENT FOLLOWING PROFESSIONAL
DEVELOPMENT ON THE PRINCIPLES OF FORMATIVE ASSESSMENT

by

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WE, THE UNDERSIGNED MEMBERS OF THE COMMITTEE,
HAVE APPROVED THIS DISSERTATION

THE IMPACT ON STUDENT ACHIEVEMENT FOLLOWING PROFESSIONAL
DEVELOPMENT ON THE NINE PRINCIPLES OF FORMATIVE ASSESSMENT

by

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November, 2015

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Abstract

This quantitative study reviews the impact on student achievement following professional development on the principles of formative assessment. The study compared mathematics and reading performance data from student populations with teachers who received training in formative assessment to performance data from student populations with teachers who have not received training in formative assessment. The performance data included the Virginia Standards of Learning, as well as quarterly benchmarks and diagnostic assessments of students within Loudoun County Public Schools in Northern Virginia.

The results of the findings lead to the rejection of the null hypothesis in 4 of the 7 research questions. Consequently, the study found that students who received instruction from teachers with training in formative assessments had higher scores in 3 key areas. The assessment data showed a statistically significant difference in growth in the area of mathematics on the state and diagnostic assessments. The present study also showed a statically significant difference in growth in the area of reading on the state assessment.

Despite the mixed results, this study adds to previous research on teacher effectiveness resulting from high-quality professional development on the principles of formative assessment and the impact to student achievement. The implication of this study serve to validate that the utilization of the principles of formative assessment can help teachers and students reach an optimal level of teaching and learning.

Dedication

I dedicate this dissertation to my family, friends, and colleagues...they KNEW I could!

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Chapter 1: The Problem

“Without continual growth and progress, such words as improvement, achievement and success have no meaning.” —Benjamin Franklin

In the United States, educational reform has existed since the 1700s. It has been undertaken to make public education more effective, and focused on more rigorous standards and increased student achievement. With the enactment of the No Child Left Behind, the most recent educational reform, required states to develop challenging academic standards, and measure whether schools, districts, and states are making adequately yearly progress toward those high standards (Cowen & Edwards, 2009). The primary goal of this legislation was to close the achievement gap of minority and low-income students, as evidenced by the results of National Assessment of Educational Progress.

In 1990, the National Center for Education Statistics (2013) reported that 38% of fourth grade students performed below the proficient levels in basic reading skills, and 50% of fourth grade students performed below the proficient levels in basic math skills. To address the low performance of basic reading and math skills, the National Commission on Excellence in Education outlined recommendations for change in five areas: curriculum content, standards and expectations of students, time devoted to education, teacher quality, and educational leadership and financial support of education (United States Department of Education, 2008). Since that time, these imposed changes have been gradually implemented with considerable impact to school practice.

Perhaps the greatest impact to school practice is the access to data, which previously did not exist. No Child Left Behind ([NCLB], 2001) has presented new opportunities and incentives for data use in education by providing schools and districts

with additional data for analysis (Marsh, Pane, & Hamilton, 2006). Achievement test data, in particular, play a prominent role in federal and state accountability policies.

Achievement data is utilized to hold educators accountable and guide continuous school improvement efforts; however, it does not serve to show student growth over time.

Throughout the years, states, districts, and schools have developed additional assessments in an effort to provide a clearer picture of student performance. New state and local test results are adding to the data on student performance that teachers regularly collect via classroom assessments, observations, and assignments (Marsh et al., 2006). These new assessments serve a completely different purpose—to inform. While data analysis is important, it is the action, or the immediate decision, that impacts student achievement and those for whom the data is intended. Therefore, it is teachers' decision making that builds the background for this quantitative study.

Background of the Study

Children are our nation's hope for building a strong future economy and thriving society (Annie E. Casey Foundation, 2014). The growing demands of our global economy, coupled with demographic changes, require that American students are educated at greater levels than ever. In 1983, the landmark U.S. Department of Education report, *A Nation at Risk*, found that about 13% of 17 year olds were functionally illiterate, SAT scores were dropping, and students needed an increased array of remedial courses in college (U.S. Department of Education, 2008).

In 2010, research conducted by the Annie E. Casey Foundation found that 80% of lower-income fourth graders and 66% of all kids are not reading proficiently—a key predictor of a student's future educational and economic success. This trend signifies

that the United States would not have enough human resource capital for an ever-increasing competitive global economy.

Another piece of research from the Annie E. Casey Foundation (2010) report, *Early Warning*, drew links among failure to read proficiently by the end of third grade, ongoing academic difficulties in school, failure to graduate from high school on time, and chances of succeeding economically later in life, including individuals' ability to break the cycle of intergenerational poverty and the country's ability to ensure global competitiveness, general productivity, and national security. The essay called attention to the reading-achievement gap not only between White children and children of color, but also between children from low-income families and their peers from more affluent families (Annie E. Casey Foundation, 2013). Research demonstrates that writing and reading are intertwined and embedded in the larger picture of literacy (Langer & Flihan, 2015). Therefore, literacy is essential to our students' and nation's successes.

Improving students' academic achievement has been a priority for the education community for many years. However, since the implementation of NCLB (2001), accountability has never been greater. While there have been many studies conducted to examine factors influencing student achievement, one common variable stands out: the classroom teacher. Virtually, every study that has examined the role of the classroom teacher in the process of educating students has come to the conclusion that an effective teacher is the greatest determinant in student achievement. Research indicates that teachers are among the most powerful influences in learning (Hattie, 2012). Knowing teacher effectiveness is key to student achievement, one must delve deeper and examine the assessment practices of an effective teacher.

Assessment is a complex concept and as such, the research reveals two types of assessments: assessments of learning and assessments for learning. Specifically, they are labeled as summative assessment and formative assessment. Summative assessments report final results and are used for many purposes. Summative assessments serve as assessments of learning, because their purpose is to support the assignment of final grades or levels of proficiency related to course outcomes or state standards (Burke, 2010).

Out of summative assessments come the informal, ongoing assessments called formative, which are used through the learning experience to inform and modify teaching to meet better student needs. Formative assessment has a specific goal (improve learning and motivation) achieved by gathering and using information so that new instruction and experiences will lead to enhanced achievement (McMillan, 2008). Therefore, one must look toward the principles of formative assessment to determine the true extent of student learning.

In determining the degree of teacher effectiveness, it is the measurement of student learning that is most essential. For this to be done correctly, there must be a balance of assessment of learning and for learning (Stiggins, 2008). Therefore, educators must be provided with training and support on the implementation of the principles of formative assessment to ensure they are not only embedded into their practice, but utilized effectively. Robert Marzano and Rick Stiggins, two experts in the field of assessment, have provided insight into effective classroom assessment. Four generalizations have surfaced: (a) feedback from classroom assessments should give students a clear picture of their progress on learning goals and how they might improve;

(b) feedback on classroom assessments should encourage students to improve; (c) classroom assessment should be formative in nature; and (d) formative classroom assessments should be frequent (Marzano, 2006). These generalizations provide the foundation to effective classroom assessment, and when utilized, can dramatically impact student achievement.

Statement of the Problem

Since the inception of NCLB (2001), instructional accountability has never received greater attention, and the concept of teacher effectiveness has replaced that of teacher quality. Teacher effectiveness is driven by the teaching and learning that occurs in the classroom on a daily basis. The principles of formative assessment serve to guide the teaching and learning process. Formative assessment is meant to inform the teacher so that instructional practice can be adjusted or planned. Formative assessment is—or should be—the bridge or causeway between today’s lesson and tomorrow’s (Tomlinson, 2014). To ensure formative assessment is utilized thoughtfully and appropriately, teachers must be provided training.

Professional development serves as the vehicle to change teachers’ instructional practices, resulting in teaching effectiveness. The formative assessment principles have been the professional development focus for teachers at two Title I schools within Loudoun County Public Schools, Ashburn, Virginia, to enhance teacher effectiveness. The professional development was structured to provide teachers job-embedded training to learn, discuss, apply, and evaluate the effectiveness of the implementation.

In advance of the training, teachers completed a survey on their understanding of the nine principles of formative assessment. At that time, the three principles receiving

the highest levels of understanding were communicating with students about their status and improvement (46%), describing what targets their students were to hit and what comes next in their learning (45%), and understanding and articulating the achievement targets students are to hit in advance of learning (43%). Following the training, the survey was administered again with 8% to 49% gains resulting among the nine principles of formative assessment (APPENDIX A). The two areas with the most significant gains were involving students in the assessment process (49%) and transforming achievement targets into dependable assessments that yield accurate information (46%). Previously, these two areas received the lowest levels of understanding.

In addition to administering the postsurvey, 28 classroom observations were conducted to determine the degree to which quality formative assessment strategies were utilized within the classroom. For this purpose, four strategy areas were targeted: (a) information techniques, (b) signals and question-response, (c) reflective activities, and (d) student involvement in the assessment process. Of these four areas, the highest level of strategy implementation observed were student monitored progress, conversations with students, descriptive feedback, and questioning (APPENDIX B).

Formative assessment is an integral part of the Loudoun County Public Schools' formal and informal observation process. The formal and informal observation process, consisting of seven standards, follows the Virginia Board of Education *Guidelines for Uniform Performance Standards and Evaluation Criteria for Teachers*. Formative Assessment is a component of Performance Standard 4: Assessment of and for Student Learning, where the teacher systematically gathers, analyzes, and uses all relevant data to measure student academic progress, guide instructional content and delivery methods,

and provide timely feedback to both students and parents throughout the school year (Virginia Department of Education, 2011).

Formal observations are conducted twice a year for teachers on cycle, with informal observations occurring yearly for teachers off cycle. While this serves as the evaluation process, walkthroughs serve to provide data utilized to drive and monitor professional development. As part of the walkthrough process, assessment of student learning is an ongoing area of focus, and teachers receive immediate feedback through an electronic format. When the district conducted an instructional audit, less than 30% of teachers were utilizing formative assessment to adjust instruction and/or reteach, maximizing content mastery for the learner; however, following professional development, walkthroughs show that more than 90% of teachers are utilizing formative assessments to adjust instruction and/or reteach, maximizing content mastery for the learner. The formal and informal observation process validates the content, and the level of the implementation of the professional development is the known. However, it is not known if the time and resources devoted to teacher professional development in the area of formative assessment have impacted student achievement scores.

Not knowing the impact on student achievement following the implementation of professional development has the potential for negative consequences. The greatest is the potential for not realizing the measurable return on investment. This is critical, as districts have recently experienced reduction in federal, state, and local funding. This reduction results in cuts to discretionary funding. To date, \$300,000 has been expended on this particular initiative, in addition to other nonfiduciary resources allocated. In the era of do more with less, expenditures must be reasonable and necessary. Therefore, without

knowing the impact, administration may not continue to support this professional development effort.

Another consequence of not knowing the impact of the professional development on student achievement involves teacher affect. Access to achievement data that validates the positive effect of real-world application of formative assessment methodologies is necessary. Teachers who have been trained may wane from utilizing the principles of formative assessment because of lack of evidence. This has the potential of a final negative consequence: the diminishment of teacher effectiveness.

Purpose of the Study

The purpose of this study is to determine whether time and resources devoted to teacher professional development in the area of formative assessment have impacted student achievement scores. The study compares mathematics and reading performance data from student populations with teachers who received training in formative assessment to performance data from student populations with teachers who have not received the training in formative assessment.

Research Questions

The following seven research questions guide this study:

1. Do students who have received instruction from teachers with training in formative assessments score statistically different in mathematics Standards of Learning assessments than students who have received instruction from teachers without training in formative assessments?
2. Do students who have received instruction from teachers with training in formative assessments score statistically different in Reading-English

Standards of Learning assessments than students who have received instruction from teachers without training in formative assessments?

3. Do students who have received instruction from teachers with training in formative assessments score statistically different in the mathematics Benchmark assessments than students who have received instruction from teachers without training in formative assessments?
4. Do students who have received instruction from teachers with training in formative assessments score statistically different in Reading-English Benchmark assessments than students who have received instruction from teachers without training in formative assessments?
5. Do students who have received instruction from teachers with training in formative assessment score statistically different in mathematics i-Ready assessments than students who have received instruction from teachers without training in formative assessments?
6. Do students who have received instruction from teachers with training in formative assessment score statistically different in Reading-English i-Ready assessments than students who have received instruction from teachers without training in formative assessments?
7. Do students who have received instruction from teachers with training in formative assessment score statistically different in Reading DRA2+ assessments than students who have received instruction from teachers without training in formative assessments?

Research Hypotheses

Null hypotheses. The seven null hypotheses for this study are as follows:

1. There is no discernible impact on achievement scores in mathematics Standards of Learning assessments for students taught by teachers who were trained on formative assessment strategies and those students whose teachers were not trained on formative assessment strategies.
2. There is no discernible impact on achievement scores in reading Standards of Learning assessments for students taught by teachers who were trained on formative assessment strategies and those students whose teachers were not trained on formative assessment strategies.
3. There is no discernible impact on achievement scores mathematics Benchmark assessments for students taught by teachers who were trained on formative assessment strategies and those students whose teachers were not trained on formative assessment strategies.
4. There is no discernible impact on achievement scores in reading Benchmark assessments for students taught by teachers who were trained on formative assessment strategies and those students whose teachers were not trained on formative assessment strategies.
5. There is no discernible impact on achievement scores in mathematics i-Ready assessments for students taught by teachers who were trained on formative assessment strategies and those students whose teachers were not trained on formative assessment strategies.

