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The association between grades Pre K-12 student achievement and differentiated instructional strategies in the Anytown Township School District explored through units of study

Jeff Gorman

THE ASSOCIATION BETWEEN GRADES PRE K-12 STUDENT ACHIEVEMENT AND DIFFERENTIATED INSTRUCTIONAL STRATEGIES IN THE ANYTOWN TOWNSHIP SCHOOL DISTRICT EXPLORED THROUGH UNITS OF STUDY

by
Jeff Corey Gorman

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Dedication

I dedicate this dissertation to my incredible wife Cheryl and the amazing family that we have created together. I would never have gotten to this point without Cheryl's patience, understanding, love, and perseverance to each other and our children through both the good times and the tough times on this journey. As a third grade teacher, Cheryl has provided me with insight to why what we do is so important. Her dedication and commitment to every one of her students as a respected learner and individual has inspired me to complete the work contained in this study. Thank you for trying so hard each and every day that we are together. Our love for our three children, Matthew, Jared, and Zachary is second to none and was a driving force for me to finish this part of my career. They are our legacy and by committing ourselves to them, they will get a chance to add their part in shaping the future of society. At 12, 10, and 7 years of age, I am so proud of what they have already accomplished and look forward to sharing their lives with them as they make their impact on the world.

Finally, I dedicate this work to my father George, my brother Ken, and my late mother Lisa; all have inspired me in their own way to pursue new heights of academic excellence.

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This dissertation would not have been possible without the guidance and support of my dissertation chair, Dr. JoAnn Manning. Since the beginning of our journey together, I have felt a comfort and connection with her that has allowed me to find my way to produce this dissertation. Dr. Robert Campbell has provided me with a tremendous amount of support. I would also like to acknowledge a long time educational partner of mine in Dr. Jeanette Baubles. Her intelligence and knowledge exceeds her years in education, and she has been someone that remains connected to me in this profession. Lastly, this dissertation would not have been completed without the influence of Dr. Tomlinson. I attended a three-day conference with her almost 10 years ago, and her continuous support and knowledge on the topic of differentiated instruction has inspired me to complete this study. My overarching goal is to meet the needs of every learner who I encounter in the field of education.

Abstract

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This is a quasi-experimental quantitative study that sought to determine the association between differentiated instructional elements or strategies and student achievement as measured through pretest and posttest results for teacher created units of study in the area of mathematics and language arts literacy. A series of descriptive and parametric inferential statistics was utilized.

A one-between one-within analysis of variance (ANOVA) on change scores by time (pretest vs. posttest) and group (primary vs. elementary vs. middle vs. high school) was conducted. The results for the main effect of time were statistically significant as indicated by F (1,194) = 530.30, p = .001, and as indicated by the smaller mean for the pretest (M =47.19, SD = 30.09) than the posttest (M=79.85, SD = 20.23). The effect of the interaction between each group and time was significant as measured by F (3,194) = 54.61, p =.001. This statistical significance denoted an improvement in student achievement as a partial result of the application of differentiated instructional elements or strategies.

A multiple regression was conducted, and the results of the regression were deemed significant by F (3,194) = 30.61, p = .001, and the independent variables

accounted for 32.1% of the variance in the change score. The related results implied that teachers who most frequently utilized ongoing assessment for learning had an increase of .25 units; the teachers who most frequently utilized flexible grouping had an increase of .04 units; and the teachers who most frequently utilized clear learning goals (KUDs) had a decrease of .07 units.

With respect to these descriptive and parametric inferential statistics, there was a significantly positive association between differentiated instruction and student achievement.

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Chapter 1

Introduction

Differentiated instruction has been at the forefront of instructional delivery models for several decades relevant to individualizing the learning experience and maximizing student achievement. "The school program must be adjusted to each child's maturity…. This adjustment must be made, insofar as we expect mastery from each child" (Washburne, 1953, p. 6). More to this point, schools should have,

> Clear educational goals in mind, consistently assess to find out where particular students are in their progression toward those goals, and use the assessment data to ensure that we support each student in achieving success in ways that work for that particular student. (Tomlinson & McTighe, 2006, p. 186)

"Students feel betrayed by a one-size-fits-all delivery system demanding that everyone learn the same thing at the same time in the same way, no matter what their individual needs may be" (Sarason, 1990, as cited in Tomlinson & McTighe, 2006, p. 186). With this in mind, this quasi-experimental quantitative study will focus on the association between student achievement data and differentiated instructional elements or strategies explored through units of study.

Presupposing that the association between student achievement data and differentiated instructional elements or strategies identified for the purposes of this quasi-experimental quantitative study is statistically significant, it is paramount to recognize,

> Differentiated instruction is doing what's fair for students. It's a collection of best practices strategically employed to maximize students learning at every turn, including giving them the tools to handle anything that is undifferentiated. It requires us to do different things for different students some, or a lot, of the time in order for them to learn when the general classroom approach does not meet students' needs. (Wormeli, 2006, p. 3)

Until all of the students in the Anytown Township School District demonstrate advanced proficiency on standardized assessments and criterion-referenced assessments, there is a sense of urgency in raising the rigor and meeting the individual needs of every student. A differentiated classroom is an environment that is student-centered and respectful. It is also a place where students are responsible for their own learning as each meets and exceeds the benchmarks identified via the New Jersey Core Curriculum Content Standards (NJCCCS) and the Common Core.

Utilizing this research to further the implementation of the differentiated instruction model in the district's three primary schools, two elementary schools, one middle school, and one high school will require transformational leadership. The researcher has interwoven leadership into this quasi-experimental quantitative study. It is the researcher's intent to professionally develop the teachers and the administrators in each school in regard to three elements or strategies indicative of the differentiated instruction model: clear learning goals, flexible grouping, and ongoing assessment and adjustment for learning. In doing so, the research findings for this study have provided the foundation to continue this work in the Anytown public school district.

Reflecting upon the link between leadership and the change process, the researcher has aspired to continually serve as a transformational leader with an eclectic approach to creating second order change. Transformational leadership "is a favored style of leadership given that it is assumed to produce results beyond expectations" (Burns, 1978 as cited in Marzano, Waters, & McNulty, 2005, p. 14). More specifically, transformational leadership is:

> A relationship of mutual stimulation and elevation that converts followers into leaders and may convert leaders into moral agents…. Transforming leadership assists a group of people to move from one stage of development to a higher one and in doing so address and fulfill better a higher human need. (Couto, 1995, p. 103)

Transformational leadership theory has evolved as it relates to the school principal who can be the most important influence of change in a school building. There are four "I"s of transformational leadership that Marzano (2005) expanded upon in his study of leadership. The four "I"s are the skills that school leaders need to meet the challenges of this day and age. As each leads change, each has to provide the first "I," which is individual consideration, as each provides for personal needs of each staff member. Next, each must provide intellectual stimulation as each leads his/her staff toward new ways of examining student achievement. A pertinent example, utilizing formative assessment to drive instruction and determine flexible groups, will likely not evolve by itself without the principal providing a forum for dialogue among teachers. The third "I" is inspirational motivation, which enables the leader to raise the bar and provide high expectations for all students, parents, and staff members. The last "I" is termed idealized influence, which occurs when the principal provides through his/her own accomplishments a model of work ethic, knowledge, learning, and excellence (Marzano et al., 2005, p. 15). In conjunction with these four "I"s, it is the researchers expectation that the principals in the Anytown school district will employ a differentiated approach to staff supervision.

This leadership will be both top down and bottom up. Specific to the top down component, it will be essential that the administrators, led by the building principal, effectively coach teachers as each implements differentiated instructional elements or strategies. "Cognitive coaching is a nonjudgmental process of mediation applied to those

human life encounters, events, and circumstances that can be seized as opportunities to enhance one's own and another's resourcefulness" (Costa & Garmston, 2002, p. 28). In designing this quasi-experimental quantitative study, the researcher, the staff developer, and the participating teachers coached one another. The building principal will eventually take on a more complex role as an instructional leader for the school. By enlisting the building principal as a partner in implementing these strategies, it was the researcher's intent to increase the building principal's knowledge and understanding to enable him/her to become a leader for second order change.

Marzano et al. (2005), identified seven key attributes that educational leaders possess in order to complete a second order change:

> These attributes are: 1) Knowledge of curriculum, instruction, and assessment; 2) The extent of a leader to inspire others and being the driving force for implementation of change (optimizer); 3) Providing intellectual stimulation; 4) Being a change agent; 5) Monitoring and evaluating the change; 6) Being flexible; and 7) Maintaining and communicating ideals and strong educational beliefs. (p. 70).

Problem Statement

Pertaining to multiple measures, student achievement in the Anytown Township School District as measured by standardized state assessment results has remained stagnant from 2007-2010 at the primary, elementary, middle, and high school grade levels. Consistent decisions regarding curricular and instructional practices have generally been absent. There has been an absence of comprehensive units of study, an absence of the elements of differentiated instruction, and an absence of cohesive and effective professional development needed for district leaders and certain staff members. Instead, the curriculum and instruction have been primarily traditional and teacher-centered.

Nature of Study

This quasi-experimental quantitative study was designed to determine the association between present student achievement levels measured by pretest and posttest data and various elements or strategies of the differentiated instructional delivery model. To this end, the students in this quasi-experimental quantitative study were exposed to the communication of clear learning goals or what teachers expect them to know, understand, and do (KUDs), flexible grouping, and ongoing assessment and adjustment for learning during teacher created units of study. Lastly, the researcher examined the association between daily student attendance and student achievement for each unit of study in this quasi-experimental quantitative study.

Of the seven schools in the district, three serve primary students; two serve elementary students; one serves middle school students; and one serves high school students. One classroom from each school and the students in the class were chosen to be part of this quasi-experimental quantitative study. The classrooms consisted of predominantly white female and male heterogeneously grouped students, two inclusive of in-class support teachers. Two hundred three students, nine teachers, one staff developer, and this researcher participated at varying levels of this quasi-experimental quantitative study.

To identify a convenience cluster student sample, the researcher solicited teacher volunteers from within the district. While attending the Summer Institute for Academic Diversity (SIAD) for five days and four nights at the University of Virginia, the nine identified teacher participants created units of study for the content areas of language arts

literacy and mathematics to be implemented during the months of September and October of 2010.

Differentiated instruction was the primary delivery model for these units of study. Clear learning goals, flexible grouping, and ongoing assessment and adjustment for learning constituted the elements or strategies of the differentiated instruction model utilized within each unit of study. The teacher participants recorded the frequency with which each differentiated instructional element or strategy was utilized while presenting the unit and submitted these data in addition to pretest and posttest student data and student attendance records during the unit of study.

Following this submission, a series of descriptive and parametric inferential statistics was analyzed to determine statistical significance and to unearth the association between each differentiated instructional element or strategy and student achievement levels as measured on a teacher created pretest and posttest in the areas of language arts literacy or mathematics at various grade levels. These statistics included a one-between one-within and repeated measures analysis of variance (ANOVA), t-tests, and Kolmogorov-Smirnov (KS) test for equality.

> The Kolmogorov-Smirnov Test procedure, compares the observed cumulative distribution function for a variable with a specified theoretical distribution, which may be normal, uniform, Poisson, or exponential. The Kolmogorov-Smirnov Z is computed from the largest difference (in absolute value) between the observed and theoretical cumulative distribution functions. This goodness-of-fit test tests whether the observations could reasonably have come from the specified distribution. (Nustini, Yuni, 2003, p.152)

The rationale for analyzing these statistics was to assess the normality and the distributional functions of the ANOVA, means, and standard deviations. A table describing these statistics for within-subjects or repeated measures was presented,

keeping consistent with the American Psychological Association (APA) format (Nicol & Pexman, 2010). Also, the multiple regression tests were utilized to measure the validity of this quasi-experimental quantitative study relative to the predictions and associations between and among the variables of communicating clear learning goals by way of what we want students to know, understand, and be able to do, flexible grouping, and assessment of learning and change score from pretest to posttest.

Research Questions

Two overarching research questions and five ancillary research questions drove this quasi-experimental quantitative study, each assisting the researcher with determining the association between present student achievement levels measured by pretest and posttest data, and various elements or strategies of the differentiated instructional delivery model. Further, this researcher explored which of the three differentiated instructional elements or strategies had the most significant association with student achievement. Lastly, the researcher identified other variables that had an association with student achievement. These research questions guided this quasi-experimental quantitative study:

Overarching Research Question 1

ORQ1: Is student achievement dependent upon differentiated instructional elements or strategies?

H0: Student achievement is not dependent upon differentiated instructional elements or strategies.

Ancillary Research Question 1

ARQ1: Is student achievement dependent upon differentiated instructional elements or strategies for primary students?

H0: Student achievement is not dependent upon differentiated instructional elements or strategies for primary students.

Ancillary Research Question 2

ARQ2: Is student achievement dependent upon differentiated instructional elements or strategies for elementary students?

H0: Student achievement is not dependent upon differentiated instructional elements or strategies for elementary students.

Ancillary Research Question 3

ARQ3: Is student achievement dependent upon differentiated instructional elements or strategies for middle school students?

H0: Student achievement is not dependent upon differentiated instructional elements or strategies for middle school students.

Ancillary Research Question 4

ARQ4: Is student achievement dependent upon differentiated instructional elements or strategies for high school students?

H0: Student achievement is not dependent upon differentiated instructional elements or strategies for high school students.

Overarching Research Question 2

ORQ2: Does the differentiated instructional element or strategy of communicating KUDs to students (clear learning goals) have the most significant impact on change score with respect to student achievement as opposed to flexible grouping and ongoing assessment and adjustment for learning?

H0: The differentiated instructional element or strategy of communicating KUDs to students (clear learning goals) does not have the most significant impact on change score with respect to student achievement as opposed to flexible grouping and ongoing assessment and adjustment for learning.

Ancillary Research Question 5

ARQ5: Does daily student attendance have a significant impact on change score with respect to student achievement?

H0: Daily student attendance does not have a significant impact on change score with respect to student achievement.

Purpose of the Study

In an effort to address stagnant student achievement, the purpose of this quasi-experimental quantitative study was to determine if student achievement was impacted by three elements or strategies of the differentiated instructional delivery model: clear learning goals, flexible grouping, and ongoing assessment and adjustment for learning, with student achievement measured via the differences between student pretest and posttest data at the primary, elementary, middle, and high school levels.

The results from this analysis will further inform curricular, instructional, and assessment initiatives as noted in the Chapter 5 recommendations. Threaded through these recommendations is the need for second order change in regard to the instructional delivery model, and critical to actualizing this change is transformational leadership. This being the case, subscribing to Fullan's (2001) leadership theory was appropriate, as this researcher has led the Anytown School District through a culture of change. There are five aspects of this theory: (1) Moral purpose; (2) Learning and gathering information;

(3) Understanding a culture of change; (4) Building trust and relationships; and (5) Uniting the four components toward a common vision (pp. 4-9). Enthusiasm, energy, and hope abound resulting in higher levels of success when these aspects transcend the organization. The followers who are part of this process become motivated, and the results are positive. Preemptively, the researcher has utilized Kotter's (1996) eight-step model of change. This tool encompasses establishing a sense of urgency, creating a guiding coalition, developing a vision and strategy, communicating the change vision, empowering action, generating short term wins, producing more change, and anchoring new approaches to the culture. This has been an effective tool in the implementation of school reform models to cause positive cultural change (Kotter, 1996, p. 21). What Kotter has termed the guiding coalition, this researcher has deemed the professional learning community for this quasi-experimental quantitative study. This model has afforded the researcher the opportunity to establish a common vocabulary among participating teachers and members of the administrative team.

Theoretical Base

The concept of transfer that Grant Wiggins and Jay McTighe (2005) reference in the curricular model Understanding by Design (UbD) is the cornerstone of the theoretical base for this quasi-experimental quantitative study.

The Anytown Township School District's curricula are ultimately derived from the New Jersey Core Curriculum Content Standards. These standards identify what students should know, understand, and be able to do in accordance with their respective grade levels. To teach for transfer, or understanding, the instructional delivery model is to then be based on big ideas, enduring understandings, and essential questions.

Incorporating big ideas, enduring understandings, and essential questions affords teachers opportunities to educate students by teaching core skills and understandings as each applies to the real world in which students live (Wiggins & McTighe, 2007).

To "uncover" the content and bring depth to teaching (Tomlinson & McTighe, 2006, p. 110), the intersection of Understanding by Design and differentiated instruction merits more intensive exploration.

> In effective classrooms, teachers consistently attend to four elements: whom they teach (students), where they teach (learning environment), what they teach (content), and how they teach (instruction). If teachers lose sight of any one of the elements and cease investing effort in it, the whole fabric of their work is damaged and the quality of learning impaired…. Understanding by Design focuses on what we teach and what assessment evidence we need to collect…. It also emphasizes how we teach, particularly ways of teaching for student understanding…. Differentiated instruction focuses on whom we teach, where we teach, and how we teach. (Tomlinson & McTighe, 2006, pp. 2-3)

Put simply, employing differentiated instructional elements or strategies is one approach framing the instructional vision in public school districts. Fostering this vision is in its infancy in many school districts, including the Anytown Township School District.

Recognizing student readiness and refining units of study to accommodate varying student entry points are important components of this vision.

> Attending to student readiness allows for academic growth. Our learning expands when the work we do is a little too difficult for us and when a support system exists to get us past the difficulty. Because students' readiness to learn particular ideas and skills at particular times will inevitably vary, a teacher must make appropriate readiness adjustments to enable consistent academic growth for each learner. (Tomlinson & McTighe, 2006, p. 19)

Subsequently, "Teachers look for links between the learning goals (the standards as well as what students should know, understand, and be able to do) and the individual lessons in each unit" (Tomlinson & Eidson, 2003, p. 15).

When looking at second order change and paradigm shifts, it is important to note that the magnitude of creating and maintaining a differentiated classroom is significant. "Differentiated instruction is a way of thinking not a formula or recipe. Educators draw on, apply, and adapt its tools with the goal of maximizing knowledge, understanding, and skill for the full range of learners" (Tomlinson & McTighe, 2006, p. 10). This being the case, adjustments to instruction based on assessment data drove the data collection for this quasi-experimental quantitative study.

