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An Analysis Of The Implementation Of Differentiated Instruction In A Middle School And High School And The Effects Of Implementation On Curriculum Content And Student Achievement

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AN ANALYSIS OF THE IMPLEMENTATION OF DIFFERENTIATED
INSTRUCTION IN A MIDDLE SCHOOL AND HIGH SCHOOL
AND THE EFFECTS OF IMPLEMENTATION ON
CURRICULUM CONTENT AND STUDENT ACHIEVEMENT

BY

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requirements of the Degree of Doctor of Education
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Chapter I

INTRODUCTION OF THE PROBLEM

Introduction

Since many schools have moved away from ability grouping, educators have been in search of ways to reach all students in the heterogeneous classroom. Research indicates that regular classroom teachers make very few modifications in their instruction for gifted learners (Westberg, Archambault, Dobyms, & Slavin, 1993), and historically, there is a tendency to “teach to the middle” which can cause boredom in gifted students and confound students at risk, resulting in poor achievement in both groups (Csikszentmihalyi, Rathunde & Whalen, 1993). The push away from homogeneous grouping has made it imperative that this issue be addressed.

Some school districts have begun using Differentiated Instruction as a means to meet the needs of all students in mixed-ability classrooms. Differentiated Instruction is an amalgam of various brain-based, active-learning strategies that de-emphasize facts and focus on concepts, emphasizing the relationships among ideas. While there are an increasing number of journal articles written on the application of Differentiated Instruction in various settings, there have been no major studies on the effectiveness Differentiated Instruction as a means of reaching all students in heterogeneous classrooms.

Differentiated Instruction was initially used as a means to enrich instruction for Gifted and Talented (G&T) students by identifying students' strengths and using appropriate strategies to address a variety of abilities, preferences, styles and readiness. Students have the flexibility to take a topic and approach it from a variety of perspectives, depending on their interests and abilities, constructing their own meaning and creating their own devices through which they exhibit their understanding of the topic.

The success of Differentiated Instruction in this application prompted Special Education (SE) teachers to utilize Differentiated Instruction in self-contained SE classrooms and, more recently, in general education classrooms for the benefit of SE students in those classrooms, because by tapping into each students' interests, and offering a variety of approaches for a student to explore the subject, SE students become more involved in the subject, make it their own, and attain better understanding and higher achievement.

Differentiated Instruction is now being used in some mixed-ability, general education classrooms at all levels. Many teachers do not feel equipped to differentiate for a class of students of diverse needs and abilities, even with in-service training. This is not surprising because even the most ardent proponents of Differentiated Instruction admit that effective differentiation, though not difficult to understand from staff

development meetings, is difficult to translate into consistent classroom practice and “complex to use” (Tomlinson, 2000b).

Another issue affecting the successful implementation of Differentiated Instruction is teacher resistance to change. Fullan (1991) claims that teachers are often opposed to change that they had no input into because they have no reason to believe the change and House (1974) explains that the amount of energy and time required to learn the new skills or roles associated with the new innovation is a useful index to the magnitude of resistance (p. 73). This is important to note as Tomlinson (as cited in Hess, 1999) estimates that to really institutionalize differentiation can take 7 to 10 years.

Most of what has been written about differentiation has concerned special needs groups or middle schools. It seems natural to implement differentiation in these settings because, for these groups, curriculum is concept driven, as the focus of instruction is on understanding and developing lifetime learners. High schools, however, are content driven and many still depend on lecture for transmission of facts. Tate (1993) recognizes that teachers of advanced courses are under “more pressure to cover college content than they are to provide interesting lessons” (p.18). But, Differentiated Instruction, with its focus on depth, may not be compatible with the high school perspective. Newmann (1988) claims that to overcome the obstacles to depth will require cutting content from the existing curriculum.

Purpose of the Study

Previous research on Differentiated Instruction has mainly focused on benefits to Gifted and Talented students and students at risk in the general education classroom. With the growing popularity of Differentiated Instruction as a means to meet the needs of all students in the general education classroom, many authors have discussed the advantages to students of covering concepts in depth; few have looked at whether this depth has had any effect on the teaching of curriculum content or if there are differences in implementation at the middle and high school levels.

The purpose of this study is, first, to explore whether the implementation of the philosophy of Differentiated Instruction in a New Jersey school district's middle and high schools impacts the participants' (teachers') ability to complete the written curriculum as defined by the school's curriculum guide. Implementation is described as using Differentiated Instruction: accommodating students' learning differences by identifying their strengths and using appropriate strategies to address their abilities, preferences and styles. The second purpose is to evaluate the differences in implementing Differentiated Instruction that may have occurred between the middle and high school level, including the conditions that may have influenced these differences. Finally, the study will explore any effects that implementation has on student achievement, based on scores to standardized tests.

Problem Statement

Differentiation stresses teaching of concepts rather than facts. This requires study of a topic in depth; such study yields a rich understanding of the topic. To overcome the obstacles to depth requires changing instructional strategies and possibly cutting content from the existing curriculum (Newmann, 1988).

What effect will the implementation of Differentiated Instruction in a New Jersey school district's middle and high schools have on the participants' (teachers') ability to complete the written curriculum as defined by the school's curriculum guide and on student achievement based on scores on standardized tests, and are there differences in implementation at the middle school and high school levels?

Research Questions

The following research questions will be investigated during the study:

Research Question 1: What is the impact of studying concepts in depth using Differentiated Instruction on the coverage of curriculum content?

Research Question 2: If it was necessary to modify content, did each teacher, independently, decide what content would be eliminated? A related sub question is: If it was necessary to modify content, were the teachers satisfied that the extra depth made up for any loss of content?

Research Question 3: Is there a difference in teacher philosophy about covering content at the middle and high school levels?

Research Question 4: Did teacher resistance to change affect the implementation of Differentiated Instruction? A related sub question is: What are the factors that contribute to teacher resistance to change?

Research Question 5: To what degree has Differentiated Instruction been implemented in the classroom?

Research Question 6: How has the implementation of Differentiated Instruction affected teaching? Related sub questions are: (a) How important is it to utilize the pedagogic strategies of Differentiated Instruction? (b) How important are teacher behaviors that relate to Differentiated Instruction? (c) How has Differentiated Instruction affected student understanding and outcomes?

Significance of the Problem

As stated earlier, there have been no major studies on the effectiveness of Differentiated Instruction in meeting the needs of all students in mixed-ability classrooms. Differentiated Instruction involves studying topics in depth and some literature on Differentiated Instruction suggests that curriculum may need to be “narrowed” (Newman, 1988). This research will add to the body of knowledge on Differentiated Instruction in the middle and high school: whether

narrowing of the curriculum is necessary to achieve depth of study, teacher understanding of the benefits of depth over breadth in relation to student achievement, and teacher understanding of the viability of across-the-board use of Differentiated Instruction at the middle and high school levels.