6. There is no discernible impact on achievement scores in reading i-Ready assessments for students taught by teachers who were trained on formative assessment strategies and those students whose teachers were not trained on formative assessment strategies.
7. There is no discernible impact on achievement scores in reading DRA2+ assessments for students taught by teachers who were trained on formative assessment strategies and those students whose teachers were not trained on formative assessment strategies.

Alternate hypotheses. The seven alternate hypotheses for this study are as follows:

1. Achievement scores will be higher on the mathematics Standards of Learning assessments for students taught by teachers who were trained on formative assessment strategies than those students whose teachers were not trained on formative assessment strategies.
2. Achievement scores will be higher on the reading Standards of Learning assessments for students taught by teachers who were trained on formative assessment strategies than those students whose teachers were not trained on formative assessment strategies.
3. Achievement scores will be higher on the mathematics Benchmark assessments for students taught by teachers who were trained on formative assessment strategies than those students whose teachers were not trained on formative assessment strategies.

4. Achievement scores will be higher on the reading Benchmark assessments for students taught by teachers who were trained on formative assessment strategies than those students whose teachers were not trained on formative assessment strategies.
5. Achievement scores will be higher on the mathematics i-Ready assessments for students taught by teachers who were trained on formative assessment strategies than those students whose teachers were not trained on formative assessment strategies.
6. Achievement scores will be higher on the reading i-Ready assessments for students taught by teachers who were trained on formative assessment strategies than those students whose teachers were not trained on formative assessment strategies.
7. Achievement scores will be higher on the DRA2+ assessments for students taught by teachers who were trained on formative assessment strategies than those students whose teachers were not trained on formative assessment strategies.

Significance of the Study

This research is significant in several ways: (a) A determination was made as to whether there are significant gains in student achievement; (b) The results of this study can be used to improve both the assessment and instructional practices throughout the district if the study shows an impact; and finally, (c) The study contributes to the existing knowledge and research surrounding the Principles of Formative Assessment, a specific theoretical assessment model.

Definition of Terms

Accountability: Refers to measurable proof, usually in the form of student results on various tests, that teachers, schools, divisions, and states are teaching students efficiently and well.

Achievement Gap: The difference between the performance of subgroups of students, especially those defined by gender, race, ethnicity, disability, and socioeconomic status.

Alignment: The effort to ensure what teachers teach is in accord with what the curriculum says will be taught and what is assessed on official tests.

Assessment: Refers to the method of measuring the learning and performance of students.

Benchmark Assessment: For Loudoun County Public Schools, these are quarterly tests in reading and mathematics that simulate and measure the success of students in meeting the board of education's expectations for learning and achievement.

Data-Driven Decision Making: Refers to teachers, principals, and administrators systematically collecting and analyzing various types of data, including input, process, outcome, and satisfaction data, to guide a range of decisions to help improve the success of students and schools (Marsh et al., 2006).

Diagnostic Reading Assessment (DRA2+): A proven, criterion-referenced assessment and includes recommendations for scaffolded support to increase student reading proficiency, and approved for use by the Virginia Department of Education.

Formative Assessment: Defined as a process used by teachers and students during instruction that provides feedback to adjust ongoing teaching and learning to improve students' achievement of intended instructional outcomes (McManus, 2008).

i-Ready: An adaptive reading and mathematics assessment program to determine student growth, at least quarterly, and approved for use by Virginia Department Of Education.

Principles of Formative Assessment: Refers to the features used to make the formative assessment process effective (Tomlinson, 2014).

Standards of Learning: For Virginia Public Schools, these establish minimum expectations for what students should know and be able to do at the end of each grade or course in English, mathematics, science, history-social science, and other subjects.

Standards of Learning Assessment: For Virginia, these are tests in reading, writing, mathematics, science, and history-social science that measure the success of students in meeting the board of education's expectations for learning and achievement.

Student Achievement: Refers to the ability of students to demonstrate mastery and content knowledge as measured against defined assessment criteria.

Summative Assessment: An assessment of student learning that occurs at the end of a program and is used to provide evidence of student mastery and progress toward achieving the goals or standards.

Teacher Effectiveness: Refers to attributes teachers utilize as part of the whole-child approach to ensure the success of students.

Summary

This dissertation contains five chapters. The first chapter includes an introduction, background of the study, a problem statement, purpose of the study, research questions, null hypotheses, alternate hypotheses, and significance of the study. Chapter 2 consists of a review of the literature on educational reform efforts, accountability demands, teacher effectiveness, formative and summative assessment, and student achievement. The research design and methodology are contained within Chapter 3. An analysis and discussion of the results are presented in Chapters 4 and 5, respectively.

Chapter 2: Literature Review

“The real voyage of discovery consists not in seeking new landscapes, but in having new eyes.” —Marcel Proust

This chapter considers research having contributed to knowledge about the connections between student achievement and teacher effectiveness. This review of the literature focuses on the following areas: (a) educational reform, (b) role of teacher unions, (c) use of data, (d) teacher effectiveness, (e) formative and summative assessment, (f) principles of formative assessment and student achievement, (g) teacher training program, (h) Teach for America, and (i) conflicting research.

Educational Reform

It is a basic premise that education is a federal interest, a state function, and a local responsibility; however, changes throughout history signify that reform crosses all boundaries. Educational reform, at its base, is driven by the one singular idea that runs consistently throughout American experience—the idea that education has the power to create fundamental change both for individuals and for society at large (Iorio & Yeager, 2011). Over time, the American experience has generated a number of reform efforts.

Reform efforts in the United States can be traced back to the first thirteen colonies. In 1647, Massachusetts’s law mandated that every town of 50 or more families support a school (as cited in Comer, 2004). This law required parents and guardians of children to make certain that their charges could read and understand the principles of religion and the laws of the Commonwealth (Ornstein & Levine, 1984). While early education was primarily private or religious, it brought the concept of literacy forward.

For many years, literacy had been at the forefront of educational reform; however, in the mid-1900s, advancements in other content areas surfaced. In 1958, Congress

approved the National Defense Education Act, which federally funded programs in science, mathematics, engineering, and foreign languages (New York State Education Department, 2009). The National Defense Education Act, the impact aid law, was in direct response to the launching of the Russian Sputnik satellite, and release of an educational policy paper stressing the importance of academic excellence. Shortly thereafter, the impact aid law was amended. In a ceremony in front of his own former one-room school house in Stonewall, Texas, President Lyndon Baines Johnson signed the Elementary and Secondary Education Act, into law (New York State Education Department, 2009).

In the spring of 1983, the National Commission on Excellence in Education released its report, *A Nation at Risk*, declaring America's educational institutions seem to have lost sight of the basic purposes of school, and of the high expectations and disciplined effort needed to attain them, warning of a rising tide of mediocrity that threatens our very future as a nation and a people (as cited in Ornstein & Levine, 1984). This report brought about standards-based reform, which led to the development of the six national education goals and the implementation of a voluntary assessment program.

With the passage of the NCLB Act, the United States federal government entered into the most far-reaching, controversial, and potentially expensive effort to reform public education in the history of the country (Cushner, McClelland, & Safford, 2009). In all actuality, NCLB was technically a reauthorization of the Elementary and Secondary Education Act of 1965. Regardless of its origination, it was designed to end a culture of low expectations so that, as President George W. Bush said, "All students will have a better chance to learn, to excel, and to live out their dreams" (Spellings, 2007, p. 1).

Under NCLB, children in Grades 3 through 8 and high school were assessed in reading, mathematics, science, and social studies. It is this assessment of progress that is believed by proponents to be the engine of reform—serving both to measure achievement and to compel it (Cushner et al., 2009).

Role of Teacher Unions

Unions play a role in public education and in the educational reform process, in an era when education is seen as the means to ensure a competitive global economy. Unions serve to advocate for those at the center of the efforts, and contribute to the ongoing politics found within public education. Teacher unions serve as advocates for teachers with the primary goal being collective bargaining. Collective bargaining is the key mechanism by which unions conventionally seek higher wages (Coulsen, 2010). Even in states where it is not a legal right, unions participate in informal bargaining on teachers' behalf at the local level and lobby at the state level with respect to educational issues (Bascia & Osmond, 2012).

Unions, while being advocates, have been viewed by many as the limiting force to the achievement of students. The recently released documentary, *Waiting for Superman*, attributed many of the inequities in public schooling to teacher unions (Bascia & Osmond, 2012). Some would argue that unions are a contributing factor to the lack of teacher effectiveness and continuous school improvement efforts.

While educational reform has evolved, so has the role of the unions. Recent educational reform has impacted the way unions conduct business, as these efforts have called into question the collective bargaining process. Unions appear to be at work to support public education and work with stakeholders to implement policy changes. The

most common public expectation for teacher unions is that their priorities are consistent with prevailing policy (Bascia & Osmond, 2012).

At the center of much debate are the evaluation of teachers and the success of their students. Improving the evaluation of teacher performance is particularly relevant as a means to recognize excellence in teaching and to advance teacher effectiveness (Virginia Department of Education, 2011), because teachers are so fundamentally important to school improvement and student success. Unions will continue to collaborate with federal, state, and local agencies to ensure teachers have a voice and are represented fairly in the evaluation processes, as they continue to do in the collective bargaining process. Unions see themselves as part of the solution, and as such, facilitate necessary change through the alignment of current practices and policies. Whether good, bad, or indifferent, unions have an integral role in the educational reform process.

Use of Data

While the efforts have changed, the use of assessment has remained and is an integral component of education. In each instance of reform, practitioners also figured out compromises, adopting and adapting reforms to fit their schools and classrooms, blending the old with the new (Cuban, 2012). Historically, assessments have been used to measure the success of students or schools as compared with others, or summatively. When children are assessed, it is critical the data be collected and analyzed in a timely manner. This should serve to inform the teaching and learning in the classroom.

A Calveric (2010) quantitative study, *Elementary Teachers' Assessment Beliefs and Practices*, promoted and supported the need for professional development. Calveric found that a greater understanding of assessment beliefs and importance of instructional

practice can contribute to the development of relevant professional development aimed at improving teachers' assessment pedagogies and practices. These can contribute to greater educational success. The Calveric study provides findings that suggest four distinct assessment beliefs exist within the elementary classroom. Of those four beliefs, and yielding the highest composite mean, was the belief that assessment should be utilized to improve teaching and learning.

Ruland's (2011) study, *The Impact of Using Formative Assessment Attributes in Daily Instruction on Student Affect*, utilized a quasi-experimental design to determine if the systematic use of formative assessment attributes influenced academic efficacy and eagerness to learn for middle school students. Ruland's study examined the use of learning targets, progress monitoring, or descriptive feedback. A strong statistical association between student perception of clear learning targets and students' eagerness to learn was found, as well as student perception of progress monitoring and eagerness to learn.

Assessment research conducted by Friesland (2010) explored the perceptions of elementary-level teachers who utilize formative assessment scores to make curricular and pedagogical adjustment for students who perform poorly on those assessments. This descriptive study collected data from teachers across the State of Kansas. The data collected indicated that the teachers responded favorably to making instructional adjustments or changes when students performed poorly on those formative assessments. Additionally, the study concluded that teachers sought out professional development opportunities to aid in instruction after formative assessments are given.

A secondary study by Hearn (2008), *The Relationship Between Learner-Centered Assessment Practices and Student Motivation: Best Practices and Accountability*, explored the relationship between learner-centered assessment practices and student self-reported levels of mastery goal orientation, self-efficacy, and engagement. Hearn utilized the Learner-Centered Psychological Principles and applied them to the various types of assessment found within the secondary classroom. Results from the study indicated that greater use of learner-centered assessment practices yielded higher levels of student motivation.

An I. Richardson (2010) descriptive case study, *Exploring Elementary Teachers' Implementation of Formative Assessment Practices for Reading*, was completed to determine whether the exploration of a theoretical model of formative assessment would change teacher understanding and filter down into their classroom assessment practices for reading. Richardson's study found that teacher understanding of the elements of formative assessment occurred, which led to changes in their assessment practices. For this study, Richardson combined the research on formative assessment and utilized six elements: (a) articulating desired student learning outcomes so that the teacher and students clearly understand them; (b) selecting, developing, and implementing assessments aligned with articulated learning outcomes; (c) making accurate inferences about student learning based upon aligned assessments; (d) providing accurate and timely feedback to students about progress toward learning targets; (e) modifying students' instructional experiences based on inferences from assessments; and (f) involving students in classroom assessment practices.

The principles of formative assessment can be found within each of these recent studies. The outcome of each study supports the utilization of the guiding principles surrounding formative assessment; as such a clear recommendation can be made regarding the use of the guiding principles. One of the outstanding features of studies of assessment in recent years has been the shift in the focus of attention toward greater interest in the interactions between assessment and classroom learning and away from concentration on the properties of restricted forms of test, which are only weakly linked to the learning experiences of students (Black & Wiliam, 1998b). It is this shift in attention that guides the teacher effectiveness discussion.

Teacher Effectiveness

We live in a moment when personalizing the learning experience is not just a possibility—it's almost an expectation (W. Richardson, 2012). The individualized experience for students impacts the teacher effectiveness discussion, as teachers must use the guiding principles to “teach up” (p. 22). Teaching up means monitoring student growth so that when students fall behind, misunderstand, or move beyond expectations, teachers are primed to take appropriate instructional action (Tomlinson & Javius, 2012). Thus, teachers have a critical role in the advancement of student progress.