Significance of the Study

Reflected in the literature review, there is a great deal of research specific to utilizing the differentiated instructional model; however, "there is a decided gap in the literature regarding the use and effectiveness of the differentiated model in practice" (Subban, 2006, p. 936). This researcher provided quantitative data from the Anytown School District linking a connection between differentiated instruction and student achievement in practice. Hall, Strangman, and Meyer (2011, p. 3) stated, "While no empirical validation of differentiated instruction as a package was found,…there are a generous number of testimonials and classroom examples that authors of several publications and websites provide."

Presented in the *Journal for Advanced Academics* (Beecher & Sweeny, 2008) was one school's story of improved student achievement derived from teacher created units of study employed over an 8-year span using differentiated instruction. Data from this study showed a "dramatic improvement by students who were in the lowest or remedial band on state assessments. Results for children from the lowest socioeconomic levels who scored in the remedial band were reduced 28%..." (Beecher & Sweeny, 2008, p. 526).

Subsequently, Tieso (2002) conducted a comparison group – experimental group design similar in structure to this quasi-experimental quantitative study. Tieso noted, "Less research linked ability grouping to the specific enhancement and differentiation of curriculum based on student prior knowledge" (Tieso, 2002, p. v). Similarly, in the Tieso study,

> A pretest-posttest…Teachers implemented three different types of grouping practices (whole class, Joplin Plan, and Flexible Small Groups [FSG]) and two types of curricular practices (modified and differentiated). Repeated Measures Analysis of Variance was employed to investigate the effects of different grouping arrangements and appropriate curricular design on the treatment and comparison groups. Results indicated significant differences, F (5, 253) = 40.988, $p < .001$ ($ES = .42$)…Further, results indicated significant differences, F (11, 645) = 55.816, $p < .001$ ($ES = .52$ for FSG, $ES = .28$ for Joplin), among curricular (modified or differentiated) and grouping (whole, between, and within-class) treatment groups after adjusting for grade level (4 or 5). (Tieso, 2002, p. v.)

In a recent doctoral dissertation, the quantitative effects of differentiated instruction on standardized test scores in a third grade classroom resulted in these future recommendations:

> Future studies need to include more schools in the division and in other school divisions across the nation. Observations of differentiated instruction classrooms would provide more insight into how differentiated instruction is being implemented and if there is any noticeable improvement. Surveys of students, educators, administrators, and other stakeholders on their opinions, perceptions, and experiences based on the implementation of differentiated instruction could offer more insight into this study. Other forms of assessments, formal and informal, are recommended to determine if differentiated instruction in the classroom helps to improve student achievement. (Gault, 2009, pp. 96-97)

Moreover, a qualitative dissertation authored by Eady (2008) reviewed the differentiated instructional model, which led to the following recommendations:

> Sarason (1990) suggests that principals consider the following criteria as the schools are reformed: (a) understand the culture of the school, (b) collaborate with teachers and parents in decision making, and (c) providing all concerned about the nature of change. (p. 109)

Extensive qualitative research on the change process and implementation of new programs will provide educators and administrators with the understanding of the importance of change, the effect on staff, parents, and students as new and existing programs are implemented.

In conjunction with the theoretical base, clear learning goals, flexible grouping, and ongoing assessment and adjustment for learning, were the three differentiated instructional elements or strategies identified by this researcher as having a positive association with student achievement levels. The essence of these elements or strategies established the significance of this quasi-experimental quantitative study.

Evidence of the statistically significant association between student achievement and various combinations of instructional strategies is reflected in a summary of a meta-analyses that Marzano, Pickering, and Pollock (2001) conducted:

> The goal of this study was to identify those instructional strategies that have a high probability of enhancing student achievement for all students in all subjects and all grade levels…. An inference can be drawn that no instructional strategy works equally as well in all situations; just as all students learn at various levels. Any combination of these strategies helps promote differentiated instruction and enhance student achievement. (p. 1)

As previously stated, this researcher has begun to utilize components of the differentiated instructional model to improve instruction in the Anytown School District. This researcher hopes to expand this quasi-experimental quantitative study to generate model differentiated classrooms in the Anytown School District as a way to expand best practices and create common instructional ground throughout the district as per the recommendations in the Gault (2009) study. Examined in the literature review, Van Tassel-Baska et al. (2008) conducted a 3-year study on professional development for differentiated instruction. The

results supported a need for this researcher's quasi-experimental quantitative study as well as future professional development through professional learning communities.

Definition of Terms

Pertaining to this quasi-experimental quantitative study, these essential terms have been defined to provide clarity for the reader:

Cognitive coaching. "A nonjudgmental, interactive strategy focused on developing and utilizing cognitive processes, liberating internal resources, and accessing the five states of mind as a means of more effectively achieving goals while enhancing self-directed learning" (Costa & Garmston, 2002, pp. 401-402). "These five states of mind inform human perception….These basic human forces drive, influence, motivate, and inspire our intellectual capacities, emotional responsiveness, high performance, and productive human action…efficacy, flexibility, craftsmanship, consciousness, and interdependence" (Costa & Garmston, 2002, p. 124).

Differentiated instruction. Differentiated instruction is a teacher's reaction to students' learning styles, interests, and readiness levels. Teachers can distinguish what students learn (content), how they learn it (process), and how they measure what they have learned (product). A major component of differentiated instruction is the learning environment or where students learn. The foundation for good teaching is the creation of an emotionally and physically safe environment that thrives on caring and building relationships between teacher and student. Teachers differentiate content, process, and product through different means such as respectful tasks, flexible grouping, and continuous assessment of students. Through these assessments, teachers adjust their instruction to meet the needs of different learners (Tomlinson, 2008, pp. 26-28).

Flexible grouping. According to Radenich and McKay:

> When teachers plan for flexible grouping, they consider the strengths and weaknesses of each grouping approach and then put them together to allow the teacher to best meet the needs of the classroom. The groups are formed and dissolved as needs change to allow for maximum flexibility, avoiding the static nature of the grouping patterns of the past. (Radenich & McKay, 1995 as cited in Ford, 2005, p. 1)

Ongoing assessment and adjustment for learning. Throughout units, teachers use assessments to yield an emerging picture of those students who understand key ideas and can perform targeted tasks. The teacher shapes the next lesson to fit again the needs of individual students. Assessments need not be formal "tests" but may come from activities such as group discussions, journal or portfolio entries, skills inventories, homework assignments, or interest surveys (Tomlinson, 1999, p. 10).

Professional development. Defined by Wei, Darling-Hammond and Adanson:

> Professional development is a key strategy available to schools and school systems for improving teaching quality. To ensure effective teaching in every classroom, educators must have opportunities each day to refine and expand their practice, reflect on how their practice impacts student learning, and engage in ongoing improvement to address learning challenges in the school. (Wei, Darling-Hammond, & Adanson, 2010, p. ii)

Professional learning community. Dufour, Dufour, Eaker, and Many (2006) state:

> Educators committed to working collaboratively in an ongoing process of collective inquiry and action research in order to achieve better results for the students they serve,…PLCs operate under the assumption that the key to improved learning for students is continuous, job-embedded learning for educators. (p. 217)

Respectful tasks. A classroom teacher ensures that students' learning is respected. The teacher does this by assessing the readiness level of each student by evaluating competency in the skills and concepts included in the local curriculum standards, expecting and supporting continual growth in all students by providing challenging curriculum, offering all students the opportunity to explore skills and understanding at

appropriate degrees of difficulty, offering all students tasks that are equally interesting, important, and engaging (Tomlinson, 1999, p. 12).

Second order change. An extreme change that accompanies the following characteristics:

1. Is perceived as a break with the past;
2. Lies outside existing paradigms;
3. Conflicts with prevailing values and norms;
4. Requires resources currently not available to those responsible for implementing the innovations; and
5. Maybe resisted because only those who have a broad perspective of the school see the innovation as necessary (Marzano & Waters, 2009, p.105).

Understanding by Design. Wiggins (2010) offers this definition:

> Understanding by Design (UbD) is a framework for improving student achievement. Emphasizing the teacher's critical role as a designer of student learning, UbD works within the standards-driven curriculum to help teachers clarify learning goals, devise revealing assessments of student understanding, and craft effective and engaging learning activities. (Wiggins, 2010, para. 1)

Unit of study. Wiggins and McTighe (2005) suggest:

> Units represent a coherent chunk of work in courses or strands, across days or weeks…. a body of subject matter that is somewhere in length between a lesson and an entire course of study that focuses on a major topic or process and that lasts between a few days and a few weeks. (Wiggins & McTighe, 2005, p. 353)

Limitations

Within the scope of this quasi-experimental quantitative study, these limitations existed:

1. Seven of several hundred classrooms within the Anytown Township School District were utilized on a volunteer basis with inconsistencies noted for the

number of classrooms for each grade level within each segment of the student population, primary, elementary, middle school, and high school, thus yielding a sample of convenience.

2. The units of study were representative of two content areas, language arts literacy and mathematics. Science, social studies, world language, and the balance of New Jersey Core Curriculum Content areas were not part of this quasi-experimental quantitative study.
3. Each unit of study was missing components prompted by the lack of alignment between the district curricula and the 2009 New Jersey Core Curriculum Content Standards and the Common Core.
4. The researcher selected three differentiated instructional elements or strategies from the Tomlinson (1999) model omitting others initially identified such as, but not limited to, respectful tasks and appropriate degree of challenge.
5. The time of year the units of study were implemented complicated the execution thereof as far as the establishment of classroom management routines was concerned, and as far as the amount of time available for teachers to develop the units of study were concerned.
6. Each unit of study included varying amounts of instructional minutes.
7. The implementation of each unit of study did not lend itself to the same start and end dates.
8. Student attendance rates varied, meaning some students were present each day while others were not.

9. Further regression analysis could not be conducted within the primary and elementary groups because all the independent variables did not meet the sample size requirements. “The Accuracy in Parameter Estimation (AIPE) approach to sample size planning allows researchers to plan necessary sample size, a priority, such that the computed confidence interval is likely to be as narrow as specified” (Kelley & Maxwell, 2003, p. 305).

Summary and Summary of Remaining Chapters

Included in Chapter 1 were the problem statement, nature of study, research questions, purpose of the study, theoretical base, significance of the study, definition of terms, and limitations. A literature review pertaining to differentiated instruction comprises Chapter 2. Clear learning goals, flexible grouping, and ongoing assessment and adjustment for learning are the elements or strategies identified and described. Professional learning communities are a key part of Chapter 2 as well. In Chapter 3, the methods for data collection and analysis are detailed for this quasi-experimental quantitative study for the association between differentiated instructional elements or strategies and student achievement levels. The results or findings of a series of descriptive and parametric inferential statistics are analyzed in Chapter 4 to determine statistical significance and to unearth the association between each differentiated instructional element or strategy and student achievement levels. In conclusion, this researcher expands upon leadership and second order change in Chapter 5 for the purpose of having this quasi-experimental quantitative study evolve into a model differentiated classroom for each primary, elementary, middle, and high school teacher, and administrator.

Chapter 2

Literature Review

Two overarching research questions framed the literature review for this quasi-experimental quantitative study: Is student achievement dependent upon differentiated instructional elements or strategies? Does the differentiated instructional element or strategy of communicating KUDs to students (clear learning goals) have the most significant impact on change score with respect to student achievement as opposed to flexible grouping and ongoing assessment and adjustment for learning? An overview of differentiated instruction, clear learning goals, flexible grouping, and ongoing assessment for learning is presented in this review of pertinent literature. Professional learning communities are included in the literature review as well, in that much of the data collection for this quasi-experimental quantitative study occurred through this method.

Overview and Need for Differentiated Instruction

Differentiated instruction is a mindset regarding how we teach students. Further, it is a comprehensive instructional delivery model focused on student entry points. The concept of differentiated instruction was reflected in John Dewey's early 20th century research. Dewey stated,

> An educator must take into account the unique differences between each student. Each person is different genetically and in terms of past experiences. Even when a standard curricula is presented using established pedagogical methods, each student will have a different quality of experience. Thus, teaching and curriculum must be designed in ways that allow for such individual differences. (Neill, 2005, para. 5)

A one-size does not fit-all prescription for learning has been emphasized over the years (Heacox, 2002; Neill, 2005; Tomlinson, 1999, 2001, 2003; Tomlinson & Imbeau,

2010; Tomlinson & McTighe, 2006; Vygotsky, 1978; Washburne, 1953). As 21st century learners are exposed to public school systems, diversity is a common characteristic noted throughout primary, elementary, middle, and high school classrooms (Darling-Hammond, 2008). Meeting the needs of diverse learners is a challenge when considering ethnicity, learning disabilities, economic disadvantage, and giftedness (Darling-Hammond, 2007; Ford & Harris, 1999; Kozol, 2005; Mulroy & Eddinger, 2003).

A renowned educational and developmental psychology scholar, Vygotsky (1978), theorized that the learning process varies for each student in accordance with a social process. The zone of proximal development is, "the distance between the actual development levels as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). Differentiated instruction was born from the zone of proximal development as evidenced by other educators who have conducted field research, namely Tomlinson (1999; 2000; 2001; 2003; 2008).

To this end, Tomlinson and Allan (2000, p. 3) summarized that differentiated instruction is a teacher's reaction to students' learning styles, interests, and readiness levels. Teachers can distinguish what students learn (content), how they learn it (process), and how they measure what they have learned (product). Teachers differentiate content, process, and product through instructional elements or strategies such as clear learning goals, flexible grouping, and continuous assessment of students. Through these assessments, teachers adjust their instruction to meet the needs of different learners.

Differentiated instruction is capturing what is developmentally appropriate for each learner.

Subban (2006) explored differentiated instruction in a recent study: "While differentiation is acknowledged to be a compelling and effectual means of restructuring the traditional classroom to include students of diverse abilities, interests, and learning profiles, the philosophy is lacking in empirical validation" (p. 936). Combining the many factors that make up the philosophy of differentiated instruction such as student diversity, brain research, different learning styles, multiple intelligences, how students learn, the content that they learn, and how they make sense of this content, a need to effectuate institutional changes regarding this comprehensive strategy serves as a research rationale for this study (Subban, 2006, p. 937).

Closing the student achievement gap utilizing curriculum enrichment and differentiation in a manner similar to how the researcher conducted this quasi-experimental quantitative study was apparent in Beecher and Sweeny's (2008,) 8-year study. Essentially, the teachers who participated in this study created differentiated, enriched units of study. The units of study were created over a 1-week time period in the summer after the teachers received training on differentiation. Content, process, and product were emphasized throughout the training, and once the units were created individual lessons were planned based on meeting individual student needs. State achievement test results revealed an overall improvement in proficiency for all content areas. Specifically, "The gaps in achievement between students with differing socioeconomic status narrowed from 62% to 10%. All ethnic groups showed

improvement in their achievement, with Asian students making the largest gains at 60%, and white and Hispanic students gaining 5%" (Beecher & Sweeny, 2008, p. 525).

Another comprehensive study measuring the effects of differentiated instruction over time was conducted by VanTassel-Baskel et al. (2008). This study compared and contrasted teachers' behavioral changes as measured by an observation scale of differentiated teaching strategies. A group of 71 teachers in six heterogeneous Title 1 schools participated in professional development activities and created and implemented research based units of study. Several conclusions were drawn from this study inclusive of participating teachers in the study continuing to use higher levels of differentiated instructional practices over a control group that were not exposed to this 3-year exposure to professional development. Using various observational tools comparing and contrasting the groups, "There was a statistically significant treatment effect favoring experimental teachers' overall instructional behavior, F (1,23) = 14.79, $p < .01$ The magnitude of behavioral differences between veteran experimental and comparison teachers was large…" (p. 305). Likewise, "Increasing levels of student engagement corresponded to teachers' competency in using differentiation strategies, suggesting that experimental teachers' improvement in instructional competence directly affected student classroom engagement" (Van Tassel-Baska et al., 2008, p. 303). This was measured by "the Pearson product-moment correlation coefficients, which showed a statistically significant and positive relationship in Year 1 (.62-.68), Year 2 (.63-.75), and Year 3 (.49-.46)" (Van Tassel-Baska et al., 2008, p. 303). Also, the study supported the need for two consecutive years of professional development to measure teacher changes and a sustained need of support towards implementation of the curriculum. A major implication

for this study includes "the need for monitoring implementation…Thus, formal means of classroom observation remains a critical component of judging the results of professional development" (Van Tassel-Baska et al., 2008, p. 307). These findings were in part the impetus for this researcher to implement a long-term plan of action for professional development in the Anytown Township School District. Consequently, the remaining parts of the differentiated instruction literature review have revolved around teachers and "whom they teach (students), where they teach (learning environment), what they teach (content), and how they teach (instruction)" (Tomlinson & McTighe, 2006, p. 2). Examining each is paramount to understanding the variables that impact student achievement levels.

Content, Process, and Product Differentiation

Content is what teachers teach. The development of content is often influenced by the State Department of Education and national organizations such as the Council of Chief State School Officers (CCSSO) and the National Governors Association Center for Best Practices (NGA Center).

At the local level, "Understanding by Design focuses on what we teach and what assessment evidence we need to collect. Its primary goal is delineating and guiding application of sound principles of curriculum design" (Tomlinson & McTighe, 2006, p. 2). Within this design, teaching for understanding results in students establishing connections to big ideas, acquiring enduring understandings, and answering essential questions. Application to the real world for each student maximizes teaching for understanding (Wiggins & McTighe, 2007, p. 283). Teaching for understanding is "broad-based….Teachers must focus on the concepts, principles, and skills that students

should learn….The content of instruction should address the same concepts with all students, but the degree of complexity should be adjusted to suit diverse learners" (Hall et al., 2011, para. 5).