Limitations of the Study

This study is limited to the effects of the implementation of Differentiated Instruction in one school district and different results may occur in other districts depending on the professional development for differentiation and the motivation of the teachers to differentiate.

Definition of Terms

For the purposes of this study, the following terms are defined:

Differentiated Instruction is regarded as accommodating learning differences in students by identifying their particular strengths, interests and learning profile and adjusting content, process and product accordingly. Differentiation is concept driven, stressing study of topics in depth, rather than acquisition of facts.

Depth refers to focusing on deep understanding of concepts; key ideas, not facts.

Breadth refers to focusing on a broad curriculum, covering many topics more superficially.

Content is what students will learn, defined by the school's curriculum guide.

Process refers to activities designed to help students make sense of key ideas.

Product is how students show their understanding of the topic.

Chapter II

REVIEW OF LITERATURE

Differentiated Instruction

Historical Roots

To treat children, even children the same age, as if they were all equal is to commit a biological and social absurdity. The equal treatment of unequals is the most unequal way of dealing with human beings ever devised. We're all very different, and because we're all very different, we require individual attention.

(Montagu, 1980)

Teachers are not usually in a position to do anything about the differences they recognize in their students because of the way that school systems are organized. Most of us are products of traditional, teacher-centered instruction of “fact-based subject matter, and a steady diet of drill and practice” (Windschitl, 1999, ¶12). Traditional approaches emphasize the presentation of information by the teacher who tells the students everything they need to know as they cover the school's prescribed curriculum. Students need to absorb the information and be able to recall the information flawlessly. Unfortunately, the signs and symbols of teacher-centered education and learning by transmission persist in classrooms today.

Times have changed. We live in the Information Age; so much information is available to us by a few clicks of a mouse. It is necessary

for educators to adopt new instructional methods to meet the changing times (Share & Rogers, 1997). Research indicates that teaching for understanding involves a significant reorientation of teacher beliefs and the acquisition of new forms of pedagogical and content knowledge (National Research Council, 1999). Today, more than ever, there is a call for teachers to be willing and able to become side-by-side learners with their students, not afraid to acknowledge “I don’t know,” and then can turn around and say, “Let’s find out together” (Rogers, 1999, ¶10). Unfortunately, for the most part, schools have not stepped up to the plate and changed with the times. Schools still require teachers to “deliver a prescribed body and sequence of information” (Rogers, 1999, ¶7). Share and Rogers (1997) believe that schools must mirror the new age and shift gears, to move from rote memorization to understanding processes, from following orders to solving problems, from theory to application of theory, from teacher dependent to learner empowered students, and from learning in youth to lifelong learning .

The past decades have seen many innovations come to the field of educational instruction. Differentiated Instruction has been adopted by many schools as a means to meet the needs of diverse learners in heterogeneous classrooms. Differentiated Instruction is regarded as accommodating learning differences in children by identifying students’ strengths and using appropriate strategies to address a variety of abilities, preferences, and styles. It is an amalgam of various

educational theories and practices, and “rests upon an active, student-centered, meaning-making approach to teaching and learning. Such approaches are often called “constructivist” (Tomlinson, 2000a, p. 18)).

The constructivist classroom requires different perspectives from those of traditional classrooms. According to constructivist theory and philosophy, learners do not acquire knowledge passively but construct it actively based on their experiences. The constructivist classroom is student-centered and learning-oriented with instruction geared toward the intellectual development of the students. Students begin to understand that knowledge is context dependent and their role as learners is to think independently. Teachers become the facilitators of the learning process instead of the giver of answers. The focus of classroom instruction becomes the acquisition of student skills and competencies and teaching becomes an intentional activity in which instructors guide students and isolate learning difficulties along the way.

According to Windschitl (1999), “a growing number of teachers are embracing the fundamental ideas of constructivist learning: that their students’ background knowledge profoundly affects how they interpret subject matter and that students learn best when they apply their knowledge to solve authentic problems, engage in sense-making dialogue with peers (¶5), and strive to understand core ideas, not when they are focused on recalling a laundry list of facts. Teaching that

heavily emphasizes rote learning does not promote spatial, experienced learning and can inhibit understanding.

In the effort to incorporate constructivist approaches into the classroom many educators have turned to active learning strategies (group work, case studies, problem-based learning, etc.) equating activity with the constructing of knowledge. However, to use these strategies effectively educators must have a good understanding of the meaning of knowledge construction and its relationship to course content and, also, how to teach it. Current brain research shows that people construct new understanding by incorporating new ideas into what they have already experienced (Share & Rogers, 1997). “The most effective learning occurs when students are able to apply their new concepts to important tasks, thereby reinforcing the new patterns,” says education expert Robert Marzano (as cited in Share & Rogers, 1997, ¶5).

Some authors maintain that although these descriptions have prompted educators to reexamine the roles of teachers, the ways in which students learn best, and even what it means to learn, the image of what is possible in a constructivist classrooms remains too idealized (Windschitl, 1999). Many talented, dedicated, and experienced teachers find constructivist ideologies and practices bewildering, because constructivism does not seem to be one thing. No one can live in the

world of education long without becoming aware that constructivism is more than one thing, as is Differentiated Instruction.

What is Differentiated Instruction?

Differentiated Instruction takes constructivism and goes a bit further. Teachers who differentiate instruction are those who strive to do whatever it takes to ensure that all students, those from different cultures, struggling and advanced learners, and students with different background experiences “all grow as much as they possibly can each day, each week, and throughout the year” (Tomlinson, 1999, p. 2). In differentiation the teacher, instead of teaching to the middle, must assess the abilities of all students before each lesson, theme, or project and teach to each according to readiness, interests and/or learning profile.

Teachers need to begin where students are and build upon the knowledge that all students differ (Tomlinson, 1999, p. 2). They must be ready to adjust their instruction to reach students through different learning modalities, appeal to different interests, and vary task complexity and rates of instruction. They must “work diligently to ensure that struggling, advanced, and in-between students think and work harder than they meant to; achieve more than they thought they could; and come to believe that learning involves effort, risk, and personal triumph” (Tomlinson, 1999, p. 2).

One common element of differentiation is “scaffolding—providing learners with greater support during the early phases of learning and then gradually reducing support as their competences and ability to assume responsibility increase” (Parkay & Hass, 2000, p. 169).