Individual teachers have the largest single school effect on student performance (The Chicago Public Education Fund, 2008). In Goldhaber, Liddle, Theobold, and Walch's (2010) study, *Teacher Effectiveness and the Achievement of Washington's Students in Mathematics*, findings suggest that a one standard deviation increase in teacher effectiveness would increase student achievement by about 18% of a standard deviation. These findings suggest that having a highly effective teacher rather than an

average teacher could cut these achievement gaps down by nearly one fifth of a standard deviation. Teacher effectiveness counts and it really matters.

One such factor is in the area of assessment. Formative assessments are one of the most powerful weapons in a teacher's arsenal (Marzano, 2006). Formative assessments typically measure a few things frequently and are intended to inform teachers regarding the effectiveness of their practice and students of their next steps on the learning scaffold (DuFour, DuFour, Eaker, & Many, 2010). Therefore, the implications of quality assessment practices take hold.

Quality assessment is critical to measuring student learning. When teachers assess for learning, they should utilize the information gained about student achievement to check on and advance learning. Teachers, can assess for learning and advance learning utilizing nine principles, now referred to as the Nine Principles of Formative Assessment. It is the utilization of these nine principles that influence teacher effectiveness.

1. Understanding and articulating in advance of teaching the achievement targets that the students are to hit.
2. Informing their students about those learning goals in terms that students understand from the very beginning.
3. Becoming assessment literate so they can transform those expectations into assessment exercises and scoring procedures that accurately reflect student achievement.
4. Using classroom assessments to build student confidence in themselves as learners, helping them to take responsibility for their own learning so as to lay a foundation for lifelong learning.

5. Translating classroom assessment results into frequent, descriptive (versus judgmental) feedback for students, providing them with specific insights regarding their strengths as well as how to improve.
6. Continuously adjusting instruction based on the results of classroom assessment.
7. Engaging students in regular self-assessment with standards held consistent so they can watch themselves grow over time and thus learn to become in charge of their own success.
8. Actively involving students in communicating with their teachers and their families about their achievement status and improvement.
9. Making sure students understand how the achievement target that they strive to hit will relate to those that come after (Chappuis, Stiggins, Arter, & Chappuis, 2005).

It is clear the utilization of these principles of assessment can transform instruction practice. Formative assessment is a potentially transformative instructional tool that, if clearly understood and adroitly employed, can benefit both educators and their students...formative assessment constitutes the key cornerstone of clearheaded instructional thinking (Popham, 2011). What is also clear is that teacher effectiveness can, and will, be enhanced.

The effect of high-effect teachers compared with low-effect teachers is about $d = 0.25$, which means that a student in a high-impact teacher's classroom has almost a year's advantage over his or her peers in a lower-effect teacher's classroom (Slater, Davies, & Burgess, 2009). Expert teachers have high levels of knowledge and understanding of the

subjects they teach, can guide learning to desirable surface and deep outcomes, can successfully monitor learning and provide feedback that assists students to progress, can attend to the more attitudinal attributes of learning (especially developing self-efficacy and mastery motivation), and can provide defensible evidence of positive impacts of the teaching on student learning (Hattie, 2012).

Teachers indirectly and directly create the appropriate environment for learning, and having well-defined assessment practices within the classroom serve to promote student achievement gains. There have been few initiatives in education with such a strong body of evidence to support a claim to raise standards (Black & Wiliam, 1998a). Thus, educators must have a clear understanding of formative and summative assessment.

Formative and Summative Assessment

Assessment and grading are two terms that have been used synonymously throughout the years. This misunderstanding occurs as a result of their intended purpose not being communicated effectively and accurately. When differentiated, one is able to see assessment and grading are actually very different, and in their own right, each represents a complex undertaking (Marzano, 2010).

Grading has been around for a very long time. The concept of grading can be traced to the early 1800s. However, the idea of assessment has only been around since the mid-1940s, and is attributed to the work of Ralph Tyler. Tyler discusses the interrelatedness of curriculum, instruction, and assessment (Guskey & Bailey, 2001).

When delving deeper into the meaning of assessment, an examination of the research is necessary in order to gain full understanding of these concepts. Assessment and grading have been defined as: The term assessment refers to all those activities

undertaken by teachers and by their students in assessing themselves, which provide information to be used as feedback to modify the teaching and learning activities in which they are engaged (McMillan, 2008). Grading does not involve assessing. Rather, grading is the assignment of symbolic numbers or letters at the end of a specified period of time, which will serve as a summary statement of evaluations made of students (Tomlison, 2005).

Assessment for learning, when done well, is one of the most powerful, high-leverage strategies for improving student learning that we know of (Fullan, 2005). Assessment is, therefore, a valuable tool, as it provides teachers with evidence of student understanding and gives valuable feedback so that teachers may adjust instruction in order to meet students' needs. Assessment is a complex concept and as such, the research reveals two types of assessments: assessments of learning and assessments for learning. Specifically, they are labeled as summative assessment and formative assessment.

Summative assessments, assessments of learning, are those assessments that occur after learning should have taken place and are used to inform individuals outside the classroom. Summative assessments are most frequently reported in the form of grades, or when programmatic decisions need to be made about a student. Summative assessment occurs when teachers evaluate a final product, usually taking place at the end of a chapter, a unit of study, a benchmark period, a quarter, a course, a semester, or an academic year. Summative assessments report students' final results to the students, their parents, and the administration, as well as the school district, the state, and the national government. These final results become the data that are used for many purposes, including the promotion and retention of students and the evaluation of individual schools

and districts. Summative assessments serve as assessments of learning, because their purpose is to support the assignment of final grades or levels of proficiency related to course outcomes or state standards (Burke, 2010).

Out of summative assessments come the informal, ongoing assessments called formative that are used through the learning experience to inform and modify teaching to meet better student needs. Formative assessment has a specific goal (improve learning and motivation), achieved by gathering and using information so that new instruction and experiences will lead to enhanced achievement (McMillan, 2008). These assessments assist the educator in identifying student needs, planning instruction, providing students with descriptive feedback, and helping students be actively engaged in their learning. Formative data inform instructional practice as it is happening, and when there is still time to make the needed adjustments to facilitate student learning (Fogarty & Kerns, 2009). Formative assessment is not an assessment used for scoring and grading, nor used to report formally student status at any given point in time. Formative assessment is informal assessment and is designed to help students learn. In short, it is feedback (Olsen & Blandford, 2009).

Perhaps formative assessment's uniqueness is that it is collaboration between teacher and student. Formative assessment refers to the ongoing process both students and teachers engage in when they focus on learning goals, take stock of current student work in relation to the learning goals using formal or informal assessment processes, and take action to move students closer to the learning goals (Brookhart, 2009).

Student involvement in the learning process is critical, and is an important paradigm shift from the traditional perspective. The greatest potential value of classroom

assessment is realized when the learning process is opened up during learning and students are encouraged to be full partners; therefore, students who participate in the thoughtful analysis of quality work to identify its critical elements or to internalize valued achievement targets become better performers (Stiggins & Chappuis, 2012). When this occurs, formative assessment becomes a process rather than a product, as it unveils what the student understands and how well the student understands it. Formative assessment becomes a systematic way for teachers and students to gather evidence of learning, engage students in assessment, and use data to improve teaching and learning (Greenstein, 2010). Therefore, student self-assessment must become an essential component of formative assessment, and students must be taught the self-assessment process.

Without understanding the purpose of assessment, assessment will not be effective. Summative and formative assessments have two very distinct purposes. Summative assessment serves to document how much learning has occurred at a given point in time. The purpose of summative assessment is to measure the level of student, school, or program success. Summative assessments are often regarded as hard data that yield grades, scores, or rankings. Summative assessments must provide the quantitative data used to calculate grade point averages, school rankings, and district placement on state and national norms (Fogarty & Kerns, 2009).

The purpose of formative assessment is to inform, and to provide immediate, continual, and valuable feedback from students that signals a need for adjustments and modifications in the instruction (Fogarty & Kerns, 2009). For any assessment to work effectively, it must be developed with an intended purpose. Therefore, the starting place

for the effective creation and use of any assessment is this driving question: Why am I assessing? (Stiggins & Chappuis, 2012).

To assess well, educators must use the results to make informed instructional decisions in ways that maximize learning. As learning progresses, students need regular information about what they have and have not yet learned. The identification of the purpose of assessment helps determine the most appropriate form to be used for measurement of student knowledge, skills, or understanding (Olsen & Shields-Ramsey, 2010).

Formative assessment is not a test. Tests can be used during the formative-assessment process so teachers can make adjustments in how they are trying to teach students. The same test-elicited evidence can also be used so students can, if they need to do so, make adjustments in how they are trying to learn something (Popham, 2010). When teachers assess student learning for informative purposes, no final mark is given, and no summative grade is entered into the grade book. Rather, assessment serves as practice for students, just like a meaningful homework assignment does. This is formative assessment at its most valuable (Chappuis & Chappuis, 2008). As formative assessments serve to inform, the learning to be gleaned is significant.

Principles of Formative Assessment and Student Achievement

Seeking assessment results that accurately reflect student learning is critical. To ensure that happens, there are several essential principles surrounding formative assessment that every educator should understand. These essential principles or significant concepts are: (a) formative assessment is student focused, (b) formative assessment is instructionally informative, and (c) formative assessment is outcomes based

(Greenstein, 2010). When these principles are clearly understood, educators effectively utilize formative assessment and see the value in its utilization.

Formative assessment is a valuable tool for educators. Formative assessment helps teachers: (a) consider each student's learning needs and styles and adapt instruction accordingly, (b) track individual student achievement, (c) provide appropriately challenging and motivational instructional activities, (d) design intentional and objective student self-assessments, and (e) offer all students opportunities for improvement (Greenstein, 2010). Perhaps most appealing to its utilization is the flexibility with which it can be carried out. The formative-assessment process is sufficiently robust so that it can be carried out by teachers in a variety of ways yet still lead to substantially improved learning for students (Popham, 2010).

Formative assessment is effective because it aids teachers and students in making connections. Formative assessment supports the brain in making connections by linking prior knowledge to new learning, putting together parts and wholes, and providing opportunities to process information in different ways (Greenstein, 2010). These connections make learning relevant to students. When students see the relevance of their learning, they become empowered and motivated. This motivation is necessary for students to be successful in the classroom. In fact, motivation is key to student success when giving consideration to assessment and grading. Students often feel there is a gap between what they learned and on what they are assessed. This discrepancy can influence student motivation. Discussions surrounding motivation are also addressed in the research on assessment and grading.

Formative assessment can have an impact on student learning, attitude, and motivation. Assessment for learning empowers students to take ownership of their learning in the following ways: (a) students have a clear understanding of the learning targets they are to attain, (b) it teaches them to assess where they are with respect to the target, and (c) it offers strategies that can be used to close the learning between where they are and where they need to be (Marzano, 2010).

There are five key strategies or process standards that comprise formative assessment: (a) clarifying learning intentions and sharing criteria for success; (b) engineering effective classroom discussions, questions, and learning tasks that elicit evidence of learning; (c) providing feedback that moves learners forward; (d) activating students as the owners of their own learning; and (e) activating students as instructional resources for one another (Burke, 2010).

When delving further into these process standards, they can be conceptualized into principles to motivate teachers and students so that higher levels of learning occur. To be discussed are those practices that produce the greatest achievement gains: establishing learning targets, setting learning goals, providing feedback, developing assessments that yield accurate information, using results to inform instructional practice, student involvement, and communicating student learning (Olsen & Shields-Ramsey, 2010).

The principle receiving the most attention is the establishment of learning targets. The utilization of this one principle is key to ensuring sound assessment practice. When students understand what learning is intended, learning will occur as students are engaged in higher-order thinking, accountable for their own learning, and able to set learning

goals. Learning targets give students the big picture of where they are going and what it looks like. Learning targets answer this question: What is the major concept we will understand and what thinking skill(s) will we engage in? (Olsen & Shields-Ramsey, 2010).

When the learning target, objective, or goal is presented to students in advance of teaching the lesson, giving the assignment, or doing the activity, students have an understanding of what the intended learning will be. If students have no idea what they are supposed to learn, if the only information they have is that we are doing science or social studies, few of them are likely to know how to monitor their own progress and keep themselves on track (Stiggins, Arter, Chappuis, & Chappuis, 2006). When students do not understand or know the expected learning, quality learning is not taking place, and, therefore, cannot be assessed.

A learning target that produces the desired outcome includes process skills, big-rock concepts, and guiding questions. Process skills help students learn and provide skills necessary for lifelong learning. The process skills are predict, discover, describe, solve, infer, connect, draw conclusions, evaluate, explain, construct, apply summarize, imagine, integrate, revise, observe, verify, reason, communicate, interpret, demonstrate, estimate, organize, perform, synthesize, compare, analyze, investigate, justify, formulate, design, generalize, inquire, and sequence (Olsen & Blandford, 2009).

Guiding questions are also part of a learning target. Teachers use questioning every day to keep student attention and to measure or assess student learning. However, when teachers guide their questions to the task at hand, learning is stimulated and not just measured. Questions really are a doorway to learning and are powerful tools to help

students want to engage in further inquiry and cause them to wonder, to be interested, and have ah-has as they understand the answers to those questions (Olsen & Blandford, 2009). Guiding questions, or questioning tools, are very valuable, as they activate prior knowledge resulting in transfer, use, and relevant application. In *Informative Assessment: When It's Not About a Grade*, Fogarty and Kerns (2009) encourage utilizing several questioning techniques. These are fat-skinny, rhetorical, woven, probing, and delving questioning, as well as reverse questioning and think-pair-share.