When educators differentiate content, we can "adapt what we teach….We can adapt or modify how we give students access to what we want them to learn" (Tomlinson, 2001, p. 72). Accommodating varying student entry points through access to content can be achieved with multiple resources and literature, learning contracts, mini-lessons, graphic organizers, support systems, highlighting of materials, summaries of ideas, and peer and adult mentors (Mehan, Villanueva, Hubbard, & Lintz, 1996; Rose & Meyer, 2002; Tomlinson, 2001). Tomlinson identified three basic avenues for educators to deliver content to students: readiness levels, interest, and individual learning style (Tomlinson, 2001, p. 73).

As the content is introduced to the students, time and reflection are needed to comprehend. Process is usually "the doing" or the activity portion of a lesson and is to be relevant. Activities engage students through different learning modalities. Four of these modalities include auditory, kinesthetic, tactile, and visual. Regardless of the modality, the activities that teachers design should engage students at a higher level of thinking (Tomlinson, 2001, p. 80).

Marzano et al. (2001) supported research that focused on metacognition. Explicitly, some of the most effective activities to process information,

> Have a clearly defined instructional purpose, focus students squarely on one key understanding, cause students to use a key skill to work with key ideas, ensure that students will have to understand (not just repeat) the idea, help students relate new understandings and skills to previous ones, and match the students' level of readiness. (Tomlinson, 1999, p. 43)

Additional research in regard to making meaning of information that leads to higher levels of understanding, application, and synthesis has been documented in the area of the cognitive domain: coaching, higher level questioning, Socratic seminars, writing, reading, inquiry, and collaboration strategies (Bloom, 1956; Costa & Garmston, 2002; Israel, 2002; Wiggins, 2010). Evidence of making meaning from information emerges from the review of student work samples or products.

Products are activities that allow students to demonstrate what they have learned and how to apply this learning over a period of time. Products that teachers plan for their students to share should measure what they learned, what they understood, and how they are going to demonstrate this knowledge. Products are often differentiated based on a learner's readiness level, interests, and learning style. This level of engagement is geared toward teaching for understanding and the crossover to real life application (Tomlinson, 2001, p. 88).

Products are benchmarks for learning. Employing multiple intelligences to showcase the learning process is an essential component of a responsive classroom (Gardner, 1999a, p. 4; Gardner, 1999b, p. 77). Gardner defined intelligence as "the ability to solve problems or to create products that are valued within one or more cultural settings" (Gardner, 1999b, p. 34). There are nine intelligences that students can demonstrate their learning through: verbal/linguistic, mathematical/logical, visual/spatial, bodily/kinesthetic, musical/rhythmic, naturalistic, existential, interpersonal, and intrapersonal. Students can create appropriate products or solutions to demonstrate their learning such as keeping journals, solving puzzles, utilizing mind maps, performing skits,

singing, observing nature, participating in Socratic seminars, providing feedback, and writing "I" statements to keep records of their work.

Standardized testing is recognized as the ultimate product in the public school system, especially since the inception of the No Child Left Behind Act. "Content standards define the essential knowledge, understandings, and skills….Performance standards represent levels of performance defined in content standards that establish specific expectations and examples of what it means to be 'proficient' or 'adequate' in what is demonstrated by students" (McMillan, 2008, p. 3). The standards emerge from independent states, and more recently, a newly adapted national core of common standards have been adopted by different states throughout the nation (NGA Center/CCSSO, 2010). Additionally, Jackson and Davis (2000) recommend, "The teaching of a curriculum grounded in standards, relevant to adolescents' concerns, and based on how students learn best, and the use of a mix of assessment methods...use instructional methods that prepare all students to achieve high standards" (p. 25). How students learn best implies that the learning environment is rooted in developmental responsiveness; whereby, students' social-emotional needs are met.

Affect/Learning Environment

The learning environment is a key component of differentiated instruction. The foundation for effective teaching is the creation of an emotionally and physically safe environment in which caring and building relationships between teacher and students are foremost.

To meet the needs of each learner in the classroom, it is necessary to form relationships with each. The most effective teaching strategies will not yield the desired

results unless the teacher emotionally connects to the students. Treating students with respect and care perpetuates a safe emotional environment where students take risks and work their way through new explorations and experiences. A teacher in a differentiated classroom will respond to students in five distinct manners. The teacher will invite, invest, persist, opportune, and reflect on each student (Tomlinson, 2003, p. 28).

Tomlinson and Imbeau (2010, p. 85) referred to building a community in the differentiated classroom based on the concept of democracy. In his book, *A Reason to Teach*, Beane (2005) discussed "having a responsibility to care about the common good, dignity, and welfare of others" (p. 7). An extension of this point, a democratic teacher focuses on creating a democratic culture in the classroom. "A democratic culture is a culture of inquiry in which good questions are more important than easy answers, and when figuring out is more important than simply accumulating information" (Beane, 2005, p. 75).

The physical appearance of the classroom should be safe and appealing for each learner and visitor. Applicable to this concept, student exemplars should be displayed on bulletin boards and walls. Noteworthy artifacts and information about student interests are hallmarks of the differentiated classroom as well (Tomlinson & Imbeau, 2010, p. 96). Personalization of student work leads to greater relevancy and deeper understanding. "Your notebook is a room of your own. It encourages you to inhabit the first person pronoun fully and without apology" (Fletcher, 1996, p. 3). An extension of this concept, student readiness is monitored and evaluated in accordance with the students' affect in the present learning environment.

Readiness, Interest, and Learning Profile

Brain research studies have shown that students learn best when challenged or assigned work that is slightly above their comfort level (Brandt, 1998; Sousa, 2006; Wolfe, 2010). Students who continue to practice the same skills and apply the same concepts that have been previously mastered will not grow intellectually. Conversely, when skills and concepts are beyond a student's readiness level, the student becomes frustrated or gives up. Learning does not occur in this particular classroom environment (Tomlinson & McTighe, 2006, p. 180).

"Readiness is a student's entry point relative to a particular understanding or skill" (Tomlinson, 1999, p. 11). Tomlinson identified eight areas serving as an "equalizer" permitting teachers to differentiate by taking varying student entry points into consideration. The eight areas are: 1) Moving information, ideas, materials, and applications from foundational to transformational; 2) Helping students take ideas and applications from the concrete to the abstract; 3) Utilizing resources, research, issues, problems, skill, and goals from simple to complex; 4) Looking at directions, problems, applications, solutions, approaches, and connections from their own point of view to multiple points of view; 5) Helping students take a small jump with their applications, insights, and learning for transfer to a greater level; 6) Moving solutions, decisions, and approaches from structured to more open; 7) Shifting the learners' responsibility for acquiring and making sense of new content from less dependent to more independent; and 8) Having students move from slow to fast on challenging subject matters (Tomlinson, 2001, p. 47). The "equalizer" speaks to students establishing connections to concepts, which in turn, heightens interest and cognitive engagement.

Piaget (1978) conducted experiments on the topic of cognition and learning with children aged 5 to 12 by providing them with tasks to complete involving physical relationships or mechanisms. He interviewed the children after the completion of these tasks and among other conclusions discovered, "Motivation to learn increases when we feel a kinship with, interest in, or passion for what we are attempting to learn" (Piaget as cited in Tomlinson, 2001, pp. 8-9).

Students make sense of content when it is relevant to their own lives. Tangentially, Kauchak and Eggen (1998) delineated the process by which people assemble new learning through constructivism. "Constructivism is a view of learning in which learners use their own experiences to constuct understandings that make sense to them rather than having understandings delivered to them in already organized form" (p. 184).

"Everyone tends to filter input, organize information, and experience and ask questions according to what they are interested in and care about" (Caine & Caine, 2010, p. 171). Interest is described as "that which engages the attention, curiosity, and involvement of a student" (Tomlinson & Imbeau, 2010, p. 16). Tomlinson identified specific research-based instructional strategies that can be utilized in a differentiated classroom such as: i-Search, orbitals, design-a-day, group investigation, webquests, jigsaw, literature circles, and mentorships (Tomlinson, 2001, pp. 58-59). Overall, student interest is directly related to each student's learning profile.

Tomlinson and Imbeau (2010) recognized learning profile as "a preference for taking in, exploring, or expressing content" (p. 17). The profile of each learner is a

unique combination of gender, culture, intelligence, and learning style. Glickman, Gordon, and Ross-Gordon (2007) addressed intelligence in their text:

> Horn and Cattell (1967) identified two categories of intelligence: fluid and crystallized. Fluid intelligence…peaks early and explains why youth excel on tasks requiring quick insight, short term memorization, and complex interactions (Merriam & Caffarella, 1999)….Crystallized intelligence, assessed by untimed measures calling for judgment, knowledge, and experience, is more heavily influenced by education and experience. (p. 52)

Learning styles and profiles have been validated by several researchers (Claxton & Murrell, 1987; Coffield, Mosely, Hall, & Ecclestone, 2004). For example, Claxton and Murrell (1987) examined differences in personalities, information processing, social interaction, and instructional methods in college students. Different models have been developed to measure individual learning styles through inventories such as the Kolb Experiential Learning Model (Kolb, 1984), the Gregorc Learning Style Model (Gregorc, 1979), the Felder and Silverman Learning Style Model (Felder & Silverman, 1988), the VARK Model (Fleming, 2001), the Dunn and Dunn Model (Dunn & Dunn, 1989), and the RASI Model (Duff, 2004). These models can be utilized by teachers to pre-assess learning profiles and design clear learning goals within a unit of study.

Clear Learning Goals (KUDs)

Teachers differentiate content, process, and product through instructional elements or strategies such as clear learning goals, flexible grouping, and continuous assessment of students. "Differentiation calls for teachers to have clear learning goals rooted in content standards but crafted to ensure student engagement and understanding" (Tomlinson, 2008, p. 26). Wiggins and McTighe (2005,) extended this thought in their description of understanding as transferability: "Knowledge and skill, then, are necessary elements of understanding, but not sufficient in themselves…. Transfer involves figuring out which

knowledge and skill matters here and often adapting what we know to address the challenge at hand" (p. 41). As well, Wiggins and McTighe (2005, pp. 161-166) identified six facets of understanding: explaining, interpreting, applying, having perspective, emphasizing, and possessing self-knowledge.

A comprehensive study of 24 Chicago public school classrooms (Newmann, Bryk, & Nagaoko, 2001, p. 23) yielded the effects of assignments that included higher-order thinking skills, problem solving, and authentic assessments to promote deeper levels of understanding as measured by standardized test scores in the state of Illinois. The assignments were analyzed with the Many-Facet Research Analysis (MFRA). In classrooms where higher-level assignments were utilized, students' standardized test scores were 20 percent higher than the national average, and in classrooms where lower level assignments were utilized, students' standardized test scores were 20 percent lower than the national average.

Clear learning goals, or KUDs, represent what students are to know, understand, and be able to do. Within a unit of study, what students are to know includes the gains each makes from the learning process measurable by lesson objectives. What students are to understand within a unit of study is the conceptual component of the unit as it relates to making connections to the real world and extending the notion of relationships and critical thinking. Lastly, the actual skills students are to master in a unit of study are what students are to do. When combined, what students are to know, understand, and be able to do leads to academic rigor (Wormeli, 2006, p. 23).

Metacognition refers to a student's capacity to critically think about his/her thinking. Brown and DeLoache (1978) concluded that students are capable of metacognition if self-aware:

> Young children's insensitivity to problem solving potential is the lack of exposure to such situations, rather than age per se, for the same problems that beset the very small problem solver can often impede effective thinking in the adult novice. (p. 31)

Reinforced by Quint, Thompson, and Bald (2008), academic rigor is "a demanding yet accessible curriculum that engenders critical thinking skills as well as content knowledge" (p. 38). "The lesson learned from studies of transfer is that if you want students to learn something teach it to them. Don't teach them something else and expect them to figure out what you want them to do" (Detterman & Sternberg, 1993, p. 21).

In order to effectively differentiate curriculum, instruction, and assessment, learning goals must be clear. Tomlinson (1999) recommended learning goals to be stated in a KUD format; whereby, learning goals are articulated in terms of what we want students to know, understand, and be able to do as a result of a lesson or unit of study. The know goals consist of facts and procedural knowledge such as know the steps in solving the quadratic equation or know the names and locations of all continents and major bodies of water. The do goals consist of skills and are transferable to other contexts such as write persuasively for a given topic and specified audience or compare and contrast similarities and differences of two civilizations. The understand goals consist of big ideas and enduring understandings, or generalizations, and are also transferable to other contexts (e.g., time, cultures, situations). Understand goals shape the details providing the answers to the questions: So what? Who cares? Why do we study the things

we study? Two or more concepts are typically linked to the understand goals, and the know goals and do goals are developed to assist students with unpacking the understand goals (Kumpost, 2009, p. 1).

The National Research Council (2000) distinguished between understanding and memorization:

> Learning with understanding is more likely to promote transfer than simply memorizing information from a text or a lecture. Many classroom activities stress the importance of memorization over learning with understanding. Many, as well, focus on facts and details rather than larger themes of causes and consequences of events. The shortfalls of these approaches are not apparent if the only test of learning involves tests of memory, but when the transfer of learning is measured, the advantages of learning with understanding are likely to be revealed. (p. 236)

Erickson (2002) cautioned educators on addressing understandings: "Unless teachers consciously identify these understandings, they focus on the fact-based content as the endpoint in instruction, and the conceptual level of understanding usually is not addressed" (p. 49). In a study concerning responses to test items, Nuthall and Alton-Lee (1995, p. 219) verified that teaching for understanding, rather than rote recall, results in better long-term retention.

With a focus on 21st century learning, a coherent curriculum is a vehicle by which to provide students with content knowledge and conceptual understanding (Darling-Hammond, 2007, 2008; Erickson, 2002). "Deep, essential understandings are the key principles and generalizations that develop from a fact base" (Erickson, 2002, p. 47). Educators should be cautious of an overemphasis on the performance standards or the know goals and the do goals as these sometimes do not align with the enduring understandings. The assessments must be creative and differentiated so that each

student's strengths can be measured against the respective standard (Erickson, 2002, p. 67).

Marzano (2006) reported data from a synthesis study that measured the results of over 204 studies on the general effects of setting goals or objectives. Referring to this study, Marzano (2006) deduced, "The most basic issue a teacher can consider is what he or she will do to establish and communicate learning goals" (p. 10). However, this synthesis study revealed only a .12 average effect size on student achievement for elementary through adult students as measured by behavioral objectives for instruction (Lypsey & Wilson, 1993, p. 1,187).

Equally as essential, Perkins (1991, pp. 6-7) reviewed three strategies for insightful teaching. Perkins focused on applying mental models, coaching understanding performances, and teaching for transfer. Applying mental models, teachers have students communicate what it is in their minds' eyes for an assigned topic or task. By gathering this information, teachers can adjust the model for the desired result. Coaching understanding performances, teachers identify the desired behaviors and have students repeat them. Teaching for transfer, teachers guide students in forging connections to the real world, to other content areas, and to other aspects of the curriculum. These three strategies can be incorporated into the same primary, elementary, middle, and/or high school classroom with or without flexible grouping.

Flexible Grouping

Teachers differentiate content, process, and product through instructional elements or strategies such as clear learning goals, flexible grouping, and continuous assessment of students. Tomlinson (2001) indicated in flexible grouping:

> Students are part of many different groups and also work alone…. Teachers may create skills-based or interest-based groups that are heterogeneous or homogeneous in readiness level. Sometimes students select work groups, and sometimes teachers select them. Sometimes student group assignments are purposeful and sometimes random. (p. 102)

Westberg and Archambault (1997, p. 44) also confirmed the value of flexible grouping as impacting the classroom teacher's effective use of the differentiated instructional delivery model. "A hallmark of an effective differentiated classroom, by contrast, is the use of flexible grouping, which accommodates students who are strong in some areas and weaker in others" (Tomlinson, 2001, p. 3).

One 1996 meta-analysis steered the review of the effects flexible grouping have on learning in elementary classrooms. In the meta-analysis, whole group instruction, small group instruction, and within-class instruction were studied. Pertaining to within-class instruction, teachers grouped their students for part of the daily class content, part of the school year, or part of an individual lesson. Students were assigned to groups based on readiness levels, student interests, and/or learning profiles in addition to how students interacted with each other. Integral findings for the Lou et al. (1996) meta-analysis included:

> Within-class grouping appears to be a useful means to facilitate student learning, particularly in large classes…. The best within-class grouping practices combine the physical placement of students into groups with the adaptation of instruction methods and materials for small-group learning. (p. 451)

Analogous to the results of this meta-analysis, Unsworth (1984) acknowledged key principles for flexible grouping in the areas of group composition, group management, and group task design. "Group membership is not fixed; it varies according to needs and purposes…. Pupil commitment is enhanced if students know how group

work is related to the overall program…. Task structure is appropriate to the needs and interests of pupils" (p. 300).

Summarily, "Using instructional groups can help teachers alter one-size-fits-all curriculum to validate students' readiness and ability levels and ensure that all students feel appropriately challenged and motivated" (Fogarty, 2004, para. 29).

Teachers who employ differentiated instructional elements or strategies emphasize planning their units of study and daily lessons. Within this planning, teachers should map their lessons to incorporate varying flexible grouping experiences related to content, process, and product. In a classroom that has many different levels of learners (mixed-ability), the use of flexible grouping assists with the elimination of student insecurity and low self-esteem. In addition to flexible grouping being an effective instructional element or strategy, if effectively executed, a respectful classroom culture responsive to meeting the needs of each learner will emerge (Tomlinson, 2001, p. 26). Of particular importance, Parker (2004) suggests,

> While ability grouping is good for the classroom, there are other ways of grouping students so that students are less concerned with feeling stigmatized and more concerned with the learning. More often than not, always using the same grouping technique can lead to negative feelings, stigmatism, lack of appropriate instruction, boredom, and behavior problems in the classroom. Flexible grouping can change the environment daily, making it more interesting. It takes away the negative feelings and stigma of the struggling students because groups are always changing. No longer are the low ability students in the same group. (p. 32)

Kulik and Kulik (1992, pp. 73-77) also coordinated a meta-analysis for flexible grouping configurations in 11 different studies involving elementary schools. These researchers studied different forms of grouping including multilevel classes, cross-grade programs, within-class (flexible grouping), enriched classes for gifted and talented, and accelerated classes. The conclusions drawn regarding within-class flexible grouping were

that these classrooms had certain characteristics common to them: 1) In within-class flexibly grouped classrooms, different materials and work were provided for each group of students within the same classroom; 2) The classrooms in the study were primarily reading and mathematics in orientation; and 3) The flexible grouping occurred within the same classroom in this meta-analysis. Nine of the 11 classrooms in the study had an overall higher student achievement rate when flexible grouping was utilized.