Learners receive varied amounts of help from the teacher depending on students’ current understanding. If, at one level, they do not understand an instruction, the teacher offers more help; they are never left alone when they are in difficulty. When they do understand the teacher gives them more room, so the students are never held back (Wood, 1988).

Finally, we ask the question, what can be differentiated? Teachers can differentiate: (a) *content* by adjusting the point at which each student begins to study the material on the topic, the rate at which they learn, the complexity of study, and the point of departure from the topic; (b) *process* - teachers help the student use higher order thinking skills such as creative thinking, critical thinking and problem solving, and integrate basic skills and abstract thinking skills; (c) *product* - students are taught to use multiple forms for communicating learning; and (d) *learning environment* - teachers can utilize flexible groupings, offer access to various resources and materials, and create an atmosphere that encourages exploration and the expression of new ideas.

According to Carol Ann Tomlinson (1999), we can recognize Differentiated Instruction by a variety of classroom characteristics: teachers begin where students are; teachers engage students in instruction through different learning modalities; a student competes more against himself or herself than others; teachers provide specific ways for each individual to learn; teachers use classroom time flexibly; and teachers are diagnosticians, prescribing the best possible instruction for each student.

Does this technique sound too chaotic, time-consuming or just plain unrealistic? “Anything that’s worth doing is complicated” (Tomlinson as cited in Hess, 1999, ¶ 15).

Differentiated Instruction – Basis in Research

As stated earlier, differentiated instruction is an amalgam of various brain-based, active-learning strategies that de-emphasize facts and focus on concepts, emphasizing the relationships among ideas. In discussing this model, Tomlinson (2000a) has stated that these practices are supported by brain-based research. She stated, “because the model of Differentiated Instruction advocated in this and related publications is an amalgamation of beliefs, theories, and practices, research supporting the model also comes from a variety of sources” (p. 18).

Some of the research cited by Tomlinson (2000a) is summarized here. Research by David Hunt and associates (1971) dating back to the 1960s and 1970s establishes that when the teacher matches the amount of task structure to the student's level of development, more effective learning takes place. A related study shows the relationship between student achievement and prescribing appropriate tasks according to the student's skills level (Fisher et al., 1980).

Tomlinson (2000a) also referred to a "strong body of research" on multi-grade classrooms, which are differentiated by necessity. One review of quantitative studies found that students in multi-grade classrooms outperformed students in single-grade classrooms on 75% of measures used (Miller, 1990). Studies by Csikszentmihalyi et al. (1993) found the necessity of a match between the individual skill level of a student and the complexity of tasks developed by the teachers for him/her. As to accommodating learning styles, Sullivan (1993) found that there were significant academic and attitude gains for students from all cultural groups when complementary teaching or counseling interventions were employed.

Students achieve better when instruction is matched to their learning patterns. Grigorenko and Sternberg (1997) concluded that a learning profile should be taken into account in classrooms in both instruction and assessment.

And, finally, there is much documentation of positive effects of instruction based on the Multiple-Intelligences theory of Gardner (1989). Campbell and Campbell (1999) found that implementing multiple-intelligences based instruction increased test scores for students in six schools with different demographics and at different levels.

In truth, many of the components of Differentiated Instruction have been practiced for many years and have shown a positive effect on student learning. But the research is not conclusive and, as yet, there are no studies on differentiation as a whole model to support its use across-the-board in heterogeneous middle school and high school classrooms and no studies on the effect of Differentiated Instruction on curriculum content.

Differentiated Instruction in the Classroom

Differentiated Instruction—“it’s a buzzword that’s seen a thousand iterations, from SRA reading kits to placing kids in the bluebird or buzzard reading group” (Hess, 1999, ¶ 5); it’s a strategy “at least as old as the one-room schoolhouse” (Scherer, 2000, p 5). “It’s also a philosophy that sends shudders down the spines of some parents and others who doubt children can reach their highest potential in heterogeneous classrooms” (Hess, 1999, ¶ 5).

But in this new era of school reform, many of our students, including the learning disabled and the gifted, are being taught in heterogeneous classrooms. Our school systems are scrambling to deal with the problems associated with this practice; many have turned to Differentiated Instruction to attain this goal.

Unfortunately, some teachers in our middle schools and high schools do not feel they are equipped for the full spectrum of learners. In a study by Manson (as cited in Holloway, 2000) many teachers admitted that there was “room for improvement” in their preparation to teach an increasingly diverse student population. “Implicit in these inclusive settings is the assumption that exceptional learners can be served equally as well in these diverse communities of learning” (Tomlinson et al., 1997, ¶2).

It is important for school faculties and administrators to recognize that it is difficult for individual classroom teachers to move from traditional instructional approaches to ones that facilitate differentiation (Waldron, as cited in Walther-Thomas, 2001). Brian McGarvey (1997) and his colleagues found that teachers were trying to apply the principles of differentiation in their regular classrooms. However, many teachers needed help incorporating a variety of different instructional skills.

Among the many obstacles teachers faced were difficulty in planning lessons and in adapting their teaching methods to allow for

differentiation (Hess, 1999, Holloway, 2000, Tomlinson et al., 1997). In addition, many teachers failed to provide many of the elements necessary for true Differentiated Instruction: flexibility to accommodate slow and accelerated learners, instructional activities that were appropriate for diverse student populations and activities that would provide challenge for all students. Further, McGarvey (as cited in Holloway, 2000). and his colleagues found that fewer than half the teachers made provisions in class work for a wide range of abilities

Although many argue the pros and cons of differentiation, there is no dispute that successful implementation requires significant staff development (Hess, 1999). Unfortunately, teachers are not always enthusiastic about school-system-offered courses mandated by the district or state. "Too often, negative attitudes prevail in these sessions and the negativity passes over participants like a tidal wave" (Long, 2003, p. 6).

Barriers to implementing differentiation were discussed at a meeting of a differentiated teaching cadre at The Association for Supervision and Curriculum Development (ASCD) in 2000 (Sherer, 2000). Among them is the fact that teachers and administrators had little, or no, experience with the pedagogic strategies of Differentiated Instruction in their own education; it is difficult to understand the "how" to accomplish what seems to make so much sense in training sessions. It is not a "cookbook approach and keeping track of its

complexities is not always easy” (¶6) and Differentiated Instruction requires collaboration, the ability to work with experienced coaches, and continuous administrative support.

Although she is passionate about differentiation, Tomlinson (as cited in Hess, 1999) “knows clearly that there’s no magic wand in education.” (¶ 27) She estimates that differentiation can take as long as 10 years to really institutionalize (Hess, 1999; Tomlinson 1999).