Another principle producing significant results in student achievement is descriptive feedback. One perplexing finding from the research literature is that the manner in which feedback is communicated to students greatly affects whether it has a positive or a negative effect on student achievement (Marzano, 2006). Descriptive feedback focuses on student strengths and weaknesses as it relates to the learning target. Feedback is most effective when it identifies what students are doing right, as well as what they need to work on next (Stiggins et al., 2006). Feedback is a powerful strategy when utilized to the fullest.

Providing descriptive feedback is a process enabling the teacher not only to give information, but gain information. People cannot improve in skills—thinking, musical, athletic, whatever—without feedback (Willingham & Daniel, 2012). When gathering information, teachers can make instructional decisions based on the information that is obtained. Providing immediate and specific feedback helps students know exactly how they are doing. Putting answers on the board, having students self- and peer evaluate based on a rubric, and giving open-book quizzes allow students the opportunity to have immediate and frequent success (Olsen & Blandford, 2009).

There is one principle that confirms assessment and instruction are intertwined. That principle pertains to the idea that classroom assessment information should be used to revise and guide teaching and learning. Curriculum, instruction, and assessment must be aligned. Quality learning and teaching are a reflection of the intentional alignment of our learning targets, the assessment of student learning, and instruction-learning experiences (Olsen & Blandford, 2009).

The initial step in good assessment is to be sure that you know what the standards are and what more specific learning targets are needed (McMillan, 2008). Therefore, quality assessment practices must address instructional practices combined with knowing the curriculum to be taught. Modest, marginally statistically significant relationships emerged among the various aspects of assessment practices: (a) teachers who reported more frequently establishing and communicating their learning goals also more frequently reported coordinating their assessments with those goals; and (b) teachers who more frequently reported aligning their goals and assessment also tended to report that they more frequently analyzed student and group work and that they more frequently used a variety of strategies to assess student understanding (Herman, Osmundson, & Silver, 2010). This alignment will require districts to assist educators in unpacking the standards, and to do so, they must use a three-step process. This process involves unpacking the standards, identifying the dimensions that are essential for all students to learn, and organizing the dimensions into categories of related information and skills (Marzano, 2006).

Actively, consistently, and effectively involving students in the assessment process, another of the assessment principles, is a big change from the traditional view of

assessment, and requires teachers to rethink their assessment practices. A learning activity that involves students in their learning increases student accountability, helps student self-assess, helps them identify their strengths and weaknesses, and empowers students to modify their learning in the process (Stiggins et al., 2006).

Teaching students to self-assess, self-reflect, and set goals for learning are additional quality assessment practices. In order for students to set goals, they must have a clear understanding of the learning target and must be able to communicate that target as well. Without a clear understanding of the learning, setting goals becomes impossible, and students are unable to self-assess or reflect. Self-assessment, a function found within formative assessment, is not an easy undertaking for students. Self-assessment includes having students do the following: (a) identify their own strengths and areas of improvement; (b) write in a response log at the end of class, recording key points they have learned and questions they still have; (c) using established criteria, select a work sample for their portfolio that proves a certain level of proficiency, explaining why the piece qualifies; (d) offer descriptive feedback to classmates; and (e) use feedback, feedback from other students, or their own self-assessments to identify what they need to work on and set goals for future learning (Stiggins et al., 2006).

In order for self-assessment to be effective, students must be provided direct instruction on the utilization of rubrics. Specifically, students must be instructed on the criteria used to develop rubrics and then be provided opportunities to practice using them on random samples. This practice must occur prior to self-evaluation. Regarding rubrics, the research tells us that the purpose of rubrics is to guide students through the steps they must take to improve the quality of their work (Burke, 2010). In addition, a strategy for

quality formative assessment involves students in the design and then the use of rubrics for self-evaluation (Fogarty & Kerns, 2009). To provide rubrics to students is not enough, as it is imperative the rubrics be written in student-friendly language, and should be done in cooperation with students. This ensures students understand the learning expectation at each scale, and it is one strategy producing significant results in student learning.

The nine principles of assessment for learning are what make up quality assessment practices. However, it is the strategies and techniques that support those principles and assist in yielding those significant gains in achievement. There are a multitude of strategies and techniques that should be given consideration, with information techniques being key. Information techniques are composed of conversations with students, class interactions, questioning, daily work, observation, interviews, conferences, and graphic organizers, as well as more formal techniques such as quizzes, performance assessments, and portfolio assessments to monitor student progress and modify instruction accordingly (Burke, 2010).

Additionally, simple signals and response strategies are among the best practices, as they maximize feedback. A few of these strategies include: (a) check for understanding signals, (b) wait time strategy, (c) delving questions, (d) unpacking the language of the task, and (e) hands up only to ask a question. A few strategies foster equal opportunity responses among all students in the class or in the group. These would include the use of name cards, a deck of cards, a fishbowl kind of name drawing, or even color-coded tongue depressors with student names on them.

Questioning, another important information technique, can have huge implications, as reflective strategies engage students in the learning process. Questioning

strategies include rhetorical and woven questions as well as more complex questions for probing and delving for more comprehensive and revealing responses (Fogarty & Kerns, 2009). Questioning strategies are unique in that they can be composed of reflective activities that yield vast amounts of information. These activities include using lab logs, literary journals, independent reading choices, student portfolios and work folders, projects, and performances. Journals, a very powerful tool among information techniques, can obtain the maximum amount of information, promote critical self-reflection, and involve students in the assessment process, another formative assessment technique.

Additional strategies that promote quality formative assessment and student involvement in the assessment process include: (a) quiz for learning; (b) write, then turn to partner and share what the teacher said in your own words; (c) involve students in the design and then the use of rubrics for self-evaluation; (d) response statements using thumbs, fist of five, or think-pair-share; (e) answer of the day; (f) graphic organizers; (g) use of triggers; (h) student-created questions for quizzes and tests; (i) individual student whiteboards; and (j) student self-assessment (Olsen & Blandford, 2009). Using these strategies to involve students in the learning process is powerful, and when combined with the use of feedback, further enhances the learning experience for children. After all, feedback is the heart and soul of formative assessment (Burke, 2010).

Consistently applying the principles of assessment for learning can produce impressive gains in student achievement (Black & Wiliam, 1998b). Professional development in this area is key to success in order for these the principles to be understood and applied with consistency and fidelity. However, it is the quality of the teacher-training program that matters.

Teacher Training Program

The most powerful strategy school systems have at their disposal to improve teacher effectiveness is professional development (Hirsh, n.d.). Developing and implementing a quality teacher-training program is vital to not only the effectiveness of the implementation but the utilization by teachers to ensure student success. In his report titled *Evidence of Effectiveness*, Slabine (2011) wrote:

In a professional learning system, professional development is aligned with rigorous state standards and district and school improvement goals. Furthermore, the professional development takes place primarily at the school level; is facilitated by well-prepared principals and/or school-based professional development coaches, mentors, or teacher leaders; and is based on a comprehensive assessment of student, teacher, and school learning needs. Teams use data to better understand student-learning needs and examine research evidence to identify effective classroom practices, such as lesson study, examine student work, perform action research, and develop formative assessments. They regularly assess the professional development's effectiveness in achieving learning goals, improving teaching, and promoting student achievement, and they use the findings to inform their practice. (p. i)

This is an area that districts falter, when it should be the driving force to any professional development initiative.

The comprehensive research conducted on attributes of professional development that change teacher practices has identified coherence, duration, active learning, collective participation, reform approaches, and content-focused as characteristics of

professional development that produce results (Krasnoff, 2014). The research suggests there are features of teacher training programs or professional development that have an impact on student achievement. Such features include coaching over an extended time, the use of data teams, a focus on how students learn subject matter content, and teachers working collaboratively to plan and monitor lessons based on evidence about how students learn in light of this planning (Bausmith & Barry, 2011).

A more thorough examination of the research on the components of effective professional development produced the following: (a) High expectations and supervision by leaders regarding professional development goals; (b) Collective responsibility for student success and ensuring best practices move from classroom to classroom and school to school; (c) Time set aside for consistent and ongoing learning, collaboration, and problem solving with colleagues; (d) Clear and measurable goals for student and educator learning identified from an analysis of data; (e) Research-based content as a focus for educator learning; (f) Intensive, sustained, and, when appropriate, individualized opportunities to develop deeper content or pedagogical skills; (g) Classroom-based follow-up and support for implementation of new knowledge and skills; (h) New roles for teacher leaders as facilitators, coaches, mentors, and more; and (i) External expertise tapped from universities, agencies, and other organizations when expertise does not reside within the school (Hirsh, n.d.).

In evaluating this evidence, Odden, Picus, Goetz, Turner, and Aportel (2007) conclude that states reap greater benefits in terms of student achievement when they invest in building professional development to support new student assessment systems and in classroom-based coaches as opposed to more costly and less effective innovations,

including smaller class size or full-day kindergarten. Therefore, the investment should be in the people, and with the people who matter. Work with teachers to date suggests that the development of teachers' formative assessment practices through the use of teacher learning communities is manageable and relatively inexpensive to implement (William & Thompson, 2007).

A teacher learning community, known specifically as a Professional Learning Community (PLC), is an ongoing process in which educators work collaboratively in recurring cycles of collective inquiry and action research to achieve better results for students they serve (DuFour et al., 2010). According to the MetLife Inc. (2010) *Survey of the American Teacher*, more than two thirds of teachers believed that greater collaboration among teachers and school leaders would have a major positive impact on student achievement. This suggests a concern for district and school leadership, as teachers do not see the significance when the research validates its impact.

A key step in any effective improvement process is an honest assessment of the current reality (DuFour et al., 2010). In order for this to be done, and done well, teams must be led through the process. Ten years of leadership research funded by the Wallace Foundation concluded that school leadership is second to classroom teaching in influencing student learning (Louis, Leithwood, Wahlstrom, & Anderson, 2010). However, an instructional leader understands his or her role in the area of professional development. Effective professional development is planned and managed by administrators and teacher leaders working together (Hirsh, n.d.). It is apparent the role of the principal has become more complex; however, the role of the teacher has evolved as well, as being a contributing member of a team suggests. A PLC is composed of

collaborative teams the members of which work interdependently to achieve common goals to which members are mutually accountable, and action oriented: they move quickly to turn aspirations into action and visions into reality (DuFour et al., 2010).

The very essence of a learning community is a focus on and a commitment to the learning of each student (DuFour et al., 2010). However, transparency must be at the root of the effort, as educators are working at high levels, and there is no room for ambiguity. The work of the PLC fosters a collaborative culture that maintains a focus on learning for all. The work becomes a cyclical process that, according to DuFour et al., includes: (a) Gathering evidence of current levels of student learning, (b) Developing strategies and ideas to build on strengths and address weaknesses in that learning, (c) Analyzing the impact of the changes to discover what was effective and what was not, and (d) Applying new knowledge in the next cycle of continuous improvement. Throughout this continuous improvement process, the utilization of formative assessment contributes to the effectiveness of the PLC and its members, as it affords the teams the immediate feedback necessary to monitor each student's learning.

It is this job-embedded professional development opportunity that promotes efficiency for teachers, and equity and access for students. Effective use of formative assessment, developed through teacher learning communities, promises not only the largest potential gains in student achievement, but also a process for affordable teacher professional development (William & Thompson, 2007).

Teach For America

Teacher preparation contributes to the politics that surround education. One such teacher preparation program is Teach For America, an alternative certification program

challenging the role of traditional teacher training. Teach For America is one of the largest and most studied teacher-preparation and educational-leadership development organizations in the country (Teach For America, 2015). Teach For America is a nonprofit organization that recruits a diverse group of individuals to become teachers, or corps members, in low-income communities. These corps members commit to teach within partnership schools for 2 years. During that time, the corps members are trained and supported in best practice.

The training at Teach For America is held by regions and consists of a 5-day induction, a 5- to 7-week residential institute, which includes teaching summer school, and a 1- to 2-week orientation. The induction and orientation is a time when corps members get to know their region and school district, locate housing, and begin working with staff, alumni, fellow corps members, and community members to prepare for the school year (Teach for America, 2015).

It is during the 5- to 7-week institute that corps members develop the foundation of knowledge, skills, and mind-sets needed to be an effective beginning teacher (Teach for America, 2015). The institute consists of five components: teaching summer school, observations and feedback, rehearsals and reflections, lesson-planning clinics, and curriculum sessions. According to the Teach for America Web site, there are five elements of institute course work: teaching as leadership; instructional planning and delivery; investment, classroom management, and culture; diversity, community, and achievement; and literacy development.

Much research has been conducted on the Teach For America teacher-training program, which has been in existence for 25 years. The most recent study, commissioned

from Mathematica Policy Research, Inc. by the U.S. Department of Education's Institute for Education Sciences, found that students of Teach For America teachers learned 2.6 months more mathematics in a year than students in the same schools taught by teachers from traditional preparation programs or less selective alternative route programs (Teach for America, 2015). This study contributes to numerous others reaching the same conclusion, that teachers participating in the Teach For America training program are equally effective and have an instructional impact on student achievement.

Besides looking at student achievement, studies have looked at teacher retention and teacher efficacy. In the Dobbie and Fryer (2011) study, *The Impact of Voluntary Youth Service on Future Outcomes: Evidence From Teach For America*, the researchers found that those who have gone through the Teacher For America program are more likely to believe that poor children can compete with more advantaged children, that achievement gap is solvable, and that teachers play an important role in students' success. Regardless of the teacher-training program, one thing is certain: there is no substitute for hands-on classroom experience as the means to promoting teacher effectiveness.