Flexible grouping has its place in the area of inclusive education and the least restrictive environment as well. Power-deFur and Orelove (1997, p. 18) encouraged three key ingredients when implementing flexible grouping in a classroom with special needs students. The recommendation was for the teacher to consider the reason for the grouping, how each group is put together, and what educational materials will be used within the group tasks.

Universal Design Learning (UDL) is another format in which the concept of flexible grouping is the cornerstone (Hall et al., 2011). UDL is rooted in flexible approaches to guide and develop curriculum that is appropriate for every student. Flexible grouping plays an important role in this model for learning designed by the National Center on Accessible Instructional Materials. Hall et al. (2011) referenced this organization's conceptualization of flexible grouping within the UDL model:

> Flexible grouping is consistently used. Strategies for flexible grouping are essential. Learners are expected to interact and work together as they develop knowledge of new content. Teachers may conduct whole-class introductory discussions of content big ideas followed by small group or paired work. Student groups may be coached from within or by the teacher to complete assigned tasks. Grouping of students is not fixed. As one of the foundations of differentiated instruction, grouping and regrouping must be a dynamic process, changing with the content, project, and ongoing evaluations. (para. 12)

While the literature review for flexible grouping has revealed a correlation between using within-class grouping in the differentiated instructional models, the topic of grouping has been one of controversy (Kulik & Kulik, 1992; Slavin & Karweit, 1985). Much of the controversy has stemmed from the damage of grouping by ability, homogeneous versus heterogeneous, particularly as it pertains to gifted and talented students. Parents and advocates of gifted education have argued that the general classroom structure does not meet the academic needs of these students. Among the supports for this argument is that grouping for the sake of grouping does not positively impact student achievement. Some results demonstrate improvement in student achievement relative to flexible grouping while other results demonstrate significant improvement in student achievement primarily due to the attitudes of the teachers who create and implement these activities in the classroom rather than the flexible grouping itself (Allan, 1991; Slavin, 1988).

Tomlinson (2001, p. 102) suggested guidelines for teachers to refer to when enacting flexible grouping in their classrooms. Among these guidelines is the assurance that every learner works cooperatively, collaboratively, and independently on tasks designed based on the pre-assessment or teacher knowledge of student entry points.

Assessment and Adjustment for Learning

Teachers differentiate content, process, and product through instructional elements or strategies such as clear learning goals, flexible grouping, and continuous assessment of students. The link between assessment for learning and educational practices is prevalent in our schools today (Black, Harrison, Lee, Marshall, & William, 2004; Marzano et al., 2001; McTighe & O'Connor, 2005; Tomlinson & Imbeau, 2010).

Assessment for learning strategies can be divided into three categories, pre-assessment or diagnostic assessment, formative assessment or ongoing assessment, and summative assessment. Pre- or diagnostic assessment for learning precedes instruction and guides a teacher in crafting instructional activities. Formative or ongoing assessment for learning occurs while instruction is being provided and keeps the teacher abreast of the learning process, which allows for reteaching and adjusting instruction when appropriate. Typically, pre- or diagnostic assessments and formative or ongoing assessments are not graded and are primarily utilized to inform instructional decisions. Summative assessments for learning are standards-based and can be differentiated to allow each student to demonstrate what he/she knows, understands, and is able to do (McMillan, 2008; Tomlinson & Imbeau, 2010).

The Assessment Reform Group (2002) conceived assessment for learning as "the process of seeking and interpreting evidence for use by learners and their teachers to decide where the learners are in their learning, where they need to go, and how best to get there" (p. 2). With respect to additional field research, Mansell, James, & Group (2009) listed 10 principles that guide assessment for learning:

1. It should be part of effective planning.
2. It should have a focus on how students learn.
3. It should be a central part of classroom practice.
4. It should be considered a key professional skill by teachers and administrators.
5. When being delivered to students, it should be both sensitive and constructive.
6. It should foster motivation.
7. It should promote an understanding of goals and criteria.

8. It should help learners know how to improve.

9. There should be a component of self-assessment by the students.

10. It should recognize all educational achievement (p. 10).

Summarizing Stigins (2002), the use of assessment for learning increases the likelihood students will invest in lifelong learning. There is to be continual adjustment of instruction based on formative assessments administered, and the students are to be communicating with their teacher about their learning. McTighe and O'Connor (2005) noted seven practices for effective assessment for learning, including: using summative assessments as a way of creating meaningful performance goals, creating rubrics that demonstrate criteria ahead of the learning, being responsive to each student, allowing each student to demonstrate learning through different modalities, and allowing new achievement levels of students to replace a one-size fits-all model for meeting criteria (pp. 10-17).

Counterproductive to this type of assessment is the concept of averaging and grading (Marzano, 2006). Test taking and averaging have been studied for many years (Magnusson, 1966). Magnusson (1966) explained the concept of averaging as a preferred method to assessing because in theory finding the central tendency through arithmetical averaging will reduce random errors. The history of schooling has been driven by this mindset, and recent research has suggested this mindset be shifted (Black et al., 2004; Black & William, 1998, 2001). Essentially, the continual growth implicit in assessment for learning contradicts averaging (Marzano, 2006, p. 148).

> The aim of assessment is primarily to educate and improve student performance, not merely to audit it…. Once assessment is designed to be educative, it is no longer separate from instruction; it is a major, essential, and integrating part of teaching and learning. (Wiggins, 1998, pp. 7-8)

Fuchs and Fuchs (1986) managed a meta-analysis of 21 controlled studies of curriculum-based formative assessment delivered to students. The results yielded an average .70 increase in student achievement from the frequent use of formative assessment. In addition, the results indicated that formative assessment was closely aligned with teacher decisions about instruction and would therefore produce a higher level of effectiveness in executing instructional practices (p. 199).

Several other researchers have drawn similar conclusions regarding the power of constructive and meaningful student feedback (Bangert-Downs, Kulik, Kulik, & Morgan, 1991; Black & William, 1998). To this point, Marzano (2006) suggests, "When students receive feedback on a classroom assessment that simply tells them whether their answers are correct or incorrect, learning is negatively influenced" (p. 5).

Ongoing assessment and adjustment for learning was further examined by Tomlinson, Brimijoin, and Navarez (2008) as it applies to differentiated instruction:

> The teacher who emphasizes assessment to inform instruction understands that only by staying close to student progress can he or she guide student success. Assessment to inform instruction looks, sounds, or feels like the following: systematically observing students at work; using pre-assessments to understand students' starting points including status or precursory skills; using ongoing assessments to trace student progress and identify trouble spots; asking students to share interests; listening and looking for student interests; asking students about learning preferences; observing students working in different contexts and modes; asking students what is working for them and what is not; acting on student suggestions; and using assessment information to plan for reteaching, teaching in a different mode, extending understanding, developing tasks, modifying time expectations, and so on. (pp. 7-8)

The curricular model, Understanding by Design, includes ongoing assessment for learning at different stages of unit design and study. "Assessment should be designed to provide ongoing, useful feedback, to both students and teachers, on what students have

learned. This feedback should be used to improve teaching and learning progressively, not just to audit a student's performance" (Wiggins, 1998, pp. xi and xiii).

Black and Williams (1998) support the notion that formative assessment raises standards. Each also identified that formative assessment practices need to be improved and provided suggestions on how to improve them. In their report, one of the conclusions shared with the public was that many current formative assessments are based on rote learning and grading policies, which in turn, do not provide the right feedback to students (Black & William, 2001, p. 3). This is problematic as appropriately "high-quality assessments should guide students in understanding essential learning outcomes, their status relative to those outcomes, and ways in which they can work effectively to maximize their growth toward and beyond those outcomes" (Tomlinson & Imbeau, 2010, p. 21).

Professional Learning Communities

To support learner outcomes, two pillars of this quasi-experimental quantitative study were leadership and change. Effectuating second order change requires transformational leadership, and specific to this quasi-experimental quantitative study setting, professional learning communities have presented an opportunity for the researcher to marry the two relative to differentiated instruction. DuFour, DuFour, Eaker, and Many (2010) introduced a professional learning community as "an ongoing process in which educators work collaboratively in recurring cycles of collective inquiry and active research to achieve better results for the students they serve" (p. 11). Further,

> The three critical elements of great professional development are relaxed alertness as the optimal state of mind in individuals and community, the orchestrated immersion of learners in complex experience in which the content is embedded, and the act of processing of experience. (Caine & Caine, 2010, p. 20)

For professional learning communities to be effective, central office leaders must model collaboration, collective inquiry, and a results-orientated approach. A balance of accountability and autonomy permeated the research of DuFour, DuFour, Eaker, and Karhanek (2010):

> The idea that an entire staff has a collective responsibility to ensure all students acquire agreed upon essential knowledge, skills, and dispositions; that student learning must be monitored on a timely, ongoing basis using common methods of assessment; and that a school must have a plan for providing struggling students with additional time and support for learning on a timely, directive, and systematic basis has been at the heart of our work for a decade. (p. 20)

More to these points, DuFour, DuFour, Eaker, and Karhanek (2010) articulated, "Collaboration will impact student achievement in a positive way only if the co-laboring and collective inquiry focus on the right work" (pp. 33-35). A springboard from this statement, four key questions that frame the purpose of professional learning communities were raised by these researchers: 1) What is it we want our students to learn? 2) How will we know if each student is learning each of the skills, concepts, and dispositions we have deemed essential? 3) What happens in our school when a student does not learn? 4) What happens in our school when students already know it?

In addressing these key questions concerning student achievement, reform has ensued in the public school system. Louis and Marks (1998) conceded,

> School reform efforts have focused on the development of professionally enriching work groups for teachers as a vehicle for improving student achievement. This study examines the impact of school professional community on the intellectual quality of student performance (assessed using authentic measures) and on two dimensions of classroom organization, the technical (measured as authentic pedagogy) and the social (measured as social support for achievement). Employing quantitative (multilevel) and qualitative analytic methods, we show that in 24 nationally selected, restructuring elementary, middle, and high schools, professional community is strongly associated with these dimensions of classroom organization. Both professional community and social support for achievement have a positive relationship to student performance, but

> the strength of their association with authentic pedagogy accounts for that effect. (p. 532)

"Authentic pedagogy and authentic student achievement…are closely linked; that is, the measure of achievement is linked to assessment tasks prepared by a teacher whose score on the quality of that task is a component of the authentic pedagogy construct" (Louis & Marks, 1998, p. 551). Overall, the findings of the Louis and Marks (1998, p. 558) study demonstrated that professional learning communities had a positive impact on student achievement.

Questionable is the relevance of standardized testing as a student achievement measure when structuring and evaluating professional learning communities. DuFour, DuFour, Eaker, and Karhanek (2010) discuss these considerations:

> The motivation behind NCLB legislation has been widely debated. Proponents portray the initiative as a sincere attempt to guarantee that every child particularly poor and minority students receive an education that leads to high levels of learning…. Although President Obama has been critical of some of the specific applications of NCLB and the way in which it has been funded, he has repeatedly said the goals of the legislation are correct and that the nation's commitment to helping all students learning at high levels must not be diminished. (p. 16)

Waddell and Lee (2008) offer a reflective and pertinent synopsis:

> Becoming a professional learning community requires careful attention to both the technical dimension of professional practice as well as the human dimension of authentic engagement. As the staff met to review state summative achievement data, we agreed that our conversation was not about assigning blame but about owning the achievement of our students. With that understood, we took an honest look at the data. (p. 19)

Vescio, Ross, and Adams (2008) concur:

> In summarizing the findings across the literature review, participation in learning communities impacts teaching practice as teachers become more student-centered. In addition, teaching culture is improved because the learning communities increase collaboration, a focus on student learning, teacher authority or empowerment, and continuous learning…. When teachers participate in a learning

> community, students benefit as well as indicated by improved achievement scores over time. (p. 88)

With much of second order change contingent upon challenging norms embedded in a given school culture, Andrews and Lewis (2002) remind, "Educators must be empowered prior to adoption of the program, as well as during the change process. Establishing a stable, committed cadre of teachers is the first step to successful program implementation" (p. 239). Applicability is a factor too. "It is all well and good to attend conferences and workshops and to talk and think about ideas, but it is another thing altogether to be able to use those ideas appropriately in the field and in the classroom" (Caine & Caine, 2010, p. 4). The Andrew and Lewis (2002) study exemplified this notion:

> Interviews recorded the perception of teachers toward change in their approach to meeting student learning needs. At this stage, evidence is limited to their perceptions of this impact on their classroom work: …'I am putting into practice the things that I have thought for a long time that I have got to start letting students have more choice and more freedom in their actual curriculum to negotiate a lot more with how they do things, instead of just saying here it is, we are going to do it this way, my way, we need to have a lot more interaction with the students…treat them like young adults.' (p. 250)

Noteworthy and also included in the Andrew and Lewis (2002) study, "We learned increasing respect for difference in practice – in things that are important to different teachers in different departments, [and] about what they are thinking and why, and the implications of that" (p. 245). A Parise and Spillane (2010, p. 339) study provided a complementary view. Job-embedded professional development opportunities was the strongest predictor of change of teacher instructional practices. Much of the collaborative discussion was centered on content directly related to the respective teaching practices.

Ultimately, professional learning communities are predicated on people and collaboration. Snow-Gerono (2005) affirmed,

> The teachers in the study share understandings of traditional school structures that perpetuate isolationism among colleagues; however, they identify community and access to people as necessary for cultivating an inquiry stance toward teaching…. The PDS teachers in the study also discussed collaboration and professional learning community in terms of the creation of safe environment to question personal and public education practice and policy…. Teachers with an inquiry stance work best in environments where they may question and follow their attitude of openness to uncertainty and change. (pp. 244-249)

A culture of inquiry begets the nexus to differentiation. Fogarty and Pete (2010) synthesize:

> While all classroom teachers differentiate instruction in some fundamental way, the challenge is in developing reflective teachers who can identify what to differentiate, how to differentiate it, and to explain why to differentiate it. A PLC provides the structure for those all important collegial conversations that support foundational questions and critical decisions about differentiating classroom instruction. (p. 2)

Effective leadership perpetuates a culture of inquiry. "The quality of teaching, learning, and relationships in professional learning communities depends on the quality of leadership provided by principals and teachers" (Sparks, 2005, p. 156). Sparks (2005) further postulates,

> In *The Cycles of Leadership: How Great Leaders Teach Their Companies to Win*, Noel Tichy (2002) describes the leader's role in such organizations: 'Teaching is the most effective means through which a leader can lead' (p. 57). He adds: 'Everyone in the organization is expected to be constantly in a teaching and learning mode…. True learning takes place only when the leader/teacher invests the time and emotional energy to engage those around him or her in a dialogue that produces mutual understanding. (pp. 164-165)

Parise and Spillane (2010) state,

> School leaders who endorse knowledge sharing among teachers and create internal structures that promote collaboration are most effective at fostering change within their schools…. School leaders who communicate clear expectations to teachers and concrete goals for student achievement can

> encourage teachers to improve their practice (p. 328). This is not to say that school leaders can easily compel teachers to engage in productive collaboration, as some collaboration may increase conflict, but they may use different strategies to shape teachers' schedules and promote activities that have been shown to cultivate productive teacher collaboration, such as teaming and appointing team leaders…. Coaches may play an important role in facilitating teachers' on the job learning opportunities. (p. 340)

Fogarty and Pete (2010) surmise, teacher leadership is a shared process within the professional learning community in order to promote comfort and ongoing interactions (p. 5).

Summary and Summary of Remaining Chapters

An overview of differentiated instruction, clear learning goals, flexible grouping, and ongoing assessment for learning has been presented in this review of pertinent literature. Professional learning communities were included in the literature review as well in that much of the data collection for this quasi-experimental quantitative study occurred through this method.

In Chapter 3, the methods for data collection and analysis are detailed for this quasi-experimental quantitative study for the association between differentiated instructional elements or strategies and student achievement levels. The results or findings of a series of descriptive and parametric inferential statistics are analyzed in Chapter 4 to determine statistical significance and to unearth the association between each differentiated instructional element or strategy and student achievement levels. In conclusion, this researcher expands upon leadership and second order change for the purpose of having this quasi-experimental quantitative study evolve into a model differentiated classroom for each primary, elementary, middle, and high school teacher, and administrator.

Chapter 3

Methodology

Overview

> Just making the decision to collect data to answer a question, to provide the basis for taking action, or to improve a process is a key step. Once that decision has been made, an important next step is to develop a statement of purpose that is both specific and unambiguous. (Johnson & Bhattacharyya, 2006, p. 14)

The purpose of this quasi-experimental quantitative study was to determine whether the creation of units of study employing components of the curricular model Understanding by Design and components of the instructional delivery model of differentiated elements or strategies had a significant effect on student achievement as measured by change score from a teacher created pretest to posttest over a period of time.

The essence of shifting from a system of schools to a school system due to a lack of consistent curricular and instructional practices from school to school was a driving force in this quasi-experimental quantitative study. Also, the purpose of this quasi-experimental quantitative study was to determine if student achievement was impacted by three elements or strategies of the differentiated instructional delivery model, clear learning goals, flexible grouping, and ongoing assessment and adjustment for learning, with student achievement measured via the differences between student pretest and posttest data at the primary, elementary, middle, and high school levels. Recognizing the perceived need to establish differentiated classrooms across the Anytown Township School District, this researcher's preliminary work included an audit of evaluative practices undergone by district leaders as well as self-reflection as a former district principal. The audit was based on informal discussions and observations, which guided

the focus of the researcher's work. In essence, the researcher was able to determine the entry points of the teacher participants' and district administrators' pertaining to knowledge and understanding of differentiated instruction. Recommendations from the audit will be addressed as next steps for the district in Chapter 5.