Teachers and Change

“Change! Say this word to any senior veteran of our faculty and eyes will roll. The word change strikes fear into the hearts of many teachers” (Gregerson, 2003, p. 10). They are constantly being asked to try something new. Teachers have been asked to change the way they teach, how they view their students, how they develop lessons and even what to teach (Gregerson, 2003).

In the traditional system teachers taught and students were responsible to learn. It was not the teacher’s fault if they failed (Connell, 1985). But teachers are now being asked to take responsibility for the success of all students they teach “and have more fear if it goes wrong—in terms of self-esteem if nothing else. Teachers, in short, are made more vulnerable. That vulnerability is a strong motive to resist further change in these directions.” [Connell, 1985, p. 99]

“Teachers say the radical methods they are encouraged to adopt will not work in real classrooms” (Tate, 1993, p. 18). They understand the justifications for trying innovations such as active learning strategies, cooperative learning and authentic assessments; but, what they can accomplish is limited by lack of funds, administrative support, planning time, and student readiness to learn (Tate, 1993). One teacher stated, “I truly believe students must participate actively as players, not spectators, in the educational process in order to succeed. However, before I get too carried away with theory, it’s time for a reality check. Wouldn’t it be grand if a lofty philosophy could accomplish so much? Unfortunately, I work in the real world.” (Lupton, 2001, p.25).

Many teachers say they don’t have a “philosophy” about teaching but some authors argue that, even if it is not clearly defined, all teachers have a philosophy that

“can and does affect the teaching-learning process; that it contextualizes, frames, and focuses pedagogical activity . . . a teaching philosophy . . . is a composite of assumptions, goals, choices, attitudes and values that coalesce to form a way of seeing one’s task and offers guidance in performing the teaching duty” (Petress, 2003, p.128).

Even though they might not claim a teaching philosophy, most will describe what makes a “good teacher”. “A good teacher would know many methods of teaching and would prefer to use those that

allow the students to discover their own knowledge, bottom-up, from each other and from the environment rather than from her” (Barzun, as cited in Tate, 1993, p. 18); she would constantly upgrade her expertise in the latest instructional fads (Ohanian, 1985) . A good teacher does whatever she can to help her students succeed.

These aims are not at odds with the philosophy of Differentiated Instruction, but in “real” classrooms teachers’ good intentions can be buried under the weight of the reality of trying to reach so many students with such diverse abilities and needs. Somehow, though, devoted teachers remain committed to change. Some award-winning teachers interviewed by Gregerson (2003) offer advice to teachers who are having trouble changing with the times: “change doesn’t have to hurt” (p. 10). They advocate implementing only part of a new program that has been proposed, to use what feels right; their goal is to change 10% of what they do each year. This would fit with Tomlinson’s (1999) estimate of up to 10 years for institutionalizing Differentiated Instruction.

School Reform

“The history of educational theory is marked by opposition between the idea that education is development from within, and that it is formation from without” (Dewey, 1938/1983, p. 16).

The history of education in the United States has been filled with theory, innovation and reform. As the pendulum swings, educational philosophy changes from focus on content to understanding of concepts and back again. Our secondary schools are currently engaged in the shift away from curricular content to student-centered, concept-driven curriculum that would meet the needs of all students.

“Paradoxically, our schools are charged with providing equal education for all students while, at the same time, providing a differentiated education for each” (Page & Valli, 1990, p, 1).

Middle School Reform – The Middle School Concept

For most of the past century, educators in the United States have been involved in change at the intermediate level of education. Beginning with the formation of “junior high schools” in the early 1900’s, educators have acknowledged that early adolescents have developmental and educational needs that are far different from the needs of older adolescents.

The birth of the junior high school was supposed to meet the needs of these early adolescent students—to provide engaging, relevant learning experiences that would help them with their transition into adolescence and high school—but it evolved into just what the name implies—a “little” high school. The curriculum began to mirror that of

the high school and the focus on the development of the “whole” student was buried under curricular requirements.

The 1960's saw renewed interest in the needs of the early adolescent student. There was much criticism of the junior high school, but no real alternatives to the model. Dr. William Alexander is given credit for proposing the “middle school”, although others were involved in the planning (Wiles & Bondi, 1993). Dr. Alexander was of the progressive school, but he envisioned a school that focused on the student rather than the subject matter. However, he chose to emphasize grade configuration in middle school reform and left the curriculum ill-defined—the criteria for being a middle school became organizational rather than instructional (Wiles & Bondi, 1993).

Over the next 35 years, junior high schools gave way to middle schools, and the configuration of grades, in most cases, did not exceed the eighth. Again the focus was on the special needs of early adolescents and the reason for the new grade configuration was that new medical evidence suggested that the onset of puberty was at an earlier age than it had been when the junior high school was conceived, and that students between the ages of 10 and 14 shared similar physical, mental, social and emotional characteristics.

Although middle school educators promoted individualization, interdisciplinary instruction, and organizational flexibility, by 1975 many middle school programs mirrored the standardized curriculum

that was so much a part of the junior high school. Over the next 20 years, several organizations issued lists of elements that effective middle schools should employ in order to meet the needs of their students. Again, many elements of middle-level education were implemented but, often, nothing changed.

The last decade of the 20th Century there was renewed interest in really implementing the middle-school concept, of not only implementing components of the many lists of middle school characteristics, but to meet the needs of the adolescent in an authentic way.

Recent research (Felner et al., 1996) indicates that the effective implementation of the middle school concept has led to higher academic achievement, more positive personal development, and more harmonious group citizenship. The pedagogical strategies that are so much a part of Differentiated Instruction are well suited to the restructured middle school. Although not all middle schools have fully implemented all aspects of the middle school concept, positive results have been seen. "Interdisciplinary team organization, schools-within-schools, heterogeneous grouping, flexible scheduling, teacher-based advisory programs, integrated curriculum, and differentiated instruction-all have come to life in the new middle school" (George & McEwin, 1999, ¶ 19). Many teachers who originally resisted the middle

school concept changes eventually embraced the philosophy and its strategies.

Much of the reform of our middle schools has already been completed, with much success. The focus now switches to our high schools, but there is much debate between those who believe that high schools should follow the lead of the middle schools and switch to interdisciplinary, student-centered, concept-driven curriculum, and those who believe that, at the high-school level, students are better served by traditional content-driven curriculum.

High School Restructuring

In the last half of the 20th Century secondary education in the United States has undergone much change. First was the transformation of the junior high school into the middle school and now attention is being focused on our high schools. High school level changes will not imitate those of the middle school because “in many districts, high school educators had actively opposed the middle school concept, labeling it too permissive and less academically rigorous than the junior high school” (George & McEwin, 1999, ¶ 15). Although the form the changes at the high school level will take is unclear, it is likely that there will be substantial changes (George & McEwin, 1999; Lee, 2001).