Conflicting Research

While recent research demonstrates a correlation between student achievement and teacher effectiveness, conflicting research exists. Marzano (2003) organized and conducted a theory-based meta-analysis of 35 years' worth of educational research on student achievement. This meta-analysis led to the identification of major factors, organized into three categories: (a) school-level factors, (b) teacher-level factors, and (c) student-level factors. During this analysis, it was discovered that schools account for 20% of the variance in student achievement, while student background characteristics account

for the other 80%; however, within the school-level variance, 13% of the variance in student achievement in a given subject area results from what the teacher does, and about 7% results from what the school does.

Hattie (2012) conducted a student learning meta-analysis. Hattie's research consists of more than 900 meta-analyses and is organized into six domains: (a) student, (b) home, (c) school, (d) teacher, (e) curricula, and (f) teaching. The average effects for each of the major contributors to learning were noted: student (0.39), home (0.31), school (0.23), teacher (0.47), curricula (0.45), and teaching (0.43); and an overall average effect of 0.40.

A comparison of the Marzano factors and the Hattie domains clearly identifies similarities within their research on the contributing factors to learning. The identified school-level factors identified within the Marzano meta-analysis included, by their order of impact: guaranteed and viable curriculum, challenging goals and effective feedback, parent and community involvement, safe and orderly environment, and collegiality and professionalism. In his book, *What Works in Schools*, Marzano (2003) states, "I refer to them as school-level factors because, for the most part, they are under the jurisdiction of the school as a whole. More specifically, they are influenced by school policy, decisions and initiatives" (p. 15).

Also contained within the Marzano (2003) meta-analysis were teacher-level factors, which include instructional strategies, classroom management, and classroom curriculum design, while the student-level factors included home environment, learning intelligence-background knowledge, and motivation. Individual teachers influence

teacher-level factors, while student-level factors are associated with the background of the individual student, and outside of the school realm.

Delving deeper into the student-level effects on student achievement, various factors are commonly considered such as demographics and parenting. Within demographics, characteristics such as socioeconomic status, language, and family structure must be considered factors impacting student achievement. Research suggests there is a strong relationship between academic achievement and socioeconomic status. The belief in the strong relationship between socioeconomic status and achievement is so prevalent in the research literature that is rarely questioned (Marzano, 2000).

The relationships among income, education, and occupation cannot be denied. Individuals with income less than that deemed sufficient to provide for basic needs are identified as living in poverty. The effects of poverty are great, and come with their own set of risk factors that impact student learning. The four primary risk factors afflicting families living in poverty are emotional and social challenges, acute and chronic stressors, cognitive lags and health, and safety issues (Jensen, 2009). These impact critical parenting factors.

Within the concept of parenting, characteristics influencing the student-level factors, the research suggests, are family management and parental involvement. These factors impact student achievement. In its fourth assessment of evidence related to the value of home-school connections, the Southwest Educational Development Laboratory concluded that there is compelling, research-based evidence that when schools and families work together, student achievement spikes, particularly in low-performing schools (Barr & Parrett, 2007).

There may be a number of reasons parents choose not to be involved. Oftentimes, family members from low socioeconomic status have had negative educational experiences, which results in their uneasiness and lack of participation. Low socioeconomic-status families, especially new immigrants, minorities, and non-English-language speakers, tend to be unsure and sometimes suspicious and antagonistic toward schools (Barr & Parrett, 2007).

Research has identified many factors that contribute to the student learning, with parents being one attribute. This attribute, along with the many others identified through the research suggests there are other contributing factors to the academic success of students. Regardless of the belief and the research's interpretation, one thing is prevalent: the academic success of students is important!

Summary

Assessment provides teachers with evidence of student understanding and results in a change to instructional practice. Assessment ultimately impacts grading, which is the measurement of student mastery toward meeting the content standards. Grading is generated to report to stakeholders outside of the classroom.

Assessment comes in two forms: summative and formative. Summative assessment serves to document how much learning has occurred, and is used toward the grading process. The purpose of formative assessment is to provide immediate feedback to assist teachers in making decisions regarding instructional practice, especially since the ultimate goal of formative assessment is an accurate reflection of student learning.

To ensure the accurate reflection of student learning, teachers must understand the significance of formative assessment—it is student focused. When implemented,

formative assessment assists teachers in identifying student needs, in monitoring student achievement, and in providing challenging and motivational instructional activities.

Furthermore, formative assessment is significant, as it actively involves students in the learning process, which positively influences student motivation and attitude.

Student motivation is impacted, as student learning occurs at higher levels, which are guided by the assessment principles. The principles include goal setting, learning targets, feedback, student engagement, and self-assessment. However, the principles alone do not produce the desired outcomes, but rather the supporting strategies and activities. These strategies and activities are information techniques, signal strategies, question and response strategies, reflective activities, and student-involved assessment.

The utilization of the guiding principles and supportive strategies will influence student learning and enhance teacher effectiveness. Teacher effectiveness is also enhanced through membership in PLC's, as the work is actionable and done as a team, rather than in isolation. This PLC membership ensures issues are resolved by building shared knowledge and knowing one's impact. Therefore, knowing our impact is key to student and teacher learning.

Chapter 3: Methods

“To be successful, a man must exert an effective influence upon his brothers and upon his associates, and the degree in which he accomplishes this depends on the personality of the man. The incandescence of which he is capable. The flame of fire that burns inside of him. The magnetism which draws the heart of other men to him.” —Vince Lombardi

This quantitative study seeks to determine whether time and resources devoted to teacher professional development in the area of formative assessment have impacted student achievement scores in the Loudoun County Public Schools. The study compares mathematics and reading performance data from student populations in Grades 3, 4, and 5 with teachers who have received training on the principles of formative assessment to performance data from student populations in Grades 3, 4, and 5 with teachers who have not received the training on the principles of formative assessment.

Description of the Methodology

A quantitative methodology was used to determine whether time and resources devoted to teacher professional development on the principles of formative assessment have impacted student achievement scores. A quantitative methodology was selected, as it allows for the collection and analysis of numerical data to describe, explain, predict, or control phenomena of interest (Gay, Mills, & Airasian, 2009).

A correlational research method was utilized for this study, as is in most educational research. Correlational research involves collecting data to determine whether, and to what degree, a relation exists between two or more quantifiable variables (Gay et al., 2009). The general purpose of correlational research is to study relationships between variables and/or use such relationships to make predictions regarding variable scores (Dimitrov, 2008).

The reliability and validity of this research study was determined by ensuring that data collection is both reliable and valid. Confirming reliability and validity ensures that data are constantly rechecked for any inconsistencies, and an in-depth description of the research methodology and implications for future research are presented, along with a considered effort to ensure that research bias has been reduced (Gay et al., 2009).

Procedures

The first step in this study was to obtain approval from the superintendent of Loudoun County Public Schools where the student data were extracted. Loudoun County maintains a stringent research proposal process, and without prior approval, this study would not have been completed within the researcher's district of employment.

The second step was to conduct a literature review, which included significant research reports on educational reform efforts, teacher effectiveness, student achievement, the principles of formative assessment, and quality professional development. A thorough literature review was important to establish the relationship between professional development and student achievement.

Obtaining permission from William Howard Taft University's dissertation committee to proceed with the study was the third step in this process.

The fourth step, which followed William Howard Taft's approval to proceed with the study, was to identify the sample for this study. Two sample groups were chosen, with the first sample group consisting of 500 students who were taught by teachers who received professional development on the principles of formative assessment. The second sample group includes 500 students who were taught by teachers who did not receive professional development on the principles of formative assessment.

Step five was to complete a Data Request Form and submit this to the Research Office at Loudoun County Public Schools, Ashburn, Virginia, to obtain the multiple data for the sample groups.

Step six was to receive and examine the data from the school district to ensure the data points were included and in proper format for the research design. Data points requested are: (a) Virginia Standards of Learning Assessments in the areas of reading and mathematics, (b) Quarterly Benchmarks in the areas of reading and mathematics, (c) i-Ready Diagnostic Assessments in the areas of reading and mathematics; and (d) Diagnostic Reading Assessment (DRA2+).

The seventh step was to conduct an initial analysis of the data as guided by the seven research questions. The seven research questions answered in this study are:

1. Do students who have received instruction from teachers with training in formative assessments score statistically different in mathematics Standards of Learning assessments than students who have received instruction from teachers without training in formative assessments?
2. Do students who have received instruction from teachers with training in formative assessments score statistically different in Reading-English Standards of Learning assessments than students who have received instruction from teachers without training in formative assessments?
3. Do students who have received instruction from teachers with training in formative assessments score statistically different in the mathematic Benchmark assessments than students who have received instruction from teachers without training in formative assessments?

4. Do students who have received instruction from teachers with training in formative assessments score statistically different in Reading-English Benchmark assessments than students who have received instruction from teachers without training in formative assessments?
5. Do students who have received instruction from teachers with training in formative assessment score statistically different in mathematics i-Ready assessments than students who have received instruction from teachers without training in formative assessments?
6. Do students who have received instruction from teachers with training in formative assessment score statistically different in Reading-English i-Ready assessments than students who have received instruction from teachers without training in formative assessments?
7. Do students who have received instruction from teachers with training in formative assessment score statistically different in Reading *DRA2+* assessments than students who have received instruction from teachers without training in formative assessments?

Step eight was to conduct a *t*-test comparing mathematics Standards of Learning student achievement data of students whose teachers received professional development on the principles of formative assessment to student achievement of students whose teachers did not receive professional development on the principles of formative assessment. The SPSS software was used for all proceeding *t*-tests. The data was entered into the SPSS software in preparation for this analysis and the next six steps. The

researcher used the results to determine whether there was a correlation between student achievement and teacher training.

Step nine was to conduct a *t*-test comparing reading Standards of Learning student achievement data of students whose teachers received professional development on the principles of formative assessment to student achievement of students whose teachers did not receive professional development on the principles of formative assessment.

Step 10 was to conduct a *t*-test comparing the second data point, mathematics Quarterly Benchmark assessment data, of students whose teachers received professional development on the principles of formative assessment to student achievement of students whose teachers did not receive professional development on the principles of formative assessment.

Step 11 was to conduct a *t*-test comparing reading Quarterly Benchmark assessment data of students whose teachers received professional development on the principles of formative assessment to student achievement of students whose teachers did not receive professional development on the principles of formative assessment.

Continuing to the third data point, step 12 was to conduct a *t*-test comparing mathematics i-Ready Diagnostic data for students whose teachers received professional development on the principles of formative assessment to student achievement of students whose teachers did not receive professional development on the principles of formative assessment.

Step 13 was to conduct a *t*-test comparing reading i-Ready Diagnostic data of students whose teachers received professional development on the principles of formative

assessment to student achievement of students whose teachers did not receive professional development on the principles of formative assessment.

The final data, and step 14, was to conduct a *t*-test comparing Reading Diagnostic Assessment (DRA2+) data for students whose teachers received professional development on the principles of formative assessment to student achievement of students whose teachers did not receive professional development on the principles of formative assessment.

Step 15 included a detailed discussion of the results to be contained in Chapter 4, with the final step making conclusions and recommendations regarding the findings as a means to expand the field on the topic the formative assessment principles.

Sample and Population

The sample utilized for this study consists of students enrolled within Loudoun County Public Schools, Ashburn, Virginia, in third through fifth grades beginning in 2010–2011 academic year and going through the 2013–2014 academic year. From this population, two sample groups were chosen. The first sample group consisted of 500 students who were taught by teachers who received professional development on the principles of formative assessment. The second sample group included 500 students who were taught by teachers who did not receive professional development on the principles of formative assessment.

The Loudoun County Public Schools are located in the Washington Metropolitan area, 25 miles out of Washington, DC. The district currently serves 73,740 students with 17,649 children ranging from third to fifth grade. The ethnic breakdown of the district is approximately 53% Caucasian, 18% Asian, 16% Hispanic, 7% African American, and

6% other. Subgroups of interest include 17% Economically Disadvantaged, 11% Special Education, and 9% English Language Learners. Class sizes on average for Grades 3 to 5 range from 25 to 28 students, with a district-wide per-pupil expenditure of \$11,638 for the 2013–2014 academic year.

Virginia is held to federal and state accountability requirements. Virginia has been approved for a flexibility waiver from the Elementary and Secondary Education Act, and has issued a state accountability system identified as state accreditation. As Virginia is not a Common Core State, Virginia has developed College and Career Readiness Standards.

Under federal accountability for the 2014–2015 academic year, Loudoun County Public Schools Did Not Meet the Annual Measurable Achievement Objective in the areas of English for the Limited English Proficient subgroup and in the area of Graduation Rate for the Economically Disadvantaged and Limited English Proficient subgroups. Under the state accountability system, state accreditation, Loudoun County Public Schools is fully accredited as a district. However, for the 2014–2015 academic year, there are four schools with conditional accreditation: three in the area of mathematics and the other in the area of reading.

Instrumentation and Data Collection

Assessment data from the Virginia Standards of Learning Assessment, District Quarterly Benchmark's, i-Ready and DRA2+ was closely examined to determine whether a discernible impact on achievement scores in the areas of reading and mathematics resulted. Virginia's accountability system supports teaching and learning through the establishment of rigorous academic standards and measured by an annual assessment of

student achievement, the Standards of Learning Assessment. For this study, the reading and mathematics assessments were examined.