Fostering this vision is in its infancy in many school districts inclusive of the Anytown Township School District. "The basic intent of an experimental design is to test the impact of a treatment (or an intervention) to an outcome, controlling for all other factors that might influence that outcome" (Creswell, 2009, pp. 145-146). Therefore, the treatment of differentiated instructional elements or strategies for student achievement prompted the use of a quasi-experimental quantitative study.

As such, the teacher participants whose student data were used in this quasi-experimental quantitative study attended a week-long professional development conference over the summer. The teachers were charged with creating a unit of study limited to between three and six weeks in length. Creswell (2009) suggested to "report the descriptive statistics calculated for observations and measures over time at the pretest or posttest stage of experimental designs. These statistics are the mean, the standard deviation, and the ranges" (p. 166). "Measures of cental tendency are values that represent a typical member of the sample of population….The mean is the most powerful measure of central tendency" (Cronk, 2008, pp. 21-22). Means are measured on interval scales. In the case of this quasi-experimental quantitative study, the interval scales or ranges were 1-100 on the teacher pretest and posttest scores. *T*-tests compare the means of two sample groups. Additionally, the standard deviation measures the variability of the range of scores in the pretest and posttest results. Patten (2001) specified, "If the mean

has been selected as the average, use the standard deviation as the measure of variability" (p. 99). Pretest and posttest results were reported by teachers at the primary, elementary, middle, and high school levels.

To examine the hypotheses in this quasi-experimental quantitative study, descriptive and parametric inferential statistics were employed. "For experimental designs with categorical information (groups) on the independent variable and continuous information on the dependent variable, researchers use *t*-tests or univariate analysis of variance (ANOVA)" (Creswell, 2009, p. 167). Conceptually, the ANOVA led to the determination that over time differentiated instructional elements or strategies had a statistically significant impact on student achievement as measured from pretests and posttests. Within the ANOVA, the *F* test accounted for the differences between the means, which assisted the researcher in understanding the strength of the relationship between scores. For this quasi-experimental quantitative study, the groupings (i.e., primary, elementary, middle, and high school classes) were the independent variable, and the pretest and posttest scores were the dependent variable. Both a one-between one-within ANOVA and repeated measures ANOVA were utilized to compare and contrast the means for the different groupings in order for the researcher to address overarching research question 1 and ancillary research questions 1, 2, 3, and 4.

"To obtain a useful prediction model, one should record the observations of all variables that may significantly affect the response….The name multiple regression refers to a model of relationship where the response depends on two or more predictor variables" (Johnson & Bhattacharyya, 2006, p. 481). Captured in the multiple regression model, statistical significance or "the extent to which a difference or a relationship exists,

judged against the likelihood that it would happen just by chance alone" (Remler & Van Ryzin, 2011, p. 534) was examined through the predictors of student achievement. In this quasi-experimental quantitative study, the predictors analyzed were: (1) clear learning goals – total amount of minutes the teacher verbally and nonverbally communicated clear learning goals during the respective unit of study; (2) flexible grouping – total amount of minutes the students spent working in flexible group activities during the respective unit of study; and (3) ongoing assessment and adjustment for learning – total amount of minutes the students spent engaged in various forms of assessments during the respective unit of study. The dependent variable consisted of teacher created pretests and posttests based on the Anytown Township School District's language arts literacy or mathematics curriculum and the NJCCCS. A multiple regression model was utilized to address overarching research question 2. A "simple linear regression was used to allow the prediction of one variable from another" (Cronk, 2008, p. 45). A simple linear regression model was utilized to address ancillary research question 5.

In conclusion, this researcher discussed the leadership and change frameworks that are the foundation of this quasi-experimental quantitative study evolving into a model differentiated classroom for each primary, elementary, middle, and high school teacher and administrator. By sustaining the structure of professional learning communities, this researcher will upon the research findings from this quasi-experimental quantitative study, further develop units of study that blend the intersection of Understanding by Design and differentiated instruction. This researcher will initially model this professional development for teachers and then transition the responsibility to building level administrators.

Quantitative Research Design

The research design for this study was quasi-experimental and included a student convenience cluster sampling. Two overarching research questions and five ancillary research questions guided this quasi-experimental quantitative study.

> The subject of statistics provides the methodology to make inferences about the population from the collection and analysis of sample data. These methods enable one to derive plausible generalizations and then assess the extent of uncertainty underlying these generalizations. Statistical concepts are also essential during the planning stage of an investigation when decisions must be made as to the mode and extent of the sampling process…. The design of the sampling process is an important step. A good design for the process of data collection permits efficient inferences to be made, often with a straightforward analysis. (Johnson & Bhattacharyya, 2006, pp. 17-18)

For this quasi-experimental quantitative study, the researcher reported these inferences in Chapter 4. "In many experiments, only a convenience sample is possible because the investigator must use naturally formed groups (e.g., a classroom, an organization, a family unit) or volunteers. When individuals are not randomly assigned, the procedure is called a quasi-experiment" (Creswell, 2009, p. 155). The sample for this quasi-experiment consisted of the assessment data produced by students assigned to the Anytown Township School District classroom for teacher participants. One teacher or one teacher and one in-class support teacher from each school in the Anytown Township School District were chosen.

"In a multistage or clustering procedure, the researcher first identifies clusters, (groups or organizations), obtains names of individuals within those clusters and then samples within them" (Creswell, 2009, p. 148).

> By studying such bivariate or multivariate data, one typically wishes to discover if any relationships exist between the variables, how strong the relationships appear to be, and whether one variable of primary interest can be effectively predicted

> from information on the values of the other variables. (Johnson & Bhattacharyya, 2006, p. 83)

In regard to this quasi-experimental quantitative study, the relationship between differentiated instruction and student achievement was analyzed. The researcher identified clear learning goals, flexible grouping, and ongoing assessment and adjustment as the three differentiated instructional elements or strategies possibly having a statistically significant association with student achievement levels.

Within this quasi-experimental quantitative study, the ANOVA was utilized. The analysis of variance is "a statistical method that comes from experimental research that compares the means of a dependent variable across categories" (Johnson & Bhattacharyya, 2006, p. 307). The dependent variable was the change score, the difference between pretest and posttest scores for students. For consideration were the degrees of freedom as well. The degrees of freedom represent the number of independent pieces of information from a data set. Noteworthy, "The *F* test will determine if significant differences exist between the sample means" (Johnson & Bhattacharyya, 2006, p. 543). The *F* tests conducted for this quasi-experimental quantitative study yielded several hundred degrees of freedom.

Part of hypothesis testing entails two types of errors, Type I and Type II. Type I errors occur when the researcher rejects the null hypothesis, but that hypothesis was true. In this quasi-experimental quantitative study, Type I errors were denoted by alpha. Type II errors occur when the researcher accepts the null hypothesis, but that hypothesis is false. Type II errors were denoted by beta. Most of the errors for this quasi-experimental quantitative study were Type I errors emerging from the ANOVA and the

repeated measures ANOVA on test scores by time. Despite these errors, ultimately the researcher was able to determine R^2, the percentage of variance in change scores.

Research Questions and Hypotheses

The following two overarching research questions and five ancillary research questions guided this quasi-experimental quantitative study:

ORQ1: Is student achievement dependent upon differentiated instructional elements or strategies?

H0: Student achievement is not dependent upon differentiated instructional elements or strategies.

ARQ1: Is student achievement dependent upon differentiated instructional elements or strategies for primary students?

H0: Student achievement is not dependent upon differentiated instructional elements or strategies for primary students.

ARQ2: Is student achievement dependent upon differentiated instructional elements or strategies for elementary students?

H0: Student achievement is not dependent upon differentiated instructional elements or strategies for elementary students.

ARQ3: Is student achievement dependent upon differentiated instructional elements or strategies for middle school students?

H0: Student achievement is not dependent upon differentiated instructional elements or strategies for middle school students.

ARQ4: Is student achievement dependent upon differentiated instructional elements or strategies for high school students?

H0: Student achievement is not dependent upon differentiated instructional elements or strategies for high school students.

ORQ2: Does the differentiated instructional element or strategy of communicating KUDs to students (clear learning goals) have the most significant impact on change score with respect to student achievement as opposed to flexible grouping and ongoing assessment and adjustment for learning?

H0: The differentiated instructional element or strategy of communicating KUDs to students (clear learning goals) does not have the most significant impact on change score with respect to student achievement as opposed to flexible grouping and ongoing assessment and adjustment for learning.

ARQ5: Does daily student attendance have a significant impact on change score with respect to student achievement?

H0: Daily student attendance does not have a significant impact on change score with respect to student achievement.

Summary of Study Setting

Notwithstanding the 45 square miles of Anytown Township, the community has shifted from a rural to suburban school district since the year 2000, and the District Factor Group has remained an FG.

> The District Factor Groups (DFGs) were first developed in 1975 for the purpose of comparing students' performance on statewide assessments across demographically similar school districts. The categories are updated every 10 years when the Census Bureau releases the latest Decennial Census data. Since the DFGs were created, they have been used for purposes other than analyzing test score performance. In particular, the DFGs played a significant role in determining the initial group of districts that were classified as Abbott districts. Additionally, subsequent to the Abbott IV court ruling, the DFGs were also used to define the group of school districts on which Abbott v. Burke parity remedy aid would be based. The DFGs represent an approximate measure of a community's

relative socioeconomic status (SES) (New Jersey Department of Education, 1996-2011).

The present, predominantly white enrollment across three primary schools, two elementary schools, one middle school, and one high school is approximately 5,700 students. The 2010-2011 $100,000,000 budget supported close to 600 certificated staff members, 260 non-certificated staff members, and 55 custodians and maintenance staff members.

Of the close to 600 certificated staff members in the Anytown Township School District, nine teachers participated in this quasi-experimental quantitative study with class sizes ranging from 18-33 listed as follows: (1) Pa = grade two, 26 students, one in-class support teacher; (2) Pb = grade two, 23 students; (3) Pc = grade one, 19 students; (4) Ea = grade four, 18 students; (5) Eb = grade four, 18 students; (6) M = grade seven, 33 students, one in-class support teacher; and (7) H = grade 10, 66 students in three sections. Of the 66 high school students, five were excluded from the data analysis because they did not take the pretest and/or posttest. These specific students were: H38, H40, H43, H49, and H52.

A review of the composite standardized assessments for the student participants denoted a minimal range of achievement gains or losses between and among the 2008, 2009, and 2010 administrations of the grades one and two New Jersey Proficiency Assessment of State Standards (NJPASS), the grades four and seven New Jersey Assessment of Skills and Knowledge (NJASK), and the grade 10 High School Proficiency Assessment (HSPA) accordingly: grade one mathematics 37-45% advanced proficiency; grade two language arts literacy 34-45% advanced proficiency; grade two mathematics 38-43% advanced proficiency; grade four language arts literacy 2.3-11%

advanced proficiency; grade seven 17.4-21.1% advanced proficiency; and grade 10 mathematics 19.3-24.3% advanced proficiency.

The role of public schools is to educate all students starting with the lowest achieving student. Until all of the students in the Anytown Township School District demonstrate advanced proficiency on standardized assessments and criterion-referenced assessments, there is a sense of urgency in raising the rigor and meeting the individual needs of every student.

Participants and Identification Process

The term quasi-experiment was originated by Campbell and Stanley (1963): "The initial advocates assumed that progress in technology of teaching had been slow just because the scientific method had not been applied; they assumed traditional practice was incompetent, just because it had not been produced by experimentation" (p. 3). A quasi-experiment is defined as an experiment that "lack[s] random assignment...but that otherwise [has] similar purposes and structural attributes to randomized experiments" (Remler & Van Ryzin, 2011, p. 104).

This study was a quasi-experimental design with the assessment data from the students being represented through a convenience cluster sampling given that the students were already assigned to their classes at the onset of the school year. "A sample of convenience (also known as an accidental sample) consists of respondents who are conveniently available for participation in a study" (Patten, 2001, p. 74). "In quasi-experiments, the investigator uses control and experimental groups but does not randomly assign participants to groups (e.g., They may be intact groups available to the researcher.)" (Creswell, 2009, p. 158). The ANOVA was in part utilized for this quasi-

experimental quantitative study because of its alignment with the student convenience cluster sampling. In this quasi-experimental quantitative study, the student convenience cluster sampling was comprised of different students in the classrooms at the primary, elementary, middle, and high school levels.

The invitation for every district teacher to participate in this quasi-experimental quantitative study was delivered by e-mail within the Anytown Township School District. To identify the student convenience cluster sample, the researcher solicited teacher volunteers from the Anytown Township School District. Next, the volunteers completed a questionnaire revealing baseline data specific to differentiated instructional elements or strategies. The questionnaire was approved by Tomlinson to use as part of the quasi-experimental quantitative study and was titled, *Teacher Questionnaire to Gain Baseline Data on Differentiation Practices* (Tomlinson et al., 2008, pp. 122-123) (Appendix A). The researcher gathered additional data to determine which teachers would participate via informal discussions and observations. Of the seven schools in the Anytown Township School District, three serve primary students; two serve elementary students; one serves middle school students; and one serves high school students. The classrooms consisted predominantly of white female and male heterogeneously grouped students, two inclusive of in-class support teachers. Two hundred three students, nine teachers, one staff developer, and this researcher participated at varying levels of this quasi-experimental quantitative study.

The Superintendent of the Anytown Township School District signed an informed consent form allowing the use of student assessment data for research that could benefit the Anytown Township School District (Appendix B), and this consent form along with

the data will be kept under lock and key in a file cabinet for a 3-year period. The teachers whose classrooms were used for this collection of data signed an informed consent form (Appendix C) designating their anonymity and confidentiality in this quasi-experimental quantitative study.

Data Coding Instrument

Pertaining to the data, the three primary teachers were coded as Pa, Pb, and Pc; the two elementary teachers were coded as Ea and Eb; the one middle school teacher was coded as M; and the one high school teacher was coded as H. Their respective students were each assigned a number. Additionally, the pretest and posttest scores were recorded on an Excel spreadsheet based on a range of 0-100 along with a standards-based formative assessment for learning score tied to each teacher's unit of study (Appendix D). This instrument was collectively designed and modified by the participating teachers and the staff developer that oversaw the respective professional learning communities

The total instructional minutes spent on communicating clear learning goals, utilizing flexible grouping, and administering assessments and making related adjustments were recorded too. To arrive at the total minutes for each of these differentiated instructional elements or strategies, the participating teachers referred to their lesson plans, reflections, and student attendance rosters to account for the varying lengths of the units of study. The lengths of the units of study ranged from three to six weeks, with some students receiving daily instruction and with some students not receiving daily instruction. Upon review of these records, a proportionate distribution of time indicative of each lesson and the overall unit of study were reported.

An integral component of this quasi-experimental quantitative study was the data collected and then developed from teacher coding. To arrive at the counts, or frequencies, for each differentiated instructional element or strategy, the teacher participants had to dissect their lesson and unit plans along with their instructional activities in the respective unit of study and translate these activities to total minutes.

Data Collection

The data collection for this quasi-experimental quantitative study occurred over an 8-month period of time, March 2010 to November 2010. The quantitivate data used for the statistical analysis were collected during the implementation of the units of study in September and October. The process of developing the units of study included collaboration between and among the participating teachers, the staff developer, and this researcher.

The researcher's intent was to expand upon leadership and second order change for the purpose of having this quasi-experimental quantitative study evolve into a model differentiated classroom for each primary, elementary, middle, and high school teacher, and administrator, while simultaneously offering professional development experiences, thereby building upon the concept of a learning organization (Senge, 2006).

In March 2010, the invitation for every district teacher to participate in this quasi-experimental quantitative study was distributed. The researcher, in April 2010, administered the questionnaire included in Appendix A, scheduled informal observations of each of the volunteer's classrooms, and secured funds from the Anytown Education Foundation (AEF) so that teacher participants could attend summer SIAD training. May of 2010 brought about additional informal classroom observations of and professional

discourse with teacher participants. Finalizing the list of teacher participants, coordinating the SIAD training details, meeting with the teacher participants to establish the professional learning community, and identifying the role of the staff developer transpired in June 2010.

An extension of these planning steps, the teacher participants attended SIAD training, during which each created her respective unit of study and began to reflect on her planning and instructional practices in July 2010. The researcher's balance of the summer, August 2010, was spent interviewing and educating the district leaders for the purpose of assessing their knowledge base on differentiated instructional elements or strategies.

At the onset of the school year, the teacher participants began articulating their respective unit of study. This continued into October 2010, and the researcher, staff developer, and building principals conducted informal observations of teacher participants' classrooms. A springboard from these observations, the staff developer provided individual coaching sessions for each teacher participant. In September, October, and November 2010, the teacher participants collected and submitted their data coding instrument, indicating frequencies for each of the three differentiated instructional elements or strategies in addition to student pretest and posttest data.

> Quite surprising and misleading conclusions can occur when data from different sources are combined into a single table…. When data from several sources are aggregated into a single table, there is always the danger that unreported variables may cause a reversal of the findings. In practical applications, there is not always agreement on how much effort to expend following up on unreported variables. (Johnson & Bhattacharyya, 2006, pp. 85-86)

Test-retest reliability was utilized in this quasi-experimental quantitative study as the teacher created pretests and posttests were the same tests administered to the same

sample of students on two different occasions. “We know that if we measure the same thing twice that the correlation between the two observations will depend in part by how much time elapses between the two measurement occasions” (Trochim, 2006a). The amount of time allowed between the units of study designed by each teacher ranged from three to six weeks.

Congruent with the concept of reliability is the concept of validity regarding teacher created pretests and posttests. Ideally, these pretests and posttests should be both reliable and valid. Trochim (2006b) states, “In criteria-related validity, you check the performance of your operationalization against some criterion” (para. 7). Subsequently, Trochim (2006b) defines operationalization as the ability to “translate a concept or construct into a functioning and operating reality” (para. 1). In this quasi-experimental quantitative study, the criterion for the pretests and the posttests were the NJCCCS and the clear learning goals (KUDs) derived from the district curricula. The researcher further substantiated the validity through discriminate measures. Essentially, the pretests and posttests for the units of study were not the same assessments used in any other classrooms in the Anytown Township School District during the period of time the data were collected.