In 1996 the report, *Breaking Ranks: Changing an American Institution*, was issued by The National Association of Secondary School Principals, in collaboration with the Carnegie Foundation for the Advancement of Teaching. This report offered a new vision of the high school of the future and was the latest in a long line of attempts to restructure and improve the U.S. comprehensive high school (George & McEwin, 1999, ¶ 11).

The report offered 82 recommendations, many of which mirrored the reforms of the middle school that would result in reorganization of the nation's high schools including: increased personalization to be attained through a school-within-a-school; a more integrated curriculum through interdisciplinary courses; individualized curriculum planning; and advisers or advocates for each student (Lee, 2001; Murphy, Beck, Crawford, Hodges & McGaughey, 2001).

In this section we will look at some of the issues that are relevant to the issue of restructuring our high schools: high school philosophy, the new standards movement, tracking, block scheduling, and interdisciplinary teams and integrated curriculum.

High School Philosophy.

High schools in the United States have, historically, attempted to balance curriculum richness and a sense of community. In the 20th Century, high schools have been organized so that the school

curriculum “is one of rigor, breadth, diversity, and complexity, and with teacher subject specialization and departmentalization delivering a content expertise that makes high standards inescapable” (George & McEwin, 1999, ¶ 23).

The New Standards Movement.

“Billed as an ‘open letter to the American public,’ the report of the National Commission on Excellence in Education, *A Nation at Risk* (1983), was an earthquake-size reaction to the perceived liberality of the previous two decades” (George & McEwin, 1999, ¶ 9). The authors of the report charged the public schools in the United States with educational inadequacy. The report drew the attention of not only educators, but also parents, businesses and industry leaders. More than 30 other reports on the state of public schools in the U.S. were to follow (Pulliam & Van Patten, 1995).

The report rocked confidence in our public schools and shocked educators into more than a decade of responses. Many of the recent national and state standards aimed at curriculum reform continues reforms put into motion many years earlier (George & McEwin, 1999; Lee, 2001). Most states formed task forces to review the recommendations of the Commission to assess local needs and virtually every state responded with legislation to recommendations for

increased requirements and higher standards. (George & McEwin, 1999).

The standards movement has become a controversial issue among educators. Many are concerned that higher standards will translate into lower achievement for many students; they feel it is unfair to hold students with varied backgrounds and opportunities to the same high standards. But the fact is that someone is going to hold the students to high standards—if not by the schools, then certainly by employers, communities or others. “So, the idea that educators are doing students a disservice by holding them to high standards is a fallacy” (Simmons as cited in O’Neil, 1993, ¶ 42).

In their efforts to raise standards through a world-class curriculum, high school educators seemed to forget the goals our nation’s high schools: curriculum richness and a sense of community. They overlooked the need to balance the new curriculum with a sense of community in our schools that would tie teachers and students together in a community of caring.

Contemporary attempts at restructuring the high school have been aimed at restoring the balance between curriculum and community. “High schools must have both a rich and rigorous curriculum, and a strong sense of community, where faculty and students feel connected to one another in appropriately personal ways” (George & McEwin, 1999, ¶ 24).

Tracking:

A half-century of research on instructional grouping shows that teachers' beliefs about their students' abilities affect student achievement. In many cases it is a self-fulfilling prophecy: students only achieve what their teacher believes they can (Lee, 2001). Research consistently supports reducing the degree to which high school courses are leveled, based on prior achievement or perceived ability of students taking the course (Oakes, 1985; Slavin, 1990). Although many high school educators promote detracking, relatively few schools have made dedicated attempts to minimize curriculum tracking (George, 1999; Lee, 2001). According to Oakes (1992), even in high schools where educators believe that rigid tracking must be eliminated, attempts to accommodate heterogeneous grouping by changing grading and reporting practices is challenging.

“In regard to grouping for instruction, a few ‘pioneers’ have blazed a trail that the great majority of high school educators have yet to follow” (George & McEwin, 1999, ¶ 51). Many high schools are attempting to implement the philosophy of Differentiated Instruction to address the needs of students in heterogeneous classrooms, but that is in no way a quick fix. It requires a commitment to change instruction and assessment over a period of many years and a fundamental change in the structure of the high school.

Block Scheduling.

The school reform efforts of the 1990s have identified an important factor in student achievement, academic learning time (Murphy, 1992). The need to cover large amounts of content in short blocks of time does nothing to enhance the learning experience of students; there is little time for discussion and enrichment. Some successful high schools have begun to move away from the 50-minute period to fewer, longer blocks of time each day (Murphy, et al., 2001) commonly called *block scheduling*. In some cases where each period is 90 minutes, students would only have four courses per semester instead of the ordinary eight.

Some schools have embraced block scheduling because the longer periods allow for more variety and depth in learning activities, (Cawelti as cited in Murphy et al., 2001) which are particularly well suited for active learning strategies such as those common in Differentiated Instruction. Another benefit is the decreased teacher load which allows teachers to get to know their students better and fosters a sense of community.

One drawback of the block schedule is that students could have a whole year between classes in which continuity is important (such as foreign language and mathematics). Research suggests that although increased instructional time positively affects student learning, reorganization and better use of current school time is a more

productive strategy (Oakes, 1985). Approximately 50% of the nation's high schools have either changed to block scheduling or are seriously considering the change (George & McEwin, 1999).

Academic Teams and Integrated Curriculum.

In many high schools, leaders are “moving away from strict departmentalization to interdisciplinary teams, often known as *academic teaming*, as a way to empower teachers to increase student success” (George & McEwin, 1999, ¶ 36). Academic teaming is a way for teachers to get to know their students better. Because the teams share the same students and the same planning time, teachers can discuss students and students' needs with the other teachers who also teach them. The perspectives of a group of teachers enhance understanding of the students, their needs, their interests, their weaknesses and their strengths. An academic team is not synonymous with team teaching and teachers do not necessarily integrate curriculum projects; they retain their subject specializations (George & McEwin, 1999).

Academic teaming at the high school level does not mean that teachers must treat their students as if they were still in middle school. In the high school, academic teaming is “a way of keeping the curriculum pressure higher than ever, while attempting to build more of a sense of community into the school” (George & McEwin, 1999, ¶ 39).

Integrated curriculum may have repercussions for high school students who take advantage of them. When traditional measures are used for college admissions, students with nontraditional curricular experiences may be at a disadvantage (Pribbenow, Phelps, Briggs and Stern, 1999). High schools that have moved toward concept-driven curriculum may offer integrated courses that have no traditional meaning to college admissions officers.