At the district level, benchmark assessments have been developed utilizing the same subgroup categories as the state Standards of Learning assessment. The benchmark assessments measure proficiency subsets of standards and are aligned with the state assessment, and district curriculum and pacing guides. These assessments are administered to all students at the end of each quarter. Classroom teachers use these standardized assessments to evaluate the degree to which students have mastered selected standards in both their classrooms and to compare with other grade-level classrooms in the district.

At the school-level, i-Ready is utilized at the elementary programmatic level. The i-Ready assessment is an adaptive diagnostic assessment in the areas of reading and mathematics. I-Ready customizes the evaluation of every student and tracks student growth and performance and accurately identifies student's needs and prescribes differentiated instruction. For this study both reading and mathematics data were used.

The final data compared in the study was from another school-level assessment. The Development Reading Assessment, 2nd Edition PLUS (DRA2+) measures accuracy, fluency, and comprehension. These data serve to assist the researcher in answering the research questions and determining whether professional development on the principles of formative assessment made any impact on student achievement.

Data-Analysis Procedure

Data analysis in this study was performed using an independent samples *t*-test to answer each of the seven research questions. The *t*-test was selected, as it assesses

whether the means of the two groups are statistically different from each other. This analysis is applicable whenever you want to compare the means of two groups. Statistical significance will be set at $\alpha = 0.05$, the standard level of significance used in educational research (Gay et al., 2009).

Summary

The purpose of this chapter is to describe the quantitative research methodology utilized to determine if an impact on student achievement is significant following professional development on the principles of formative assessment. The researcher completed a data collection extract to include the multiple data points in the areas of reading and mathematics. The data collection also provided the researcher with evidence needed to address and answer the research questions with detail and accuracy.

Chapter 4 included the research findings, while Chapter 5 presents an analysis and discussion of the findings and the implications for future research.

Chapter 4: Results and Discussion

“Know thy impact.” —John Hattie

This quantitative study sought to determine whether time and resources devoted to professional development in the area of formative assessment impacted student achievement. The study compared mathematics and reading performance data from student populations in Grades 3, 4, and 5 with teachers who have received training on the principles of formative assessment to performance data from student populations in Grades 3, 4, and 5 with teachers who have not received the training on the principles of formative assessment.

Findings

This chapter presents the study findings. The descriptive statistics are presented to answer the research questions and provide information about the sample used. The research questions include the following:

1. Do students who have received instruction from teachers with training in formative assessments score statistically different in mathematics Standards of Learning assessments than students who have received instruction from teachers without training in formative assessments?
2. Do students who have received instruction from teachers with training in formative assessments score statistically different in Reading-English Standards of Learning assessments than students who have received instruction from teachers without training in formative assessments?
3. Do students who have received instruction from teachers with training in formative assessments score statistically different in the mathematics

Benchmark assessments than students who have received instruction from teachers without training in formative assessments?

4. Do students who have received instruction from teachers with training in formative assessments score statistically different in Reading-English Benchmark assessments than students who have received instruction from teachers without training in formative assessments?
5. Do students who have received instruction from teachers with training in formative assessment score statistically different in mathematics i-Ready assessments than students who have received instruction from teachers without training in formative assessments?
6. Do students who have received instruction from teachers with training in formative assessment score statistically different in Reading-English i-Ready assessments than students who have received instruction from teachers without training in formative assessments?
7. Do students who have received instruction from teachers with training in formative assessment score statistically different in Reading DRA2+ assessments than students who have received instruction from teachers without training in formative assessments?

Findings for research question 1. In this study, the first research question was: Do students who have received instruction from teachers with training in formative assessments score statistically different in mathematics Standards of Learning assessments than students who have received instruction from teachers without training in formative assessments? The accompanying null hypothesis for this question stated:

There is no discernible impact on achievement scores in mathematics Standards of Learning assessments for students taught by teachers who were trained on formative assessment strategies and those students whose teachers were not trained on formative assessment strategies.

An analysis of the data was conducted to examine the relationship between teacher training and student achievement. To begin the analysis, students in this study were placed into two groups based on whether teachers had received professional development on the principles of formative assessment. From that, student achievement data on the mathematics Standards of Learning assessments were examined, and an independent sample *t*-test was performed. Table 1, shows that students taught by teachers who received training received a mean assessment result of 46.28 ($SD = 42.29$), whereas students taught by teachers who did not receive the training received a mean assessment result of 22.88 ($SD = 50.24$).

Table 1

t-Test for Mathematics Standards of Learning Growth Results as a Function of Teacher Training on the Principles of Formative Assessment

Variable	<i>n</i>	<i>M</i>	<i>SD</i>
Students with PFA trained teachers	84	46.28	42.29
Students without PFA trained teachers	180	22.88	50.24

Note. $t(264) = 3.69, p = .000, N = 264$

The *t*-test between the two groups (Students Taught by Trained Teachers and Students taught by Non-Trained Teachers), resulted in statistical significance $t(264) = 3.69, p = .000$. In view of this finding, the null hypothesis was rejected, and a conclusion

was reached that students who were taught by teachers who were trained on the principles of formative assessment performed at higher levels in the area of mathematics. Therefore, the alternative hypothesis that stated, achievement scores will be higher on the mathematics Standards of Learning assessments for students taught by teachers who were trained on formative assessment strategies than those students whose teachers were not trained on formative assessment strategies, was accepted.

Findings for research question 2. The second research question stated: Do students who have received instruction from teachers with training in formative assessments score statistically different in Reading-English Standards of Learning assessments than students who have received instruction from teachers without training in formative assessments? The null hypothesis that followed stated: There is no discernible impact on achievement scores in reading Standards of Learning assessments for students taught by teachers who were trained on formative assessment strategies and those students whose teachers were not trained on formative assessment strategies.

An analysis of the data was conducted to examine the relationship between teacher training and student achievement. To begin the analysis, students in this study were placed into two groups based on whether teachers had received professional development on the principles of formative assessment. From that, student achievement data on the mathematics Standards of Learning assessments was examined, and an independent sample *t*-test was performed. Table 2, shows that students taught by teachers who received training received a mean assessment result of -3.09 ($SD = 46.41$), whereas students taught by teachers who did not receive the training received a mean assessment result of -27.34 ($SD = 50.06$).

Table 2

t-Test for Reading-English Standards of Learning Growth Results as a Function of Teacher Training on the Principles of Formative Assessment

Variable	<i>n</i>	<i>M</i>	<i>SD</i>
Students with PFA trained teachers	94	-3.09	46.41
Students without PFA trained teachers	198	-27.34	50.06

Note. $t(292) = 3.95, p = .000, N = 292$

This *t*-test between the same two groups (Students Taught by Trained Teachers and Students taught by Non-Trained Teachers), resulted in statistical significance $t(292) = 3.95, p = .000$. In view of this, the null hypothesis was rejected, concluding that students taught by teachers trained on the principles of formative assessment performed at higher levels in reading. The alternative hypothesis that stated, achievement scores will be higher on the reading Standards of Learning assessments for students taught by teachers who were trained on formative assessment strategies than those students whose teachers were not trained on formative assessment strategies, was accepted.

Findings for research question 3. The third research question was: Do students who have received instruction from teachers with training in formative assessments score statistically different in the mathematics Benchmarks assessments than students who have received instruction from teachers without training in formative assessments? The null hypothesis stated there is no discernible impact on achievement scores mathematics Benchmark assessments for students taught by teachers who were trained on formative assessment strategies and those students whose teachers were not trained on formative assessment strategies.

An analysis of these data was conducted to look at the relationship between teacher training and student achievement. Students in this study were also placed into two groups based on whether teachers had received professional development on the principals of formative assessment. From that, student achievement data on the mathematics Benchmark assessments was examined, and an independent sample t -test was performed. Table 3, shows that students taught by teachers who received training received a mean assessment result of 9.72 ($SD = 18.40$), whereas students taught by teachers who did not receive the training received a mean assessment result of 14.32 ($SD = 14.00$).

Table 3

t-Test for Mathematics Quarterly Benchmark Growth Results as a Function of Teacher Training on the Principles of Formative Assessment

Variable	n	M	SD
Students with PFA trained teachers	269	9.72	18.4
Students without PFA trained teachers	425	14.32	14

Note. $t(694) = -3.72, p = .000, N = 694$

This independent t -test between the two groups (Students Taught by Trained Teachers and Students taught by Non-Trained Teachers), resulted in negative statistical significance, $t(694) = -3.72, p = .000$. In view of this finding and regardless of the directionality of the significance, the null hypothesis was rejected.

Findings for research question 4. The fourth research question related to this study stated: Do students who have received instruction from teachers with training in formative assessments score statistically different in Reading-English Benchmark

assessments than students who have received instruction from teachers without training in formative assessments? The null hypothesis that was associated with this question stated, There is no discernible impact on achievement scores Reading Benchmark assessments for students taught by teachers who were trained on formative assessment strategies and those students whose teachers were not trained on formative assessment strategies.

An analysis of the data was conducted to examine the relationship between teacher training and student achievement. To begin the analysis, students in this study were placed into two groups based on whether teachers had received professional development on the principles of formative assessment. From that, student achievement data on the reading Benchmark assessments was examined, and an independent sample *t*-test was performed. Table 4, shows that students taught by teachers who received training received a mean assessment result of -1.26 (*SD* = 14.20), whereas students taught by teachers who did not receive the training received a mean assessment result of -.23 (*SD* = 16.10).

Table 4

t-Test for Reading Quarterly Benchmark Growth Results as a Function of Teacher Training on the Principles of Formative Assessment

Variable	<i>N</i>	<i>M</i>	<i>SD</i>
Students with PFA trained teachers	265	-1.26	14.2
Students without PFA trained teachers	421	-0.23	16.1

Note. $t(686) = -.85$, $p = .394$, $N = 686$

The *t*-test between the two groups (Students Taught by Trained Teachers and Students taught by Non-Trained Teachers), resulted in statistical significance $t(686) = -$

.85, $p = .39$. In view of this finding, the fourth null hypothesis of this study was accepted; and a conclusion was reached that no significant difference existed between students who were taught by teachers who had received training on the principles of formative assessment and students who were taught by teachers who had not received training on the principles of formative assessment. Therefore, the alternate hypothesis, which stated that achievement scores will be higher on the reading Benchmark assessments for students taught by teachers who were trained on formative assessment strategies than those students whose teachers were not trained on formative assessment strategies was rejected.

Findings for research question 5. The fifth research question stated: Do students who have received instruction from teachers with training in formative assessment score statistically different in mathematics i-Ready assessments than students who have received instruction from teachers without training in formative assessments? Associated with this question, the null hypothesis stated: There is no discernible impact on achievement scores in mathematics i-Ready assessments for students taught by teachers who were trained on formative assessment strategies and those students whose teachers were not trained on formative assessment strategies.

An analysis of the data was conducted to examine the relationship between teacher training and student achievement. To begin the analysis, students in this study were placed into two groups based on whether teachers had received professional development on the principles of formative assessment. From that, student achievement data on the mathematics i-Ready Diagnostic Growth assessments were examined, and an independent sample t -test was performed. Table 5, shows that students taught by teachers

who received training received a mean assessment result of 37.54 ($SD = 42.63$), whereas students taught by teachers who did not receive the training received a mean assessment result of 29.80 ($SD = 37.42$).

Table 5

t-Test for Mathematics i-Ready Diagnostic Growth Results as a Function of Teacher Training on the Principles of Formative Assessment

Variable	<i>n</i>	<i>M</i>	<i>SD</i>
Students with PFA trained teachers	516	37.54	42.63
Students without PFA trained teachers	437	29.8	37.42

Note. $t(953) = 2.90, p = .003, N = 953$

The *t*-test between the two groups (Students Taught by Trained Teachers and Students taught by Non-Trained Teachers), resulted in statistical significance $t(953) = 2.9, p = .003$. In view of this finding, the null hypothesis was rejected, and a conclusion was reached that students who were taught by teachers who were trained on the principles of formative assessment performed statistically significantly. Therefore, the alternate hypothesis, which stated, Achievement scores will be higher on the mathematics i-Ready assessments for students taught by teachers who were trained on formative assessment strategies than those students whose teachers were not trained on formative assessment strategies, was accepted.

Findings for research question 7. In this study, the sixth research question stated: Do students who have received instruction from teachers with training in formative assessment score statistically different in Reading-English i-Ready assessments than students who have received instruction from teachers without training in formative assessments? The accompanying null hypothesis for this question stated: There is no

discernible impact on achievement scores in reading i-Ready assessments for students taught by teachers who were trained on formative assessment strategies and those students whose teachers were not trained on formative assessment strategies.

An analysis of the data was conducted to examine the relationship between teacher training and student achievement. To begin the analysis, students in this study were placed into two groups based on whether teachers had received professional development on the principles of formative assessment. From that, student achievement data on the reading i-Ready assessments was examined, and an independent sample *t*-test was performed. Table 6 shows that students taught by teachers who received training received a mean assessment result of 59.07 (*SD* = 55.86), whereas students taught by teachers who did not receive the training received a mean assessment result of 54.37 (*SD* = 49.15).