> The calculations of the sample mean and sample variance treat all the observations alike. The presumption is that there are no apparent trends in data over time, and there are no unusual observations. Another way of saying this is that the process producing the observations is in statistical control. The concept of statistical control allows for variability in the observations but requires that the pattern of variability be the same over time. Variability should not increase or decrease with time, and the center of the pattern should not change. (Johnson & Bhattacharyya, 2006, p. 60)

Data Analysis

The data in this quasi-experimental quantitative study were analyzed through *Statistical Package for the Social Sciences* (SPSS) Version 16.0. Several tests were conducted to analyze each overarching research question and each ancillary research question. Table 1, a *Summary of Analyses Performed,* includes these tests:

Table 1

Summary of Analyses Performed

Research Question	Analysis
Overarching research question 1	One-between one-within analysis of variance
Ancillary research question 1	One-between one-within analysis of variance
Ancillary research question 2	One-between one-within analysis of variance
Ancillary research question 3	Repeated measures analysis of variance
Ancillary research question 4	Repeated measures analysis of variance
Overarching research question 2	Multiple linear regression
Ancillary research question 5	Linear regression

To examine overarching research question 1 on differentiated instructional elements or strategies and student achievement, a one-between one-within analysis of variance (ANOVA) was conducted to determine if student achievement is dependent upon differentiated instructional elements or strategies. The assumption of normality was examined through a one-sample KS test. Consequently,

> The Kolmogorov-Smirnov goodness-of-fit test…are employed to determine whether or not the distribution of scores in a sample conforms to the distribution of scores in a specific theoretical or empirical population (or probability) distribution… in that when conducting a goodness-of-fit test a researcher often wants or expects to retain the null hypothesis. In other words, the researcher wants to demonstrate that a sample is derived from a distribution of a specific type. (Sheskin, 2004, p. 203)

To examine ancillary research question 1 on the student achievement in primary classrooms, a one-between one-within analysis of variance (ANOVA) was conducted to determine if student achievement is dependent upon differentiated instructional elements or strategies for primary students. The assumption of normality was examined through a one-sample KS test.

To examine ancillary research question 2 on student achievement and elementary student data, a one-between one-within analysis of variance (ANOVA) was conducted to determine if student achievement is dependent upon differentiated instructional elements or strategies for elementary students. The assumption of normality was examined through a one-sample KS test.

To examine ancillary research question 3 on student achievement and middle school student data, a repeated measures analysis of variance (ANOVA) was conducted to determine if student achievement is dependent upon differentiated instructional elements or strategies for middle school students. The assumption of normality was examined through a one-sample KS test.

To examine ancillary research question 4 on student achievement and high school student data, a repeated measures analysis of variance (ANOVA) was conducted to determine if student achievement is dependent upon differentiated instructional elements

or strategies for high school students. The assumption of normality was examined through a one-sample KS test.

To examine overarching research question 2 on the impact of specific differentiated elements and strategies and student achievement, multiple linear regression tests were conducted to determine whether the differentiated instructional element or strategy of communicating KUDs to students (clear learning goals) has the most significant impact on change score with respect to student achievement as opposed to flexible grouping and ongoing assessment and adjustment for learning.

To examine ancillary research question 5 on student attendance and student achievement, a linear regression test was conducted to determine whether daily student attendance had a significant impact on change score with respect to student achievement.

"Data analysts often jump to unjustified conclusions by mistaking an observed correlation for a cause-and-effect relationship….An observed correlation between two variables may be spurious. That is, it may be caused by the influence of a third variable" (Johnson & Bhattacharyya, 2006, p. 98). There were other variables that were not measured in this quasi-experimental quantitative study that could possibly account for the change scores in the students' pretests and posttests.

Summary and Summary of Remaining Chapters

Chapter 3 detailed the methodology for this quasi-experimental quantitative study. The research questions and hypotheses were listed, and a description of the Anytown Township School District setting and participants was included. Data coding, collection, and analysis concluded Chapter 3. The results or findings of a series of descriptive and parametric inferential statistics are analyzed in Chapter 4 to determine statistical

significance and to unearth the association between each differentiated instructional element or strategy and student achievement levels. In conclusion, this researcher expanded upon leadership and second order change for the purpose of having this quasi-experimental quantitative study evolve into a model differentiated classroom for each primary, elementary, middle, and high school teacher, and administrator.

Chapter 4

Research Findings and Analysis

Introduction

The results or findings of a series of descriptive and parametric inferential statistics that are analyzed in Chapter 4 assisted the researcher in determining statistical significance and unearthing the association between each differentiated instructional element or strategy and student achievement levels. In an effort to address stagnant student achievement, the purpose of this quasi-experimental quantitative study was to determine if student achievement was impacted by three elements or strategies of the differentiated instructional delivery model, clear learning goals, flexible grouping, and ongoing assessment and adjustment for learning, with student achievement measured via the differences between student pretest and posttest data at the primary, elementary, middle, and high school levels. The results from this analysis will further inform curricular, instructional, and assessment initiatives as noted in the Chapter 5 recommendations. Threaded through these recommendations is the need for second order change in regard to the instructional delivery model, and critical to actualizing this change is transformational leadership. In Chapter 4, the analysis and outcomes for each overarching research question and for each ancillary research question are presented.

This study was a quasi-experimental quantitative design with the students being chosen through a convenience cluster sampling given the fact that the students were already assigned to their classes at the onset of the school year. Of the close to 600 certificated staff members in the Anytown Township School District, nine teachers

participated in this quasi-experimental quantitative study with class sizes ranging from 18-33 listed as follows: (1) Pa = grade two, 26 students, one in-class support teacher; (2) Pb = grade two, 23 students; (3) Pc = grade one, 19 students; (4) Ea = grade four, 18 students; (5) Eb = grade four, 18 students; (6) M = grade seven, 33 students, one in-class support teacher; and (7) H = grade 10, 66 students in three sections. Of the 66 high school students, five were excluded from the data analysis because they did not take the pretest and/or posttest. These specific students were: H38, H40, H43, H49, and H52.

Pertaining to the data, the three primary teachers were coded as Pa, Pb, and Pc; the two elementary teachers were coded as Ea and Eb; the one middle school teacher was coded as M; and the one high school teacher was coded as H. Their respective students were each assigned a number. Additionally, the pretest and posttest scores were recorded on an Excel spreadsheet based on a range of 0-100.

The total instructional minutes spent on communicating clear learning goals, utilizing flexible grouping, and administering assessments and making related adjustments for instruction were recorded. To arrive at the total minutes for each of these differentiated instructional elements or strategies, the participating teachers referred to their lesson plans, reflective journals, and student attendance rosters to account for the varying lengths of the units of study. The lengths of the units of study ranged from three to six weeks, with some students receiving daily instruction and with some students not receiving daily instruction. Upon review of these records, a proportionate distribution of time relative to each lesson and the overall unit of study were reported.

The teacher participants attended SIAD training during the summer in which each created her respective unit of study along with the pretests and posttests. In September,

October, and November 2010, the teacher participants collected and submitted their Excel spreadsheets. The researcher then conducted data analysis through SPSS Version 16 to be able to summarize the findings for each overarching research question and for each ancillary research question. The researcher's belief that differentiated instruction is the most effective delivery model biased the conclusions and recommendations for this quasi-experimental quantitative study

Overarching Research Question 1

Is student achievement dependent upon differentiated instructional elements or strategies? This research question was the foundation of this quasi-experimental quantitative study. In order to address overarching research question 1, a one-between one-within analysis of variance (ANOVA) on test scores by time (pretest vs. posttest) and group (primary vs. elementary vs. middle vs. high school) was conducted. Prior to this analysis, the assumption of normality was determined with a one-sample KS test. Many of the results for the KS test were significant, suggesting the data were not normally distributed. However, Stevens (2002) mentions, "Deviation from multivariate normality has only a small effect on Type 1 Error" (p. 243).

The results for the main effect of time were significant, F (1, 194) = 530.30, p = .001, as indicated by the smaller mean for the pretest (M = 47.19, SD = 30.09) than the posttest (M = 79.85, SD = 20.23). The effect of the interaction between group and time was significant, F (3, 194) = 54.61, p = .001. To examine the mean differences within the interaction, dependent and independent t-tests were conducted and revealed the following: 1) For the primary school groups, the pretest had a smaller mean than the posttest; 2) For the middle school group, the pretest had a smaller mean than the posttest;

3) For the high school group, the pretest had a smaller mean than the posttest; 4) For the pretest, the primary groups had a smaller mean than the elementary groups; 5) For the pretest, the primary groups had a larger mean than the middle school group; 6) For the pretest, the primary groups had a larger mean than the high school group; 7) For the pretest, the elementary groups had a larger mean than the middle school group; 8) For the pretest, the elementary groups had a larger mean than the high school group; 9) For the posttest, the primary groups had a larger mean than the elementary groups; 10) For the posttest, the primary groups had a larger mean than the high school group; 11) For the posttest, the elementary groups had a larger mean than the high school group; and 12) For the posttest, the middle school group had a larger mean than the high school group.

Taking the results of the one-between one-within ANOVA presented in Table 2, and the means and standard deviations identified in Table 3 into consideration, the researcher rejected the null hypothesis that student achievement is not dependent upon differentiated instructional elements or strategies.

Table 2

One-Between One-Within ANOVA on Test Scores by Time and Group

Source	*F*	*P*	Partial Eta Squared	Power
Time	530.03	0.001	0.73	0.99
Time * Group	54.61	0.001	0.46	0.99
Error	(185.93)			

Note. The number in parentheses is the mean square of errors.

Table 3

Means and Standard Deviations on Test Scores by Time and Group

	Pretest		Posttest	
Group	*M*	*SD*	*M*	*SD*
Primary	62.87	24.06	92.60	9.80
Elementary	81.83	12.19	85.39	11.38
Middle School	24.24	15.62	86.33	17.25
High School	21.67	12.59	58.87	18.14
Total	47.19	30.09	79.85	20.23

A further analysis of the research findings yielded an inconsistent pattern of gains throughout the various grade level configurations of the Anytown Township School District. The researcher concluded this was the case due to some of the limitations of the study identified in Chapter 1, such as the unit being delivered as the first unit of study for the school year. Classroom management and procedures could not be readily established and reinforced this early in the school year. It is to be noted that the timeline for data collection could not have been altered or extended. The lack of alignment between existing curricula and the 2009 NJCCCS was likely a factor as well. An overall analysis of the comparisons from each group exhibited a significantly high pretest mean in the primary and elementary classrooms, indicating to the researcher that the assessments at those levels may have been more skills-based than conceptually orientated. This conclusion is consistent with the literature review as Brown and DeLoache (1978) stipulated, "Young children's insensitivity to problem solving potential is the lack of exposure to such situations…" (p. 31). There are considerable limitations to this quasi-experimental quantitative study leading to bias throughout, namely a lack of empirical evidence due to the many other variables that could

have impacted student achievement levels. Absent data from a longitudinal study will cause biases to surface when attempting to draw conclusions from research findings.

Ancillary Research Question 1

Is student achievement dependent upon differentiated instructional elements or strategies for primary students? The following analysis compared the pretest and posttest results from the three primary classrooms utilized in this quasi-experimental quantitative study. To address ancillary research question 1, a one-between one-within analysis of variance (ANOVA) for the primary groups on test scores by time (pretest vs. posttest) and group (a vs. b vs. c) was conducted. Prior to the analysis, the assumption of normality was determined with a one-sample KS test. Many of the results for the KS test were significant, suggesting the data were not normally distributed. However, Stevens (2002) mentions, "Deviation from multivariate normality has only a small effect on Type 1 Error" (p. 243).

The results for the main effect of time were significant, F (1, 65) = 276.92, p = .001, as indicated by the smaller mean for the pretest (M = 62.87, SD = 24.06) than the posttest (M = 92.60, SD = 9.80). The effect of the interaction between group and time was significant, F (2, 65) = 47.01, p = .001. To examine the mean differences within the interaction, dependent and independent t-tests were conducted and revealed the following: 1) For the primary school a group, the pretest had a smaller mean than the posttest; 2) For the primary school b group, the pretest had a smaller mean than the posttest; 3) For the primary school c group, the pretest had a smaller mean than the posttest; 4) For the pretest, the primary school a group had a smaller mean than the primary school b group; 5) For the pretest, the primary school a group had a smaller

mean than the primary school c group; 6) For the pretest, the primary school b group had a smaller mean than the primary school c group; 7) For the posttest, the primary school a group had a smaller mean than the primary school b group; and 8) For the posttest, the primary school a group had a smaller mean than the primary school c group.

Taking the results of the one-between one-within ANOVA presented in Table 4 and the means and standard deviations identified in Table 5 into consideration, the researcher rejected the null hypothesis that student achievement is not dependent upon differentiated instructional elements or strategies for primary students.

Additional analysis of this research data between and among the three primary classes denoted a high pretest and posttest mean and a small change from pretest mean to posttest mean in classroom c in contrast with classrooms a and b. Classroom c was a first grade classroom and classrooms a and b were second grade classrooms. Deviation in the data results may also be a result of different time periods for the implemented units of study and different content being taught in each classroom. This researcher concluded that regardless of the identified learning goals for each unit of study each classroom did show significant gains from pretest to posttest scores. The student achievement data collected are providing teachers and administrators with validation for changing instructional practices through the professional learning community structure. It is this researcher's intent to model components of an effective professional learning community for teachers participating in this quasi-experimental quantitative study. Supported in the literature review of professional learning communities, every learner, regardless of age, needs an appropriate culture for learning, where each can make sense of the content that has been presented. The more educators share their beliefs with each other, the deeper the

learning. Learning serves as a tool to connect with other people so we can add to our world (Johnson, 2005, p.14).

Table 4

One-Between One-Within ANOVA for Primary on Test Scores by Time and Group

Source	*F*	*P*	Partial Eta Squared	Power
Time	276.92	0.001	0.81	0.99
Time * Group	47.01	0.001	0.59	0.99
Error	(92.47)			

Note. The number in parentheses is the mean square of errors.

Table 5

Means and Standard Deviations for Primary on Test Scores by Time and Group

	Pretest		Posttest	
Group	*M*	*SD*	*M*	*SD*
A	44.15	18.12	88.65	9.96
B	61.61	15.43	94.91	7.22
C	90.00	11.06	95.21	10.92
Total	62.87	24.06	92.60	9.80

Ancillary Research Question 2

Is student achievement dependent upon differentiated instructional elements or strategies for elementary students? The following analysis compared the pretest and posttest results from the two elementary classrooms utilized in this quasi-experimental

quantitative study. To address ancillary research question 2, a one-between one-within analysis of variance (ANOVA) for the elementary groups on test scores by time (pretest vs. posttest) and group (a vs. b) was conducted.

Prior to the analysis, the assumption of normality was determined with a one-sample KS test. Many of the results for the KS test were significant, suggesting the data were not normally distributed. However, Stevens (2002) mentions, "Deviation from multivariate normality has only a small effect on Type 1 Error" (p. 243).

The results for the main effect of time were significant, F (1, 34) = 4.70, p = .037, as indicated by the smaller mean for the pretest (M = 81.83, SD = 12.19) than the posttest (M = 85.39, SD = 11.38). The effect of the interaction between group and time was significant, F (1, 34) = 11.23, p = .001. To examine the mean differences within the interaction, dependent and independent t-tests were conducted and revealed the following: For the elementary group a, the pretest had a larger mean than the posttest. For the elementary group b, the pretest had a smaller mean than the posttest.

Taking the results of the one-between one-within ANOVA presented in Table 6 and the means and standard deviations identified in Table 7 into consideration, the researcher rejected the null hypothesis that student achievement is not dependent upon differentiated instructional elements or strategies for elementary students. Significant to the elementary school data results, these two teachers planned their units of study together and taught the same grade level but at different schools. Both the mean and the standard deviation of each classroom were within six points of each other leading this researcher to believe that the implementation of the units of study were consistent

regardless of the teacher. This researcher concluded that there was overall significant growth in student achievement for elementary students.

Table 6

One-Between One-Within ANOVA for Elementary on Test Scores by Time and Group

Source	*F*	*P*	Partial Eta Squared	Power
Time	4.70	0.037	0.12	0.56
Time * Group	11.23	0.002	0.25	0.90
Error	(48.47)			

Note. The number in parentheses is the mean square of errors.

Table 7

Means and Standard Deviations for Elementary on Test Scores by Time and Group

	Pretest		Posttest	
Group	*M*	*SD*	*M*	*SD*
A	84.83	10.77	82.89	11.38
B	78.83	13.08	87.89	11.13
Total	81.83	12.19	85.39	11.38

Ancillary Research Question 3

Is student achievement dependent upon differentiated instructional elements or strategies for middle school students? The following analysis compared the pretest and posttest results from the middle school classroom utilized in this quasi-experimental quantitative study. To address ancillary research question 3, a repeated measures analysis

of variance (ANOVA) for the middle school group on test scores by time (pretest vs. posttest) and group (m) was conducted.

Prior to the analysis, the assumption of normality was determined with a one-sample KS test. Many of the results for the KS test were significant, suggesting the data were not normally distributed. However, Stevens (2002) mentions, "Deviation from multivariate normality has only a small effect on Type 1 Error" (p. 243).

The results for the main effect of time were significant, F (1, 32) = 249.025, p = .001, as indicated by the smaller mean for the pretest (M = 24.24, SD = 15.62) than the posttest (M = 86.33, SD = 17.25).

Taking the results of the repeated measures ANOVA presented in Table 8 and the means and standard deviations identified in Table 9 into consideration, the researcher rejected the null hypothesis that student achievement is not dependent upon differentiated instructional elements or strategies for middle school students.