An admission officer reviewing a student's transcript may be unsure whether "Integrated Science/Math" meets the level of science and math required for college preparation, or if "Applied Calculus" meets the standards and level of *regular* calculus? Although this is the direction in which many high schools are heading, as long as universities are looking for traditional core subjects on the high school transcript, "guidance counselors and high school faculty wonder whether they are doing students a disservice by encouraging them to explore alternative curricula" (Pribbenow et. al., 1999, ¶ 13).

Conclusion

Traditionally, education has been teacher centered, with the teacher delivering information for the student to absorb. As we moved from the Industrial Age to the Information Age, many educators began to adopt new, student-centered instructional methods. These methods, often called constructivist, utilize active, student-centered, learning-

oriented practices that cast the teacher in the roll of facilitator rather than the giver of answers. According to constructivist theory, learners actively construct knowledge based on their prior experience.

Instruction is geared to the intellectual development of students and the acquisition of student skills and competencies.

Differentiated Instruction relies heavily on constructivist practices but adds a focus on each student's individual readiness, interests and learning styles. Teachers assess the abilities of all students before each lesson, theme or project and students begin study at the appropriate place, not necessarily at the beginning. Teachers provide support for students that decreases as their competencies increase; this practice is known as scaffolding (Parkay & Hass, 2000).

Teachers differentiate content, process, product, and learning environment. Teachers begin where students are, engage students through instruction in different learning modalities, provide specific ways for each individual to learn, use time flexibly, and prescribe the best possible instruction for each student (Tomlinson, 1999).

Research supporting the pedagogical strategies utilized in Differentiated Instruction come from a variety of sources (Tomlinson, 2000a). Research has shown that more effective learning takes place when the amount of task structure is matched to the student's level of development (Hunt, 1971), task complexity is matched to the individual

skill level (Csikszentmihalyi et al., 1993; Fisher et al., 1980), and instruction is matched to a student's learning patterns (Grigorenko & Sternberg, 1997). There is also much documentation of positive effects of instruction based on the multiple-intelligences theory of Gardner (Campbell & Campbell, 1999). There are, however, no studies on Differentiated Instruction as a whole model at all grade levels to support its use in all heterogeneous middle school and high school classrooms.

In this new era of school reform that has seen a shift away from tracking, school systems across the country are dealing with problems associated with serving students in heterogeneous classrooms. Many schools are looking at Differentiated Instruction as a way to meet the needs of these diverse learners.

Teachers are constantly being asked to try something new and are not always enthusiastic about district-mandated changes. Although most would agree that a "good" teacher would do whatever she can to help her students succeed, their good intentions can be buried under the weight of trying to reach so many students with such diverse abilities and needs. Some award winning teachers suggest implementing the aspects of the change that "feels right" with the goal of changing 10% of what they do a year (Gregerson, 2003). This fits with Tomlinson's (as cited in Hess, 1999) estimate of up to 10 years to institutionalize Differentiated Instruction. Differentiated Instruction

requires significant staff development (Hess, 1999), but even teachers who are excited about the practices that make so much sense in training sessions, find it difficult to implement them in their classrooms (Scherer, 2000); many teachers have difficulty planning lessons and adapting their teaching methods.

The history of education in the United States is a history of focus on content shifting to a focus on understanding of concepts, and back again. Currently our schools are engaged in a shift away from curricular content to student-centered, concept-driven curriculum that would meet the needs of individual students while providing an equal education for all (Page & Valli, 1990).

In the early 1900's educators acknowledged that early adolescents had developmental and educational needs that are far different from the needs of older adolescents. The Junior High School failed to address these needs, evolving instead into a "little" high school. In the 1960s, focus again turned to the student rather than the subject matter and the Middle School was born, promoting individualization, interdisciplinary instruction and organizational flexibility. It was not until the 1990s that the components of the middle school philosophy were implemented on a large scale.

Effective implementation of the middle school concept—interdisciplinary team organization, schools-within-schools, heterogeneous grouping, flexible scheduling, teacher-based advisory

programs, integrated curriculum—has led to higher academic achievement, more positive personal development, and a more harmonious group citizenship (Felner et al., 1996). Many teachers who had initially resisted the changes became positive about the middle school philosophy.

With the successful completion of middle-school reform, educators turned their attention to reforming the nation's high schools. In 1996, a report by The National Association of Secondary School Principals, *Breaking Ranks: changing an American Institution* (as cited in George & McEwin, 1999) envisioned the high school of the 21st century. The report offered many recommendations for reorganization of the nation's high schools, many of which mirrored middle-school reform.

Our nation's high schools have always attempted to balance the twin goals of curriculum richness and a sense of community. They have been organized so that the curriculum "is one of rigor, breadth, diversity, and complexity, and with teacher subject specialization and departmentalization delivering a content expertise that makes high standards inescapable" (George & McEwin, 1999, p. 15).

Much of the recent curriculum reform and standards are a result of reforms put into motion after the National Commission on Excellence in Education, *A Nation at Risk* (1983). The standards movement is a controversial issue. Some feel we cannot hold students with varied

backgrounds and opportunities to the same standards as other students and that the reformers overlooked the need to balance the new curriculum with a sense of community. Contemporary attempts at restructuring the high school are aimed at restoring that balance.

Some of the reforms have created other problems. The elimination of tracking has resulted in a necessary shift in educational strategies to effectively reach all students in heterogeneous classrooms. Differentiated Instruction has been adopted by many schools in an attempt to meet these needs. But many middle school and high school teachers do not feel equipped to accomplish this task, even with in-service training on differentiation. They also feel that there is scarcely time to cover the curriculum in the allotted time, which leaves no room for the pedagogic strategies of Differentiated Instruction. Some schools have initiated block scheduling, which utilizes larger blocks of time and fewer periods a day, to alleviate this problem of time, but problems are seen with subjects that require continuity, such as foreign languages and mathematics, because there could be as much as a year between courses.

The reform movement also encourages a shift from strict departmentalization toward a more integrated curriculum. This creates problems for the teachers who wish to retain their disciplines, and for students applying for colleges whose acceptance criteria does not recognize integrated courses.

There is much debate between those who believe that high schools should shift to interdisciplinary, student-centered, concept-driven curriculum, and those who believe that high school students are better served by traditional, content-driven curriculum. The modern comprehensive high school is a conservative organization where fundamental change is difficult. Reforms aimed at moving comprehensive high schools toward the vision of the high school that many educators now envision are in place in few high schools because reforms are often resisted, due in part to the time and effort required to institutionalize them (Lee, 2001).

The block schedule, heterogeneous grouping, interdisciplinary teams, and the influences of other factors such as the middle school movement, have combined to produce new interest in Differentiated Instruction in the U.S. high school. High school educators are trying harder than ever to change how they teach, to make instruction more student-centered, and raise student achievement (George & McEwin, 1999).