Table 6

t-Test for Reading i-Ready Diagnostic Growth Results as a Function of Teacher Training on the Principles of Formative Assessment

Variable	<i>n</i>	<i>M</i>	<i>SD</i>
Students with PFA trained teachers	544	59.07	55.86
Students without PFA trained teachers	448	54.37	49.15

Note. $t(992) = 1.39, p = .165, N = 992$

The *t*-test between the two groups (Students Taught by Trained Teachers and Students taught by Non-Trained Teachers), resulted in statistical significance $t(992) = 1.39, p = .165$. In view of this finding, the sixth null hypothesis of this study was accepted with the conclusion reached that no significant difference existed between students who were taught by teachers who received training on the principles of

formative assessment and students who were taught by teachers who had not received training on the principles of formative assessment. Therefore, the alternate hypothesis, which stated that achievement scores will be higher on the i-Ready assessments for students taught by teachers who were trained on formative assessment strategies than those students whose teachers were not trained on formative assessment strategies, was rejected.

Findings for research question 7. This study's seventh research question stated: Do students who have received instruction from teachers with training in formative assessment score statistically different in Reading DRA2+ assessments than students who have received instruction from teachers without training in formative assessments? Associated with this question was the seventh and final null hypothesis, which argued: There is no discernible impact on achievement scores in reading DRA2+ assessments for students taught by teachers who were trained on formative assessment strategies and those students whose teachers were not trained on formative assessment strategies.

An analysis of the data was conducted to examine the relationship between teacher training and student achievement. To begin the analysis, students in this study were placed into two groups based on whether teachers had received professional development on the principles of formative assessment. From that, student achievement data on the mathematics Standards of Learning assessments were examined, and an independent sample *t*-test was performed. Table 7, shows that students taught by teachers who received training received a mean assessment result of 13.21 ($SD = 6.67$), whereas students taught by teachers who did not receive the training received a mean assessment result of 13.75 ($SD = 5.85$).

Table 7

t-Test for Diagnostic Reading Assessment (DRA2+) Growth Results as a Function of Teacher Training on the Principles of Formative Assessment

Variable	<i>n</i>	<i>M</i>	<i>SD</i>
Students with PFA trained teachers	102	13.21	6.67
Students without PFA trained teachers	190	13.75	5.85

Note. $t(292) = -.71, p = .473, N = 292$

The *t*-test between the two groups (Students Taught by Trained Teachers and Students taught by Non-Trained Teachers), resulted in statistical significance $t(292) = .71, p = .47$. In view of this finding, the seventh null hypothesis of this study was accepted and the conclusion was reached that no significant difference existed between students who were taught by teachers who had received training on the principles of formative assessment and students who were taught by teachers who had not received training on the principles of formative assessment. Therefore, the alternate hypothesis, which stated that achievement scores will be higher on the DRA2+ assessments for students taught by teachers who were trained on formative assessment strategies than those students whose teachers were not trained on formative assessment strategies, was rejected.

Summary

The purpose of this study was to determine whether time and resources devoted to teacher professional development in the area of formative assessment impacted student achievement scores. The study compared mathematics and reading performance data from student populations with teachers who have received training in formative assessment to performance data from student populations with teachers who have not

received the training in formative assessment. Within this chapter, the quantitative analysis of the data was used to answer the seven research questions. The finding's results led to rejecting the null hypotheses in four of the seven research questions, as represented in Table 8. The study found that students who received instruction from teachers with training in formative assessments had higher scores in three key areas.

Table 8

Summary of Results

Research Question	Null Hypothesis	Alternative Hypothesis
Do students who have received instruction from teachers with training in formative assessments score statistically different in mathematics Standards of Learning assessments than students who have received instruction from teachers without training in formative assessments?	Rejected	Accepted
Do students who have received instruction from teachers with training in formative assessments score statistically different in Reading-English Standards of Learning assessments than students who have received instruction from teachers without training in formative assessments?	Rejected	Accepted
Do students who have received instruction from teachers with training in formative assessments score statistically different in the mathematics Benchmarks assessments than students who have received instruction from teachers without training in formative assessments?	Rejected	Accepted
Do students who have received instruction from teachers with training in formative assessments score statistically different in Reading-English Benchmark assessments than students who have received instruction from teachers without training in formative assessments?	Accepted	Rejected
Do students who have received instruction from teachers with training in formative assessment score statistically different in mathematics i-Ready assessments than students who have received instruction from teachers without training in formative assessments?	Rejected	Accepted

(table continues)

Research Question	Null Hypothesis	Alternative Hypothesis
Do students who have received instruction from teachers with training in formative assessment score statistically different in Reading-English i-Ready assessments than students who have received instruction from teachers without training in formative assessments?	Accepted	Rejected
Do students who have received instruction from teachers with training in formative assessment score statistically different in Reading DRA2+ assessments than students who have received instruction from teachers without training in formative assessments?	Accepted	Rejected

Chapter 5: Conclusions and Recommendations

“Knowledge is Power!” —Sir Francis Bacon

This chapter contains conclusions and recommendations resulting from the data analysis exploring the relationship between teacher training on the principles of formative assessment and student achievement. The discussion is framed around the study’s purpose, which was to determine whether time and resources devoted to teacher professional development in the area of formative assessment have impacted student achievement scores. The study compared mathematics and reading performance data from student populations with teachers who have received training in formative assessment to performance data from student populations with teachers who have not received the training in formative assessment.

Conclusions

An effective teacher is the most important school-based factor influencing student achievement (Hattie, 2012). Among the most important characteristics of an effective teacher is the ability to provide specific and actionable feedback to students that can be used to guide instruction and student learning. While teacher subject-matter knowledge and how to teach the subject matter (pedagogy) are essential to increase student achievement, effective teachers must also be able to assess the learning that has occurred. Quality assessment practices are critical for measuring student learning. Therefore, teachers’ utilization of the principles of formative assessment and effective feedback is essential.

Research indicates professional learning opportunities in this area will have a positive impact on outcomes for students. Formative assessment, an effective classroom

assessment process, is assessment for learning and includes four generalizations: (a) feedback from classroom assessments should give students a clear picture of their progress on learning goals and how they might improve; (b) feedback on classroom assessments should encourage students to improve; (c) classroom assessment should be formative in nature; and (d) formative classroom assessments should be frequent (Marzano, 2006). It is these guiding generalizations that foundationally can greatly impact teaching and learning.

Assessing learning can also occur using summative assessment. Summative assessments occur after learning has taken place and are used to inform individuals outside the classroom. Summative assessments report results of the learning and are reported in the forms of grades or levels of proficiency, as determined by local, state, and national testing requirements. Assessing student learning should utilize multiple measures, which may include formative and summative assessments.

To ensure that teachers utilize the principles of formative assessment, professional development must occur. Teacher training on the principles of formative assessment ensures teachers understand the links between teaching strategies, student response to those strategies, and what students ultimately learned. This study was conducted to determine if time and resources devoted to professional development in the area of formative assessment have impacted student achievement. The summative assessments utilized for this study included state and local assessments in the areas of reading and mathematics. The data have been analyzed for each of the seven research questions with the level of significance set at $\alpha = 0.05$.

Conclusions to Question 1

Do students who have received instruction from teachers with training in formative assessments score statistically different in mathematics Standards of Learning assessments than students who have received instruction from teachers without training in formative assessments?

For this question, results from the mathematics state assessments were analyzed for students who were continuously enrolled and had scores from three consecutive administrations of the assessments, which resulted in a sample of 264 students. The results of the *t*-test (*t*-value of 3.69, *p* = .000) indicated that students who were taught by teachers who had received training on the principles of formative assessment showed a statistically significant difference in gains on the mathematics Standards of Learning assessment to those students taught by teachers who had not received the training.

These results are aligned with the literature reviewed, which indicates that quality professional development influences teacher effectiveness, resulting in an increase in student academic achievement. Furthermore, the literature reviewed also identified the principles of formative assessment as increasing teaching effectiveness, which, therefore, impacts student achievement. Assessment for learning can have a major motivational and achievement impact on students (Stiggins et al., 2006).

Conclusions to Question 2

Do students who have received instruction from teachers with training in formative assessments score statistically different in Reading-English Standards of Learning assessments than students who have received instruction from teachers without training in formative assessments?

For this question, results from the reading state assessments were analyzed for students who were continuously enrolled, and had scores from three consecutive administrations of the assessments, which resulted in a sample of 292 students. The results of the *t*-test (*t*-value of 3.95, *p* = .000) indicated that students who were taught by teachers who had received training on the principles of formative assessment showed a statistically significant difference in gains on the reading Standards of Learning assessment to those students taught by teachers who had not received the training on the principles of formative assessment.

The results are aligned with the literature reviewed, which indicates that effective teachers focus on teaching and learning, and, therefore, students perform statistically different. Teacher use of formative assessment is powerful. Formative assessment is a potentially transformative instructional tool that, if clearly understood and adroitly employed, can benefit both educators and their students...formative assessment constitutes the key cornerstone of clearheaded instructional thinking (Popham, 2010).

Conclusions to Question 3

Do students who have received instruction from teachers with training in formative assessments score statistically different in the mathematics Benchmarks assessments than students who have received instruction from teachers without training in formative assessments?

For this question, results from the mathematics Benchmark assessments were analyzed for students who were continuously enrolled, and had scores from two consecutive administrations of the assessments, which resulted in a sample size of 694 students. The results of the *t*-test (*t*-value of -3.72, *p* = .000) indicated that students who

were taught by teachers who had received training on the principles of formative assessment showed a statistically significant difference on the mathematics Quarterly Benchmark assessment to those students taught by teachers who had not received the training.

For the mathematics Quarterly Benchmark assessment, the negative t -value implies that the group of students who were taught by teachers who received the training on the principles of formative assessment were outperformed by students taught by teachers who had not received the training. Despite the implication, there is one caveat, as it appears this may be a function of the assessments compared. The Quarterly Benchmark assessments differed in the number of questions, the standards assessed, and the rigor of the questioning. These quarterly assessments were developed to show whether students had mastered the content taught in a given period of time, and were not developed to show growth over time.

Conclusions to Question 4

Do students who have received instruction from teachers with training in formative assessments score statistically different in Reading-English Benchmark assessments than students who have received instruction from teachers without training in formative assessments?

For this question, results from the reading benchmark assessments were analyzed for students who were continuously enrolled, and had scores from two consecutive administrations of the assessments, which resulted in a sample size of 686 students. The results of the t -test (t -value of -0.853 , $p = .394$) indicated that students who were taught by teachers who had received training on the principles of formative assessment did not

show a statistically significant difference on the reading Quarterly Benchmark assessment to those students taught by teachers who had not received the training.

For the reading Quarterly Benchmark assessment, the researcher attributes the failure to reject the null hypothesis to be a function of the assessments compared. The quarterly benchmark assessments, in the area of reading, differed in the number of questions, the standards assessed, and the rigor of the questioning. These quarterly assessments were developed to show whether students had mastered the content taught in a given period of time, and were not developed to show growth over time.

Conclusions to Question 5

Do students who have received instruction from teachers with training in formative assessment score statistically different in mathematics i-Ready assessments than students who have received instruction from teachers without training in formative assessments?

For this question, results from the mathematics diagnostic assessments were analyzed for students who had been continuously enrolled, and had scores from two consecutive administrations of the assessments, which resulted in a sample size of 953 students. The results of the *t*-test (*t*-value of 2.9, *p* = .003) indicated that students who were taught by teachers who had received training on the principles of formative assessment showed a statistically significant difference in gains on the mathematics i-Ready Diagnostic assessment to those students taught by teachers who had not received the training.

The results are aligned with the scholarly literature examined, which clearly indicates teacher effectiveness positively impacts student academic achievement. Teacher

effectiveness is enhanced through professional development. The most powerful strategy school systems have at their disposal to improve teacher effectiveness is professional development (Hirsh, n.d.). More specifically, the review of the literature shed light on the importance of teacher training on the principles of formative assessment. Consistently applying the principles of assessment for learning can produce impressive gains in student achievement (Black & Wiliam, 1998a).

Conclusions to Question 6

Do students who have received instruction from teachers with training in formative assessment score statistically different in Reading-English i-Ready assessments than students who have received instruction from teachers without training in formative assessments?

For this question, results from the reading diagnostic assessments were analyzed for students who were continuously enrolled, and had scores from two consecutive administrations of the assessments, which resulted in a sample size of 992 students. The results of the *t*-test (*t*-value of 1.39, *p* = .165) indicated that students who were taught by teachers who had received training on the principles of formative assessment showed a statistically significant difference on the reading i-Ready Diagnostic assessment to those students taught by teachers who had not received the training.

For the reading i-Ready Diagnostic assessment, the researcher attributes the failure to reject the null hypothesis to two potential factors: a function of the assessments compared and the lack of a significant difference in use of formative assessment attributes between the two populations. This adaptive diagnostic assessment is used to determine student growth on specific skills, at least quarterly. This assessment is

individualized and skills-based, and, therefore, the assessments compared would not be the same for the quarter-4 comparison. Additionally, as this is an adaptive diagnostic program, the utilization of formative assessment strategies by teachers would play a role into the performance data, as the instruction is computer-generated rather than human-generated.

Conclusions to Question 7

Do students who have received instruction from teachers with training in formative assessment score statistically different in Reading DRA2+ assessments than students who have received instruction from teachers without training in formative assessments?

For this question, results from the reading diagnostic assessments were analyzed for students who were continuously enrolled, and had scores from three consecutive administrations of the assessments, which resulted in a sample size of 292 students. The results of the *t*-test (*t*-value of $-.718$, $p = .473$) indicated there was no statistical difference in achievement of students who were taught by teachers who had received the training on formative assessment compared to those students taught by teachers who had not received the training.