A 62.08 gain from pretest to posttest mean was the most significant among all of the classrooms in this quasi-experimental quantitative study. This gain may be the result of effective learning goals and diagnostic assessment for learning prior to the implementation of the unit of study. The teacher for this unit of study is an outstanding constructivist educator as cited in her end year evaluations, working within an appropriate middle school environment. Jackson and Davis (2000) in their comments from the Carnegie Press on middle school reform state:

> Nevertheless, the existing research suggests that when reforms are implemented with integrity, in a manner that leads to authentic change in curriculum, instruction, and assessment and in the organization and climate of the school, dramatic and lasting improvements in student performance can be obtained. (Jackson & Davis, 2000, p. 6)

Table 8

Repeated Measures ANOVA for Middle School on Test Scores by Time

Source	*F*	*P*	Partial Eta Squared	Power
Time	249.05	0.001	0.89	0.99
\Error	(255.42)			

Note. The number in parentheses is the mean square of errors.

Table 9

Means and Standard Deviations for Middle School on Test Scores by Time

	Pretest		Posttest	
Group	*M*	*SD*	*M*	*SD*
Total	24.24	15.62	86.33	17.25

Ancillary Research Question 4

Is student achievement dependent upon differentiated instructional elements or strategies for high school students? The following analysis compared the pretest and posttest results from the high school classroom utilized in this quasi-experimental quantitative study. To address ancillary research question 4, a repeated measures analysis of variance (ANOVA) for the high school group on test scores by time (pretest vs. posttest) and group h was conducted.

Prior to the analysis, the assumption of normality was determined with a one-sample KS test. Many of the results for the KS test were significant, suggesting the data were not normally distributed. However, Stevens (2002) mentions, “Deviation from multivariate normality has only a small effect on Type 1 Error” (p. 243).

The results for the main effect of time were significant, F (1, 60) = 230.18, p = .001, as indicated by the smaller mean for the pretest (M = 21.67, SD = 12.59) than the posttest (M = 58.87, SD = 18.14).

Taking the results of the repeated measures ANOVA presented in Table 10 and the means and standard deviations identified in Table 11 into consideration, the researcher rejected the null hypothesis that student achievement is not dependent upon differentiated instructional elements or strategies for high school students.

The high school data showed significant growth from pretest to posttest for the mean in this quasi-experimental quantitative study. This researcher predicted that instruction at the high school level would be more rigorous by the very nature of the content. This turned out to be a flawed prediction and is validated by the literature review. Wiggins and McTighe (2008) comment on the type of learning that has been occurring in American High Schools, "Unfortunately, the common methods of teaching and testing in high schools focus on acquisition at the expense of meaning and transfer. As a result, when confronted with unfamiliar questions or problems (even selected-response on standardized tests), many students flounder" (p. 37). This researcher observed that pressure of standardized testing by this teacher and content coverage was the driving force for instruction before this unit of study was developed and implemented. The data results from this unit of study partially justify the need to change the traditional approach to instruction at the high school level.

Table 10

Repeated Measures ANOVA for High School on Test Scores by Time

Source	*F*	*P*	Partial Eta Squared	Power
Time	230.18	0.001	0.79	0.99
\Error	(183.33)			

Note. The number in parentheses is the mean square of errors.

Table 11

Means and Standard Deviations for High School on Test Scores by Time

	Pretest		Posttest	
Group	*M*	*SD*	*M*	*SD*
Total	21.67	12.59	58.87	18.14

Overarching Research Question 2

Does the differentiated instructional element or strategy of communicating KUDs to students (clear learning goals) have the most significant impact on change score with respect to student achievement as opposed to flexible grouping and ongoing assessment and adjustment for learning? In order to address overarching research question 2, a multiple regression was conducted to determine if communicating KUDs, flexible grouping, and ongoing assessment and adjustment for learning predicts change score.

The results of the multiple regression were significant, as indicated by F (3, 194) = 30.61, p = .001 and the fact that the independent variables accounted for 32.1% of the variance in the change score. For every one-unit increase in communicating KUDs, the change score decreased by 0.07 units; for every one unit increase in flexible grouping, the

change score increased by 0.04 units; and for every one unit increase in ongoing assessment and adjustment for learning, the change score increased by 0.25 units.

Taking the results of the multiple regression presented in Table 12 into consideration, this researcher accepted the null hypothesis that the differentiated instructional element or strategy of communicating KUDs to students (clear learning goals) does not have the most significant impact on change score with respect to student achievement as opposed to flexible grouping and ongoing assessment and adjustment for learning.

After further analysis, this researcher concluded that the data results should be interpreted with a holistic approach towards classroom instruction and not as isolated differentiated instructional elements or strategies. Of importance, is that these three key components of the differentiated instructional model comprise 32.1% of the variables contributing to the increase from pretest to posttest mean. Based on an unaccounted variance of 67.9%, this researcher's conclusion is that true learning is a comprehensive philosophy. Thus, the null hypothesis was accepted and the theoretical base was not supported.

Overall, this researcher was cognizant that part of the methodology did not lend itself to conducting the most cohesive quasi-experimental quantitative study. Specifically, data collection was not concise. A larger sample size, a control group, and a more defined instrument to record time would have led to more reliable data.

Table 12

Regression with Communicating KUD, Flexible Grouping, and Assessment of Instruction Predicting Change Score

Independent Variables	B	SE	β	*T*	*P*
Communicating KUD	-.07	.02	-.67	3.19	.002
Flexible Grouping	.04	.02	.26	2.63	.009
Assessment of Instruction	.25	.07	.80	3.52	.001

Ancillary Research Question 5

Does daily student attendance have a significant impact on change score with respect to student achievement? In order to address ancillary research question 5, a linear regression was conducted to determine if daily student attendance predicts change score.

The results of the linear regression with aesthetic ratio predicting scores were not significant, as indicated by F (1, 196) = 0.01, p = .931 and the fact that the independent variable accounted for 0.0% of the variance in the change score.

Taking the results of the linear regression presented in Table 13 into consideration, the researcher accepted the null hypothesis that daily student attendance does not have a significant impact on change score with respect to student achievement. The data presented in overarching research question 2 regarding ongoing assessment and adjustment for learning led this researcher to deduce that teachers were able to close the gap of knowledge, understanding, and skill with ongoing assessments and adjustments for learning despite sporadic attendance patterns by select students.

Table 13

Regression with Attendance Predicting Change Score

Independent Variables	B	SE	β	*T*	*p*
Attendance	-.02	.27	-.01	.09	.931

Summary and Summary of Remaining Chapter

Chapter 4 presented a detailed analysis of the data collected in this quasi-experimental quantitative study. The researcher intended to determine the association between differentiated instructional elements or strategies and student achievement as measured through pretest and posttest results for teacher created units of study. Descriptive and parametric inferential statistics were utilized to examine the hypotheses in this quasi-experimental quantitative study, and statistical significance was measured between and among different classes at the primary, elementary, middle, and high school levels. A one-between one-within analysis of variance (ANOVA) on change scores by time (pretest vs. posttest) and group (primary vs. elementary vs. middle vs. high school) was conducted. The results for the main effect of time were statistically significant.

This researcher also sought to determine if clear learning goals (KUDs) had a more significant impact on change score than flexible grouping and ongoing assessment for learning with respect to student achievement. A multiple regression was conducted, and the results of the regression were deemed significant.

The results from this Chapter 4 analysis will allow the researcher to expand upon leadership and second order change for the purpose of having this quasi-experimental quantitative study evolve into a model differentiated classroom for each primary,

elementary, middle, and high school teacher and administrator as noted in the Chapter 5 summary, conclusions, and recommendations.

Chapter 5

Summary, Conclusions, Recommendations

Summary

This researcher intended to determine the association between differentiated instructional elements or strategies and student achievement as measured through pretest and posttest results for teacher created units of study. Descriptive and parametric inferential statistics were utilized to examine the hypotheses in this quasi-experimental quantitative study, and statistical significance was measured between and among different classes at the primary, elementary, middle, and high school levels. A one-between one-within analysis of variance (ANOVA) on change scores by time (pretest vs. posttest) and group (primary vs. elementary vs. middle vs. high school) was conducted. The results for the main effect of time were statistically significant as indicated by F (1,194) = 530.30, p = .001, and as indicated by the smaller mean for the pretest (M =47.19, SD = 30.09) than the posttest (M=79.85, SD = 20.23). The effect of the interaction between each group and time was significant as measured by F (3,194) = 54.61, p =.001.

This researcher sought to determine if clear learning goals (KUDs), flexible grouping and ongoing assessment for learning, had a significant impact on change score with respect to student achievement. A multiple regression was conducted, and the results of the regression were deemed significant by F (3,194) = 30.61, p = .001, and the independent variables accounted for 32.1% of the variance in the change score.

In order to complete the data analysis for this quasi-experimental quantitative study, a student convenience cluster sampling method was embraced. This researcher,

participating teachers, and a district staff developer, created a professional learning community and received comprehensive professional development to enable them to craft units of study via the Understanding by Design curricular model and to apply differentiated instructional strategies or elements when articulating instruction.

A literature review encompassed an overview of differentiated instruction, differentiated instructional elements or strategies, and professional learning communities. For this quasi-experimental quantitative study, the differentiated instructional elements or strategies provided the framework for the two overarching research questions and the five ancillary research questions. Ravitch (2007) asserted differentiated instruction is:

> A form of instruction that seeks to maximize each student's growth by recognizing that students have different ways of learning, different interests, and different ways of responding to instruction. In practice, it involves offering several different learning experiences in response to students' varied needs. Educators may vary learning activities and materials by difficulty, so as to challenge students at different readiness levels; by topic, in response to students' interests; and by students' preferred ways of learning or expressing themselves. (p. 75)

Albeit not quantitatively addressed in this quasi-experimental quantitative study, the impact professional learning communities have on student achievement was included in the review of the literature. Put simply, professional learning communities are the structural lynchpin for sustaining a culture of inquiry rooted in the deep understanding of the teaching and learning processes.

Also notable in the literature review is the continual theme of meeting the varying needs of each learner within the same classroom. The advent of high profile standardized testing has perpetuated this theme (DuFour, DuFour, Eaker, & Karhanek, 2010). As 21st century learners are exposed to public school systems, diversity is a common characteristic observed throughout primary, elementary, middle, and high school

classrooms (Darling-Hammond, 2008). Overall, meeting the needs of diverse learners is a challenge when considering ethnicity, learning disabilities, economic disadvantage, and giftedness (Darling-Hammond, 2007; Ford & Harris, 1999; Kozol, 2005; Mulroy & Eddinger, 2003). "The central job of schools is to maximize the capacity of each student" (Tomlinson, 2000, p. 2).

The essence of shifting from a system of schools to a school system due to a lack of consistent curricular and instructional practices from school to school was a driving force in this quasi-experimental quantitative study. To engage in systems thinking (Senge, 2006), a transformational leader must understand that differentiated instruction for students is analogous to differentiated supervision for staff members. And, ultimately, a culture of inquiry begets the nexus to differentation. This collective differenatiation must permeate the culture of the district in this quasi-experimental quantitative study.

Conclusions

This researcher has drawn several conclusions based on the results of this quasi-experimental quantitative study. Principally, effectively implementing the Understanding by Design curricular model and differentiated instruction delivery model can maximize student achievement. Tomlinson and Imbeau (2010, p. 23) advised that an interdependent relationship exists among curriculum, instruction, and assessment. These independent variables, collectively, along with other variables not measured in the study but identified in the review of the literature, constituted the larger landscape of this quasi-experimental quantitative study. Clear learning goals (KUDs) were the curricular component; flexible grouping was the instructional component; and ongoing assessment for learning was the assessment component. The Tomlinson and Imbeau (2010, p. 23) model included

references to owning student success, creating a positive environment, connecting with students, and studying students.

While the results of this quasi-experimental quantitative study were significant, these results account for a small portion of the work required to establish and sustain a differentiated classroom environment. To this point, clear learning goals (KUDs), flexible grouping, and ongoing assessment for learning comprised only 32.1% of the variance in change scores in this study. The other 67.9% will prompt the need for transformational leadership at the central office and building levels. As well, the researcher concluded that the independent variables in this quasi-experimental quantitative study, clear learning goals (KUDs), flexible grouping, and ongoing assessment for learning must be integrated and woven throughout every facet for a given unit of study. Wheately (2006), states, "However, changes in small places also affect the global system, not through incremenatalism, but because every small system participates in an unbroken wholeness. Activities in one part of the whole create effects that appear in distant places" (p. 45).

The units of study for this quasi-experimental quantitative study were among the first authored in the district, and leading second order change is critical to developing and maintaining differentiated classrooms for every student. Although quasi-experimental and quantitative in nature, this study required the researcher to address the readiness, interests, and learning profiles for participating teachers. Inclusive of the literature review, professional learning communities supported the varying needs of participating teachers. The staff developer and researcher interacted with the participating teachers during this quasi-experimental quantitative study as each constructed and implemented

his/her unit of study. Much of the summative qualitative feedback from the participating teachers captured herein reflects the topics reviewed in the literature:

Act of differentiated instruction

> I love differentiating instruction and really try my best to do it as much as I possibly can in all subjects.

> Overall, I am very excited about my DI math unit. Differentiated Instruction has definitely had a positive impact on my students' achievement as well as their love and desire to learn…. I think the most telling statement is my students actually cheer when it is math time. My students are engaged in every part of the math lesson. Within each lesson, I have the opportunity to conference and work with all my students. I can reinforce what the skill is with my struggling learners while using manipulatives or anything else that they may need. I can also push my on level and advanced learners to answer more complex problems. My goal is for all of them to leave daily, having a sense of understanding and a feeling of accomplishment. I can say that for some of my advanced learners this is the first time they have ever been properly challenged. In the beginning, they seemed to be a little taken back by the whole process because they have never had trouble answering a question before. They quickly began to trust me and the process. My favorite quote from one of my advanced learners is, 'Wow I didn't know math could be hard and fun!'

Clear learning goals (Know, Understand, and Do, KUDs)

> I was surprised at how well the students did with their first Socratic seminar. The students were engaged in conversation with one another in the circle. The students were able to build upon one another's questions and comments to effectively hold a Socratic seminar. The students who were not part of the circle were writing about what they wish they could have said, who they agreed with and who they didn't. They also had to explain why. These students were then switched into the inside circle. When listening to the students speak and discuss with one another, it was interesting to see how they viewed the question being posed. While at times the students would go slightly off topic, the other students in the group brought the conversation back by asking a level 3 question or by explaining they felt the conversation was not answering their question.

Flexible grouping

> One student told me on the first day, 'You made a mistake. You put me in the smart group, and I'm not smart.' I discussed with her individually how they were grouped, and she was sincerely surprised that I had put her in the mastery tier. She lacked the confidence in herself and the understanding that you can be strong in

> some ways and developing in others. Likewise, I had a student who saw his group and said, 'Aw, I'm in the stupid group, as usual.'
>
> Flexible grouping is also important because I find that some of my students that didn't do well on their pre-assessment do very well after one day of teaching them a lesson. I also sometimes see the same for students who score a 100% on their pre-assessment but then have difficulty with their daily objectives and activities.
>
> *Ongoing assessment for learning*
>
> Through use of the formative assessment chart, I would change my lesson planning daily to meet the individual needs of the students in the class. I never once stuck to a lesson plan because I would have to change it based on how the students did the day before. I do feel that I got to know my students much better because I was so tuned in to their needs.
>
> I also love pre-assessing my students and feel that you find out so much about the student before you even begin teaching.
>
> *Professional learning community*
>
> In short, this has been a dynamic and engaging experience for the staff and students. There is a tremendous benefit in engaging in this process with a partner with whom we can exchange ideas and reflections and also offer different perspectives. Emotionally, it is nice to have a built in support network to share frustrations and insecurities.
>
> Thank you both for coming into my classroom this afternoon and especially for staying so long to talk afterwards. I appreciate it more than you know!!!

This researcher, through the construct of a professional learning community, met with participating teachers throughout the entire process of this quasi-experimental quantitative study. The participating teachers were treated as learners themselves, in a responsive differentiated manner. In summarizing the findings across the literature review, Vescio et al. (2006) add:

> Participation in learning communities impacts teaching practice as teachers become more student-centered. In addition, teaching culture is improved because the learning communities increase collaboration, a focus on student learning, teacher authority or empowerment, and continuous learning…. When teachers participate in a learning community, students benefit as well as indicated by improved achievement scores over time. (p. 88)

This researcher came to several conclusions regarding this professional learning community with participating teachers and the district staff developer. The interactions between teachers in the Anytown Township School District at different schools were an important factor to this quasi-experimental quantitative study. The participating teachers gained insight into how other schools in the district operated. They also formed interpersonal relationships with each other that led to conversations around the goal of student achievement. A week of sustained professional development over the summer increased the knowledge base on curriculum and instruction of the participating teachers. It gave them the time to make sense and process the various components to the creation and implementation of their units of study.

The presence of the staff developer to guide this professional learning community was decisive to establishing a positive climate for learning. This reflects the literature of Tomlinson and Imbeau (2010, p. 85) referring to building a community in the differentiated classroom based on the concept of democracy. Beane (2005) discusses "having a responsibility to care about the common good, dignity, and welfare of others" (p. 7). The staff developer modeled best practices in differentiated instruction and conducted coaching sessions with each participating teacher throughout the unit of study creation and implementation.

As this quasi-experimental quantitative study surpasses the confines of this dissertation, it is important to expand the work of the participating teachers towards a model differentiated classroom. This can be accomplished with job-embedded professional development with this researcher and the staff developer. This researcher concluded that without the SIAD training and the work of the staff developer, the

resulting units of study accompanied with the differentiated instructional elements or strategies may not have produced the desired outcome, based on best curricular and instructional practices.

This researcher has reflected on the impact that this study has had on his leadership and how his leadership has impacted the study. This quasi-experimental quantitative study encapsulates this researchers overall belief system. This researcher now sees and makes the connection to a global approach to improving student achievement in the Anytown Township School District. The principles of learning for understanding along with differentiated instruction are synonymous for the work this researcher is conducting as a transformational leader.