Chapter III

METHODS AND PROCEDURES

Introduction

This chapter will present the procedures and methodology of the research study design. It will describe the purpose of the study and goals of the research, the subjects, procedures, permission, demographics of participating schools, instrumentation and data analysis.

Purpose of the Study

The purpose of this study is, first, to explore whether the implementation of Differentiated Instruction in a New Jersey school district's middle and high schools impacts the participants' (teachers') ability to complete the written curriculum as defined by the school's curriculum guide. The second aim is to evaluate the differences in implementing Differentiated Instruction that may have occurred between the middle and high school levels, including the conditions that may have influenced these differences, that is the independent variables: years of teaching experience, years at present school, teachers' degree status, teaching discipline, gender, and post-graduate courses in Differentiated Instruction. Finally, the study will explore any effects that implementation has on student achievement, based on scores to standardized tests.

Participants and Identification Process

This study was proposed to investigate the effects of Differentiated Instruction on completion of content at the middle and high school levels. To that end, a school district that had implemented Differentiated Instruction in its middle and high schools needed to be identified. The participating district was in their third year of implementation of Differentiated Instruction; full implementation is expected this year. All teachers are expected to use Differentiated Instruction in classroom instruction this year.

A letter of solicitation was sent to the Superintendent of Schools. Permission to survey middle and high school teachers was received in writing from the Assistant Superintendent of Schools. It was agreed that the researcher would hand deliver the survey packets to the principal of each school and place it in the mailboxes of all teachers currently on staff in both schools. The packet was to include an informed consent form, survey, directions for completion of the survey and a stamped, self-addressed envelope for return of the survey directly to the researcher. The subjects would be asked to return completed surveys within 2 weeks. A reminder notice would be placed in the teachers' mailboxes during the second week to, hopefully, secure additional responses.

The participants were any teachers in the participating district's middle and high school who voluntarily filled out and returned the survey.

Anonymous and Confidential Responses

As stated in the informed consent form, the teachers' participation was strictly on a voluntary basis. No teacher was obligated to complete the survey and the subjects were informed in the informed consent form that all responses would be completely anonymous and that no individual responses would be revealed. No name was requested on the survey instrument and the demographic information would be used to control for the independent variables, not for identification purposes. The participants were also assured that all surveys would be secured in a locked cabinet and that the responses would be available only to the researcher and possibly to the dissertation committee members. The researcher chose to have the surveys returned directly to him because he felt that this method of return would foster the sense of anonymity and a higher return rate.

Survey Instrument

As stated earlier, there have been no major studies on the effectiveness of Differentiated Instruction in meeting the needs of all students in mixed-ability classrooms at the middle school and high school levels; therefore there is no established or accepted measure that could be used in this study. The survey used was created by the researcher specifically for this situation in order to investigate whether a narrowing of the curriculum is necessary to achieve depth of study,

teacher understanding of the benefits of depth over breadth in relation to student achievement, and teacher understanding of the viability of across-the-board use of Differentiated Instruction at the middle and high school levels. The demographic information would be used to control for the independent variables gender, years of teaching experience, teachers' degree status, teaching discipline, and teaching level (middle school or high school).

The survey was field tested in a different school district that was in the second year of implementation of Differentiated Instruction in order to identify any problems with the questions as posed. Adjustments were made as necessary. Approximately 15 minutes were required to complete the survey.

The survey includes a nine-question demographic information questionnaire, two rating scales, 24 questions in the forced-choice format and two open-ended questions (see Appendix A).

Reliability Analysis

Because the survey was created for this study, the researcher ran a reliability analysis on the whole survey, and on each subset, to see if the items in each group are actually measuring the same thing. Cronbach alpha will help determine the reliability of the survey instrument. An alpha of 0.7 is considered acceptable in the social

sciences, but the number of items in a set can affect the alpha – if there are few items the alpha will be lower.

The alpha reliability for the survey is as follows: (a) All questions - 0.87, (b) Student understanding and achievement - 0.72, (c) Philosophy about covering content - 0.92, (d) Degree of implementation - 0.61, (e) Effects on teaching skills - 0.66, (f) Importance of pedagogic strategies - 0.90, and (g) Importance of teacher behaviors - 0.90.

The two items that have an alpha coefficient under 0.7 had only two items in the set. If the study were to be repeated, more items might be added to the set to increase the reliability.

Research Questions

The following research questions will be investigated during the study:

Research Question 1: What is the impact of studying concepts in depth using Differentiated Instruction on the coverage of curriculum content?

Research Question 2: If it was necessary to modify content, did each teacher, independently, decide what content would be eliminated? A related sub question is: If it was necessary to modify content, were the teachers satisfied that the extra depth made up for any loss of content?

Research Question 3: Is there a difference in teacher philosophy about covering content at the middle and high-school levels?

Research Question 4: Did teacher resistance to change affect the implementation of Differentiated Instruction? A related sub question is: What are the factors that contribute to teacher resistance to change?

Research Question 5: To what degree has Differentiated Instruction been implemented in the classroom?

Research Question 6: How has the implementation of Differentiated Instruction affected teaching? Related sub questions are: (a) How important is it to utilize the pedagogic strategies of Differentiated Instruction?; (b) How important are teacher behaviors that relate to Differentiated Instruction?; and (c) How has Differentiated Instruction affected student understanding and outcomes?

Overview of the Participating District

The district is a middle class/upper middle class community in northern New Jersey. Home to 16,000 people, it still has the feeling of a small town. The residents are proud of their town and supportive of the schools.

The district's schools serve approximately 2800 students in six buildings: 4 elementary, 1 middle school and 1 high school. The teachers are relatively well paid which has resulted in a stable and experienced teaching staff, with 77% of teachers holding advanced degrees.

The district's General Education Students scored above the District Factor Grouping (DFG) and State on all sections of the High School

Proficiency Assessment (HSPA) for the 2001/2002 school year as reported in the New Jersey School Report Card (NJ Department of Education, 2003), with 86.2% scoring at or above proficient as compared with 81.3% for the DFG and 74.5% for the state.

Special Education students scored below the DFG and state on all sections of the HSPA with 12.5% at or above proficient as compared with 23.3% for the DFG and 20.9% for the state.

On the Eighth Grade Proficiency Assessment the General Education students scored above the DFG and State on the Mathematics and Science sections of the test with 66.9 % scoring at or above proficient as compared with 64.2 for the DFG and 66.6 for the state on the Mathematics section and 88.7% scoring at or above proficient as compared with 81.4% for the DFG and 82.3% for the state in Science.