For this reading Diagnostic assessment, the researcher attributes the failure to reject the null hypothesis to a function of the assessments compared. This diagnostic assessment is criterion-referenced assessment used to determine reading proficiency. This criterion-referenced assessment presents several disadvantages, such as: (a) not being able to compare the performance of students because tests tend to be different from student to student and school to school; (b) difficulty with the assessor knowing what is

or is not working with regard to curriculum, instruction, and assessment; and (c) while the students' levels of performance are measured against a standard, the administration of the assessments are subject to human error as a result of the subjective nature of the assessment. Furthermore, the reliability of the results of the assessment is contingent upon the professional development provided on test administration, and the utilization of interrater reliability.

Recommendations

This study was conducted to determine whether time and resources devoted to professional development on the principles of formative assessment impacted student achievement. Among the seven research questions, statistically significant differences occurred on four occasions, with greater gains experienced by the teachers participating in the professional development on formative assessment.

The findings corresponded with the literature review, which suggested strong relationships among quality professional development, effective practices for teachers, and better outcomes for students. The results of the study also provide evidence for the benefits of using classroom formative assessment to improve teaching and learning.

Additionally, knowing the impact of the principles of formative assessment on student achievement would assist building administrators in monitoring and supporting the instructional practice through conducting walkthroughs-observations and providing ongoing feedback to teachers. Utilizing formal and informal processes for supporting teachers' instructional practices can help positively shape children's learning experiences. For example, one northern Virginia district supported its Title I schools in conducting walkthroughs to monitor teachers' use of formative assessments and other practices to

guide instruction. The principals were supported in collecting walkthrough data and sharing the results with teachers for reflection and discussion. The results were then used to provide ongoing professional development for the teachers to refine their practice. The teachers learned to provide specific feedback to students, and these data were used to differentiate and maximize teaching and learning.

Finally, this study is also significant for higher-education programs that train teachers. These preparatory programs prepare teachers to instruct children in the necessary academic skills using best practice and research-based strategies. The findings suggest that the principles of formative assessment should be an integral part of preservice training for all teachers. Also inservice programs for teachers could employ these principles to enhance further their programs and equip teachers with those skills necessary for supporting student academic achievement. Teachers, principals, and school leaders would also benefit from professional development from central office staff.

Recommendations to Question 1

Do students who have received instruction from teachers with training in formative assessments score statistically different in mathematics Standards of Learning assessments than students who have received instruction from teachers without training in formative assessments?

The results of the first research question serves to validate a correlation between professional development and student achievement. As such, the researcher recommends that building district-wide capacity to utilize the principles of formative assessment should occur in the area of mathematics. Moreover, the literature review substantiated the importance of how high-quality teacher training programs can help students overcome

many factors that may impede their capacity to learn and diminish their opportunities to succeed academically.

As such, the researcher recommends the continued collection and examination of the data for continued statistical evidence, especially since the sample populations were made up of economically disadvantaged and a high percentage of minority students. As professional development should be differentiated, reviewing the data and collecting data on teacher implementation would serve to drive the professional learning opportunities for all teachers to improve teacher effectiveness. While professional development has budgetary implementations, the review of the research suggests the professional learning opportunities that are job-embedded produce the greatest results.

Recommendations to Question 2

Do students who have received instruction from teachers with training in formative assessments score statistically different in Reading-English Standards of Learning assessments than students who have received instruction from teachers without training in formative assessments?

The result of this research question establishes a correlation between professional development and student achievement. The researcher recommends the utilization of the principles of formative assessment should occur in the area of reading. The review of the literature substantiated the importance of how high-quality teacher training programs can help students overcome many factors that may impede their capacity to learn and diminish their opportunities to succeed academically.

Further data collection and analysis for both student and teacher implementation should continue. The analysis of student data would provide further evidence on

academic achievement, while the data collection of teacher implementation would serve to enhance teacher effectiveness through differentiated feedback provided, and differentiated professional learning opportunities.

Recommendations to Question 3

Do students who have received instruction from teachers with training in formative assessments score statistically different in the mathematics Benchmarks assessments than students who have received instruction from teachers without training in formative assessments?

While the results of the third research question allowed for the rejection of the null hypothesis, a negative *t*-value resulted and failed to validate a positive correlation between professional development on the principles of formative assessment and student achievement. While the literature review substantiated the importance of teacher training programs, teacher effectiveness, and quality professional development, the research also identifies contributing factors that may impede a student's ability to achieve.

The researcher suggests further data analysis is needed, specifically looking toward conducting a regression analysis. The researcher also suggests examining and modifying the district-developed quarterly benchmarks to establish consistency in the number of questions, the standards assessed, and the rigor of the questioning.

Recommendations to Question 4

Do students who have received instruction from teachers with training in formative assessments score statistically different in Reading-English Benchmark assessments than students who have received instruction from teachers without training in formative assessments?

The outcome of the fourth research question resulted with the acceptance of the null hypothesis. As such, a correlation between professional development on the principles of formative assessment and student achievement was not determined.

The researcher suggests further data analysis, specifically looking toward conducting a regression analysis. This regression analysis would establish relationships among the variables and allow for a more thorough analysis of the data. The researcher also suggests examining, and modifying if the need exists, the district-developed quarterly benchmarks to establish consistency in the number of questions, the standards assessed, and the rigor of the questioning, while increasing reliability and validity of the assessments.

The literature review the researcher conducted substantiated the importance of teacher training programs, teacher effectiveness, and quality professional development. As such, the researcher questions the professional development provided to teachers surrounding the implementation of the quarterly benchmarks, the standards by which they are assessing, and when they are being assessed. The professional development would ensure the alignment of the written, taught, and assessed curriculum.

The research on the scholarly literature also identified contributing factors, to include school, student, and teacher, which may impede a student's ability to achieve. Delving deeper into the data would provide insight on the advancement of student achievement.

Recommendations to Question 5

Do students who have received instruction from teachers with training in formative assessment score statistically different in mathematics i-Ready assessments

than students who have received instruction from teachers without training in formative assessments?

The results of the fifth research question serve to validate a correlation between professional development and student achievement. As such, the researcher recommends that building district-wide capacity to utilize the principles of formative assessment should occur in the area of mathematics. Moreover, the literature review substantiated the importance of how high-quality teacher training programs can help students overcome many factors that may impede their capacity to learn and diminish their opportunities to succeed academically.

The researcher recommends the continued collection and examination of the data for continued statistical evidence, especially since the sample populations were made up of economically disadvantaged and a high percentage of minority students. As professional development should be differentiated, reviewing the data and collecting data on teacher implementation would serve to drive the professional learning opportunities for all teachers to improve teacher effectiveness. While professional development has budgetary implementations, the review of the research suggests the professional learning opportunities that are job-embedded produce the greatest results.

Recommendations to Question 6

Do students who have received instruction from teachers with training in formative assessment score statistically different in Reading-English i-Ready assessments than students who have received instruction from teachers without training in formative assessments?

The results of the sixth research question failed to reject the null hypothesis and validate a correlation between professional development and student achievement. The researcher suggests delving deeper into the diagnostic data. While there was not statistical significance, it is unknown if the same assessments were compared given the adaptive nature of the diagnostic assessment. Examining the data closer and comparing like assessments may yield statistical results.

The literature review substantiated the importance of how high-quality teacher training programs can help students overcome many factors that may impede their capacity to learn and diminish their opportunities to succeed academically. The researcher has to question the standardization of the training provided to teachers on the utilization of this computerized program, and the frequency by which teachers are using the data to inform first and second instruction. These school- and teacher-level factors may have influenced the data, thus leading to the acceptance of the null hypothesis.

To examine further the correlation between teacher quality and the impact on student achievement, the researcher recommends a review of the walkthrough data to determine the degree to which formative assessment principles are being utilized in the area of reading, and investigate whether the reading data is being utilized to plan for next instruction by the teacher when growth is not shown. Furthermore, an examination of the student data to determine targeted areas for individualized instruction during PLC's discussion of applicable instructional strategies should occur. Administrative participation during PLC's shed light on whether teacher training in two areas might be needed: Disaggregating the data reports to ensure effective utilization and planning for next steps and utilization of formative assessment strategies in the area of reading.

Recommendations to Question 7

Do students who have received instruction from teachers with training in formative assessment score statistically different in Reading DRA2+ assessments than students who have received instruction from teachers without training in formative assessments?

The results of the seventh research question failed to validate a correlation between professional development and student achievement, as the null hypothesis was accepted. The researcher suggests further data analysis into the DRA2+ data, specifically looking toward conducting a regression analysis. This regression analysis would establish relationships among the variables and allow for a more thorough analysis of the data. More specifically, as the assessments differ per student, an examination of the growth of specific skills could be examined for statistical significance.

The research on the scholarly literature identified contributing factors, which may impede upon a student's ability to achieve. Delving deeper into the data would provide insight on the advancement of student achievement. The literature review the researcher conducted substantiated the importance of teacher training programs, teacher effectiveness, and quality professional development. The researcher questions the professional development provided to teachers surrounding the administration of this diagnostic assessment. There are questions surrounding the quality of the training and to the level and depth to ensure fidelity, as well as using the assessment to inform their instruction. However, they are variables that may have influenced the data, resulting in the acceptance of the null hypothesis.

Summary

This study has explored the impact on student achievement following professional development on the principles of formative assessment. An attempt was made to determine whether time and resources devoted to teacher professional development in the area of formative assessment have impacted student achievement scores in the area of mathematics and reading. The study compared the growth in performance data of students taught by teachers who received training on the principles of formative assessment against students who were taught by teachers who did not receive the training on the principles of formative assessment.

While the results from the study generally supported the theory that professional development on the principles of formative assessment impacts student achievement, what emerged from the study was validation that multiple data points should be utilized to determine students' academic growth, and that no one assessment should be utilized.

Despite the mixed results, this study adds to previous research on teacher effectiveness resulting from high-quality professional development on the principles of formative assessment and the impact to student achievement. The assessment data showed a statistically significant difference in growth in the area of mathematics on the state and diagnostic assessments. The present study also showed a statically significant difference in growth in the area of reading on the state assessment.

The role of assessment has never been more critical, as a result of the hope for sustaining and building a stronger economic future for the country in an era of accountability. The utilization of the principles of formative assessment can help teachers and students reach an optimal level of teaching and learning. With this in mind, we must

continue to build the capacity of our teachers and ensure professional learning opportunities are afforded them in the area of assessment; and with this in mind, we build the capacity of our students to ensure their successes.

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APPENDIX A - Pre/Post Survey Results**Nine Principles of Formative Assessment—Pre/Post Survey Results**

Principle	2010	2012	% Gains
7. I involve my students in the assessment process.	23	72	49
4. I transform achievement targets into dependable assessments that yield accurate information.	32	78	46
9. I understand how to use assessment to build student success and confidence.	35	59	24
6. I give feedback to students that is descriptive, constructive, frequent, and timely to help them plan and improve.	42	63	21
2. I inform my students about achievement targets in words they can understand.	40	56	16
8. I communicate with students about their status and improvement.	46	61	15
5. I use assessment information to revise and guide teaching and learning.	42	56	14
1. I understand and articulate the achievement targets students are to hit in advance of teaching.	43	52	9
3. I can describe what targets my students are to hit and what comes next in their learning.	45	53	8

APPENDIX B - Instructional Audit/Walkthrough Results**Strategies for Quality Formative Assessments: 28 Observation Results**

Information Techniques	Responses	Percent
Conversations with students	27	96%
Class Interactions	11	39%
Questioning	19	68%
Descriptive Feedback	20	71%
Observation	12	43%
Interviews	7	25%
Conferences	7	25%
Graphic Organizers	4	14%
Quizzes	1	4%
Performance Assessment	8	29%
Portfolio Assessment	0	0%
None of the Above	0	0%

Utilized Signals and Question/Response Strategies	Responses	Percent
Check for Understanding	5	18%
Wait Time	13	46%
Delving Questions	19	67%
Rhetorical Questions	5	18%
Woven Questions	17	61%
Reverse Questions	4	14%
Equal Opportunity	3	11%
None of the Above	0	0%

Reflective Activities	Responses	Percent
Lab Logs	4	14%
Journals	6	21%
Ind. Reading Choices	2	7%
Portfolios	1	4%
Projects	6	21%
Performances	10	36%
None of the Above	2	7%

Involved Students in the Assessment Process	Responses	Percent
Think/Pair Share	6	21%
Partner Share	1	4%
Student Designed Rubrics	0	0%
Students Use of Rubrics	0	0%
Response Statements	4	14%
Graphic Organizers	11	39%
Student ID of Triggers	4	14%
Student ID of Target	9	32%
Student Created Questions	3	11%
Individual Whiteboards	5	18%
Student Monitored Progress	21	75%
Peer Feedback	3	11%
None of the Above	1	4%

APPENDIX C - Loudoun County Public Schools Research Approval**Loudoun County Public Schools****Department of Instruction****Research Office**21000 Education Court
Ashburn, Virginia 20148
Telephone: 571-252-1310
FAX: 571-252-1633

TO: Evonne Ironi
FROM: Sharon Ackerman, Assistant Superintendent for Instruction *ETA*
RE: Research Request
Date: August 20, 2012

Your request to conduct the study, **Quality Assessment Practices in the Elementary School**, has been approved.

As a courtesy to Loudoun County Public Schools and the participants in your research, please provide a copy of your study and subsequent findings to the Research Office.

Contact Vivian Jefferson, Research Assistant, if you have any questions.

Good luck with your project.

Cc: Dr. Mike Martin
Colleen O'Neil
Angela Robinson