Throughout this process, the researcher's leadership matured and impacted his public self as a leader in the district. The Johari Window is a research-based self assessment of the public self of an instructional leader. This model applies to the field of leadership and supervision and identifies four windowpanes of the self; the public self, the blind self, the private self, and the unknown self (Glickman et al., 2007, pp. 121-122). The goal of the different panes in the window is to take one's blind self (actions that are unknown to himself), one's private self (behaviors about others that the leader knows about but the follower is not aware of), and one's private self (behaviors the leader has but the followers do not have), and move them to a level of one's public self (behaviors that both the leader and the follower knows that the leader uses in his work). The increased reflective awareness of this researcher has led him to actualizing the different components of the Fullan (2001) model of leadership:

> (1) Moral purpose; (2) Learning and gathering information; (3) Understanding a culture of change; (4) Building trust and relationships; and (5) Uniting the four

> components toward a common vision. Enthusiasm, energy, and hope abound resulting in higher levels of success when these aspects transcend the organization. (Fullan, 2001, p. 4)

Second order change drastically alters an organization and asks educators to look at their professions through a different lens (Marzano et al., 2005, p. 66). The only way second order change can occur is through transformational leadership. Being a leader who embraces second order change, this researcher is cognizant that this may only occur when he becomes dependent of others in the organization (Tomlinson et al., 2008, p. 25).

This researcher has implemented change through this quasi-experimental quantitative study by providing a case study that the differentiated instructional delivery system through units of study results in student achievement. In doing so this researcher has touched upon several aspects of Kotter's (1996) eight-step model for change: establishing a sense of urgency, creating a guiding coalition, developing a vision and strategy, communicating the change vision, empowering action, generating short term wins, producing more change, and anchoring new approaches to the culture (p. 21). This researcher is aware that this quasi-experimental quantitative study serves as a platform for second order change in the Anytown Township School District, but this change will not be actualized if the work does not continue for several years. This researcher has learned that change is difficult to sustain. Moreover, this researcher has extended his learning on the topic of learning for understanding and transfer through units of study that utilize differentiated instructional elements or strategies. This knowledge has equipped this researcher to lead, coach, and navigate through the resistors to change.

Recommendations

In a personal interview with Dr. Tomlinson, she shared, "I think in some instances the problem is a lack of knowledge and skill about how to lead for change (or even how to lead)" (Tomlinson, personal communication, 2009). This statement, the literature review, and the research, findings, and analysis of this quasi-experimental quantitative study have led to these global subsequent recommendations.

1. Create a model differentiated classroom in every school in the district and use this classroom as an environment for observation, professional discourse, peer review, and reflective practice. Maintain the professional learning community that was formed as an outcome to this study for at least another year so they can continue to transform their classrooms beyond an isolated unit of study.
2. Further study on the combinations of independent variables within the differentiated instructional model that will positively impact student achievement would be helpful in building empirical research to support this instructional model. Tomlinson (2001) described a comprehensive model for differentiating in the mixed-ability classroom. Further exploration of content, process, product, affect, learning environment, readiness levels, interest, learning profile, and respectful tasks, as each relates to student achievement in the differentiated classroom, needs to occur. Certain combinations of these variables may account for a positive impact on student achievement, and in turn, the way in which public school systems organize for instruction ensuring that every child maximizes his/her potential.

3. Further research studies need to be conducted on which differentiated instructional strategies or elements have the most positive impact on student achievement at certain grade levels. Both the quantitative and qualitative data for this quasi-experimental quantitative study were merely snapshots of the impact differentiated instructional elements and strategies have on developmentally appropriate student achievement.
4. Realizing an absence of longitudinal student achievement data for pre K-12 students, longitudinal study to measure the results of the student as he/she moves through the system needs to be conducted. Collecting data regarding long-term differentiation will help to support public school districts and state Boards of Education with aligning curriculum, instruction, and assessment. The Center for K-12 Assessment and Performance Management at the Educational Testing Service located in central New Jersey is collaborating with the New Jersey Department of Education. The Partnership for Assessment of Readiness for College and Careers (PARCC) and the SMARTER Balanced Assessment Consortium (SBAC) are two national organizations that would benefit from conducting this type of research as each prepares new summative assessments to meet and/or exceed the recently released Common Core Standards. (Forgione & Doorey, 2011). This researcher recommends, similar to the Beecher and Sweeny (2008) journal review presented in the literature review, a continuous look at students' standardized test scores as they move through a differentiated environment to

validate and create emprical data and resaerch to be used as a foundation for continuous reform

5. As national standards evolve, there is a greater need for differentiation. The onset of the Common Core Standards and the reissuance of No Child Left Behind will lead to an ever increasing need to meet the needs of each learner in our public school systems. Administering in-district benchmark formative assessments will provide the baseline data for teachers to adjust their units of study.
6. A recommendation for cognitive coaching as a way of making meaning is imperative for teachers as they begin implementation of differentiated instruction. The emergence of cognitive coaching is closely related to professional learning community experiences. The learning process for students is analogous to the learning process for teachers. Both processes are equally as important. The latter will lead to a culture of inquiry, which fosters differentiation. Essentially, Costa and Garmston (2002) explained and utilized, "States of mind for their work in cognitive coaching…. Through a deliberate and focused series of questions in a conference, a coach can lead a teacher to a different level of thinking, and therefore, better practice in the classroom" (p. 1).

   Tomlinson et al. (2008) state:

   > It is easy to assume that we can merely ask people to change a practice. In fact, making change requires alteration in beliefs, attitudes, practices, use of materials, and the culture of the school itself. To neglect any of these is to undermine the possibility of change. (p. 11)

This statement, the literature review, and the research, findings, and analysis of this quasi-experimental quantitative study have led to these district specific recommendations:

1. Data collection is an important component to support the ongoing development of differentiated classrooms. For this reason, the data that can be collected to support ongoing development of differentiated classrooms would encapsulate the entire teaching and learning experience in the classroom. The onset of technology and the study of educational practices have led to many new innovations such as Teachscape *Reflect*. This technology records a complete, 360-degree panoramic picture of classroom events using video and audio. Their supportive web-based software allows teachers the ability to review the video, and collaboratively, share experiences, and allow for professional coaching and dialogue (Teachscape, 2011).
2. New district curricula will enhance the development of Understanding by Design and implementation of differentiated instruction. Through ongoing teacher and administrator professional development, staff members will gain deeper insights of Understanding by Design and differentiated instructional elements and strategies. Specific to the data collection for this quasi-experimental quantitative study, clear learning goals (KUDs) have now been imbedded in the curricula documents for various courses of study as well as sample differentiated tiered assignments for each unit of study. More of the same needs to follow for

each document as it becomes a valuable tool for teachers to use.

3. Teacher leaders must be groomed within the organization to assist the researcher with instituting second order change. Teacher leaders can be groomed with extensive professional development and further interaction with building, district, and central office administrators. The teachers in this study should be used as coaches and models for differentiated instruction in the district. Lambert (2003) states that teacher leaders are "those whose dreams of making a difference have either been kept alive or have reawakened by engaging with colleagues and working within a professional culture" (p. 33).
4. Professional learning communities within the organization must be evaluated. The APQC Education Group (2009) stipulated,

   > Grade level feedback sheets and grade level binders are two artifacts that are used to track the success of professional learning communities…. Each team maintains a binder that collects data, SMART goals, norms, common assessments, classroom objectives, and weekly feedback sheets. (p. 118)

5. Grade reporting must change with the onset of differentiated instruction. Grade reporting will have to be averted from the traditional practice of averaging. Tomlinson and Imbeau (2010) suggest that grade reporting be broken down into three aspects; a part on student achievement, a part on how students respond to rules and timelines, and a part on the student's work habits (p. 147). These three parts are to be separately reported out and will help communicate student progress indicators on a much more in depth level.

6. The role of the principal is critical in developing the differentiated classroom. The principal is the gatekeeper for change. As per Tomlinson (1999), to facilitate differentiation:

> The principal must establish and share a vision…. Be sure you are clear on your definitions of and goals for differentiation. Explain these definitions and goals so others can examine them and talk with you about them…. Leaders who model differentiation exemplify the kind of respectful environment needed in responsive classrooms. Leaders and models also provide natural opportunities to talk with colleagues about how differentiation works. (pp. 109 - 111)

In conclusion, this researcher's passion to meet the needs of every learner is a driving force to the work he is conducting in the field of public education and this quasi-experimental quantitative study. This researcher believes the concepts of constructivism and differentiated instruction can only be actualized with sustained work and commitment to the students that we serve. This quasi-experimental quantitative study serves as a foundation and expansion to the research on utilizing comprehensive units of study, emphasizing learning for meaning and transfer. Van Tassel-Baska et al. (2008) reinforce these concepts:

> These models emphasize vocabulary, literary analysis, reasoning, writing persuasively, and conducting research, and they highlight instructional emphasis on higher order thinking skills, problem solving skills, metacognition, and research skills, which aligned with reform agenda recommendations as well as the learning needs of advanced learners. (p. 301)

This has led this researcher to create a culture of inquiry, which in turn begets the nexus of differentiated instruction.

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Appendix A

Teacher Questionnaire: Baseline Data on Differentiation Practices

Teacher Questionnaire to Gain Baseline Data on Differentiation Practices

Reflecting on Practices for Differentiating Instruction in Response to Learner Need

Read each statement below. Circle the response that most closely the extent to which you use this practice in your classroom. Use the following scale:

(1) Never/almost never (2) occasionally (3) much of the time
(4) very frequently, consistently (5) unsure of terms/meaning

1. I pre-assess students to plan for their individual needs	1	2	3	4	5
2. I identify student interests to assist in planning	1	2	3	4	5
3. I identify students' learning profiles to help with planning	1	2	3	4	5
4. My classroom is student centered.	1	2	3	4	5
5. I pre-assess for student readiness to help with planning	1	2	3	4	5
6. I vary the pace of learning for varied learner needs.	1	2	3	4	5
7. I use ongoing assessment for instructional planning	1	2	3	4	5
8. I differentiate based on understandings/big ideas.	1	2	3	4	5
9. I use a variety of materials other than the text	1	2	3	4	5
10. I make accommodations for the needs of various learners by scaffolding (e.g.. reading buddies, graphic organizers, study guides, New American Lecture).	1	2	3	4	5
11. I provide tasks that require students to do something with their knowledge (apply and extend key understandings and skills as opposed to largely repeating information).	1	2	3	4	5
12. I use high-level tasks for all learners (e.g., application, elaboration, providing evidence, synthesis, examining varied perspectives.)	1	2	3	4	5
13. I plan and use flexible grouping	1	2	3	4	5
14. I ensure that all students participate in respectful tasks	1	2	3	4	5

15. I vary tasks by students' interests.	1	2	3	4	5
16. I vary tasks by learner profile.	1	2	3	4	5
17. I ensure that all tasks and products focus on clearly stated learning goals (KUDs) known by the students	1	2	3	4	5
18. I allow for a wide range of product alternatives (e.g.,oral, kinesthetic, visual, musical, spatial, creative, practical, analytical).	1	2	3	4	5
19. The assignments I give differ based on individual (or small-group) readiness, learning needs, and interest	1	2	3	4	5
20. I meet with students in small groups for instruction.	1	2	3	4	5
21. I use tiering	1	2	3	4	5
22. I use compacting or other forms of acceleration.	1	2	3	4	5
23. I use student learning contracts to differentiate	1	2	3	4	5
24. I encourage and support independent study.	1	2	3	4	5
25. I use interest centers/groups to differentiate	1	2	3	4	5
26. I use RAFTs to differentiate.	1	2	3	4	5
27. I work with students to develop reading proficiency.	1	2	3	4	5
28. I work with students to become proficient in working in small groups.	1	2	3	4	5
29. I use technology as a tool for differentiation.	1	2	3	4	5
30. I provide student choice within defined parameters	1	2	3	4	5
31. I use Sternberg Intelligences to address learning needs.	1	2	3	4	5
32. I plan for more than one way for students to achieve key learning goals.	1	2	3	4	5
33. I talk with my students about the need for different ways to achieve key learning goals.	1	2	3	4	5
34. I use anchor activities to extend student learning And assist with classroom management.	1	2	3	4	5
35. I use other strategies to address learning needs. List:	1	2	3	4	5

Appendix B

Superintendent Consent Form

Office of the Superintendent
ANYTOWN TOWNSHIP SCHOOLS
[redacted] **Avenue**
[redacted]
Telephone [redacted] **Fax** [redacted]

January 18, 2011

To Whom It May Concern:

I acknowledge and approve the educational research being conducted by Mr. Jeff Gorman, Assistant Superintendent of the Anytown Township Public School district in [redacted] as part of his requirements to complete his doctoral program at Rowan University. As per Anytown Township Board of Education Policy/Regulation 8330 – Pupil Records subsection 15.

15. Bona fide researchers who explain in writing, in advance to the Superintendent, the nature of the research project and the relevance of the records sought and who satisfy the Superintendent or designee that the records are to be used under strict conditions of anonymity and confidentiality. Such assurance shall be received in writing by the Superintendent prior to the release of information to the researcher.

The purpose of this study is to create a Differentiated Classroom culture and use it as a predictor for future success in each of the seven schools in the Anytown Township Public Schools in Anytown Township, [redacted] in [redacted] County. This classroom atmosphere and structure would incorporate best practices that apply to a responsive classroom such as Units of Study, continuous pre/formative and summative assessment, data driven decision making, flexible grouping, student centered instruction, DI strategies (tiering, complex instruction, webquests…), learning centers based on student needs, a strong relationship between teacher and student, big ideas and understandings, clear learning goals (KUDs) and learning for transfer. The goal is to increase student learning by improving instructional practices. Other outcomes may include but are not limited to increasing instructional leadership practices of our principals and administrative team and using these model classrooms as a foundation for improving our current teacher evaluative criteria.

The student data collected in this quantitative study will be collected from three primary teachers, coded as Pa, Pb, and Pc; two elementary teachers coded as Ea and Eb; one middle school teacher coded as M; and one high school teacher coded as H. Their respective students were each assigned a number. Additionally, the pre- and post-assessment scores were recorded on an Excel spreadsheet based on a range of 0-100.

The total instructional minutes spent on communicating clear learning goals, utilizing flexible grouping, and administering assessments and making related adjustments were recorded too. In order to arrive at the total minutes for each of these differentiated instructional elements or strategies, the participating teachers referred to their lesson plans, reflective journals, and student attendance rosters to account for the varying lengths of the units of study. The lengths of the units of study ranged from 3-6 weeks, with some students receiving daily instruction and with some students not receiving daily instruction. Upon review of these records, a proportionate distribution of time relative to each lesson and the overall unit of study were reported.

It is my understanding that all data gathered by Mr. Gorman for this study will be confidential. I understand that any information obtained from this study may be used in any way thought best for publication or education provided that the participants are in no way identified and names are not used.

I understand that there are no physical or psychological risks involved in this study, and that the teachers participating in the study are free to withdraw their participation at any time without penalty.

If I have any questions or problems concerning this study, I may contact Mr. Jeff Gorman at [redacted] Additionally, his faculty advisor's contact information is listed below:

Faculty advisor _Dr. JoAnn Manning_____

Department: Educational Leadership Location: Education Hall

E-Mail: manning@rowan.edu Telephone: [redacted]

Sincerely,

[redacted]

Anytown Township Superintendent of Schools

Appendix C

Teacher Consent Form

ANYTOWN TOWNSHIP PUBLIC SCHOOLS
Office of Curriculum and Instruction
[redacted] *Avenue*
Anytown Township, [redacted]

Informed Consent Form

I agree to participate in a study entitled, "The association between grades PreK-12 student achievement and differentiated instructional strategies in the Anytown Township School District explored through units of study" which is being conducted by Mr. Jeff Gorman, the Assistant Superintendent of the Anytown Township School District in [redacted] County [redacted].

The purpose of this study is to create a Differentiated Classroom culture and use it as a predictor for future success in each of the seven schools in the Anytown Township Public Schools in Anytown Township, [redacted] in [redacted] County. This classroom atmosphere and structure would incorporate all of the best practices that apply to a responsive classroom such as Units of Study, continuous pre/formative and summative assessment, data driven decision making, flexible grouping, student centered instruction, DI strategies (tiering, complex instruction, webquests…), learning centers based on student needs, a strong relationship between teacher and student, big ideas and understandings, learning for transfer. The goal is to increase student learning by improving instructional practices. Other outcomes may include but are not limited to increasing instructional leadership practices of our principals and administrative team and using these model classrooms as a foundation for improving our current teacher evaluative criteria.

The data collected in this study will be combined with data from previous studies and will be a part of my doctoral dissertation at Rowan University.

I understand that if I choose to participate in this project as a teacher, I will be working with other colleagues and administrators to transform my classroom to one that is differentiated in structure and practice. My participation in the study will include observations, interviewing, professional development and implementation.

I understand that if I choose to participate in this project as an administrator, I will be working with other colleagues and administrators to transform instructional practices in the classroom to one that is differentiated in structure and practice. I will participate in a survey to gain baseline data on my area of expertise in this area. My participation in the study will possibly include observations, interviewing, professional development and taking a survey.

I understand that my responses will be anonymous and that all the data gathered will be confidential. I agree that any information obtained from this study may be used in any way thought best for publication or education provided that I am in no way identified and my name is not used.

I understand that there are no physical or psychological risks involved in this study, and that I am free to withdraw my participation at any time without penalty.

If I have any questions or problems concerning my participation in this study, I may contact Mr. Jeff Gorman at [redacted]. Additionally, my faculty advisor's contact information is listed below:

Faculty advisor _Dr. JoAnn Manning_____

Department: Educational Leadership Location: Education Hall

E-Mail: manning@rowan.edu Telephone: [redacted]

_____ _____

(Signature of Participant) (Date)

_____ _____

(Signature of Investigator) (Date)

Appendix D

Data Coding Instrument

Template for Assessment of and for Learning throughout Teacher Created Units of Study

UNIT ______												
K(Know):												
U(Understand):												
D (Do):												
	Pre-Ass.	Form. Ass	Inst. Adj.	Form. Ass	Inst. Adj	Form. Ass	Inst. Adj.	Form. Ass	Inst. Adj.	Form. Ass	Inst. Adj.	Final Assessment
Student Name												
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