On the Language section of the ESPA 80.0% of the students scored at or above proficient as compared with 90.2% for the DFG and 82.7% for the state.

Special Education students scored above the DFG and state on the Science section of the ESPA with 43.6% scoring at or above proficient as compared with 42.7% for the DFG and 35.9% for the state. On the Mathematics section 16.1% scored at or above proficient as compared with 16.2% for the DFG and 13.8% for the state.

On the Language section of the ESPA the SE students scored well below both the DFG and the state with only 12.5 scoring at or above proficient as compared with 29.8% for the DFG and 25.8% for the state.

In 2003 100% of the students graduated with 90% planning to pursue further education, 42% of those at 4-year colleges. The district's administrators are proud of the students' achievement but still see the need to raise achievement levels. They are committed to providing all students with appropriate instruction to take them from their current level of knowledge to achieve all that they possibly can.

The Board of Education and Administration have looked to Differentiated Instruction to achieve their goals. Implementation of Differentiated Instruction began in the 2001/2002 school year with a projected phase-in period of 3 years. The current school year is the first year of full implementation. The board is encouraged by their advances and is looking for larger gains this year.

Data Analysis Plan

The following section details how the researcher intends to measure the data collected. The analysis of the data will be conducted by measuring the results of the independent variables (gender, years teaching, years at present school, teaching level, subject taught, highest degree held, post-graduate Differentiated Instruction education and class size) and their impact on or association with the dependent variables (the

impact of Differentiated Instruction on content, modifications of content, teacher ability to cover depth and breadth, effects of pedagogical strategies on content, teacher philosophy about content, teacher resistance to change and the degree of implementation of Differentiated Instruction). It should be noted that the researcher provides examples of the variables and its application to specified techniques to better illustrate the analysis; therefore, it should not be construed as exhaustive to the variables mentioned within the text.

Table 1 shows the relationship of the questions on the survey instrument (see Appendix A) to the research questions and the variables in Table 2.

The information from the returned surveys will be transferred into the SPSS program for analysis. The following section will discuss the statistical methods of measurement the researcher will employ to compare and contrast the findings.

Frequency distributions will be performed for the independent variables gender, years teaching, years at present school, teaching level, subject taught, highest degree held, post-graduate Differentiated Instruction education, and class size, as well as for the questions on the Likert Scales and forced-choice questions. The answers to the open-ended questions will be hand coded.

Table I

Research Questions and Related Survey Questions

No.	Research Question	Related Survey Questions
1	What is the impact of studying concepts in depth using Differentiated Instruction on the coverage of curricular content?	B1-B10, C22, C24
2	If it was necessary to modify content, did each teacher, independently, decide what content would be eliminated?	C19
2a	If it was necessary to modify content, were the teachers satisfied that the extra depth made up for any loss of content?	C14
3	Is there a difference in teacher philosophy about covering content at the middle and high-school level?	C10, C11, C23 Independent variables
4	Did teacher resistance to change affect the implementation of Differentiated Instruction?	C1-C6, C25
4a	What are the factors that contribute to teacher resistance to change?	C1-C5 Independent variables
5	To what degree has Differentiated Instruction been implemented in the classroom?	C6-9, C12, C13, C18, C25
6	How has the implementation of Differentiated Instruction affected teaching?	C15-C17
6a	How important is it to utilize the pedagogic strategies of Differentiated Instruction?	B1, B2, B3, B4, B5, B6, B7, B8, B9, B10
6b	How important are teacher behaviors that relate to Differentiated Instruction?	A1, A2, A3, A4, A5, A6, A7, A8
6c	How has Differentiated Instruction affected student understanding and outcomes?	C20, C21

Table 2

Variables

Variable	Status	Measurement
Gender	Independent	Nominal
Years teaching	Independent	Scaled continuum
Years at present school	Independent	Scaled continuum
Teaching Level	Independent	Nominal
Subject(s) taught	Independent	Scaled continuum
Regular or Special Ed	Independent	Nominal
Highest degree held	Independent	Nominal
Post-grad courses in DI	Independent	Nominal
Class size	Independent	Scaled continuum
Teacher behaviors	Dependent	Likert subscale
Pedagogic strategies	Dependent	Likert Subscale
Teacher coverage of both depth and breadth	Dependent	Nominal
Effects of pedagogic strategies on content completion	Dependent	Nominal
Teacher philosophy about content	Dependent	Nominal
Teacher resistance to change	Dependent	Nominal
Degree of implementation	Dependent	Nominal
Importance of pedagogic strategies	Dependent	Nominal
Importance of teacher behaviors	Dependent	Nominal
Effects on student understanding and outcomes	Dependent	Nominal

Factorial Analysis of Variance (ANOVA) will also be performed. The ANOVA will allow the researcher to compare more than two means utilizing variance. Variables that were scaled on a continuum will be reordered into categories. The procedure will be applied by the researcher enabling him to facilitate findings, not observable in the *t* test due to the limited criteria of a two mean comparison. The key concept in examining the analysis of variance incorporates the categorization of the independent variable and the interval level data of the dependent variable.

The guiding question examines if group membership as it relates to teachers' degree status impacts on the teachers' ability to cover a concept in depth and still retain breadth of content as measured by scores on the relevant section of the Differentiated Instruction Teacher Survey. In the event that the null hypothesis is rejected whereby the significant F value is exhibited within the ANOVA table, the differences between the groups will be specified through the use of factorial ANOVA to determine the location of any significant differences.

Chapter IV

ANALYSIS OF THE DATA

Introduction

The purpose of this chapter is to present the identification of study participants, an overview of the implementation of Differentiated Instruction in the participating district, the data collection process, the purpose of the study, the research questions, and to present the results of the statistical analysis generated by the data collected for this study. Descriptive statistics, ANOVA, Pearson correlation coefficient and point-biserial Correlation were used to analyze responses to the questions on the Teacher Survey.

Identification of Participants

This study was proposed to investigate the effects of Differentiated Instruction on completion of content at the middle and high school levels. To that end, a school district that had implemented Differentiated Instruction in its middle and high schools needed to be identified. The participating schools were in their third year of implementation of Differentiated Instruction; full implementation is expected in this, the 2003-04 school year. All teachers are expected to use Differentiated Instruction in classroom instruction.

Overview of the Participating District

The participating district is a middle class/upper middle class community in northern New Jersey. Home to 16,000 people, it still has the feeling of a small town. The residents are proud of their town and supportive of the schools.

The district's schools serve approximately 2800 students in six buildings: four elementary, one middle school and one high school. The teachers are relatively well paid which has resulted in a stable and experienced teaching staff, with 77% of teachers holding advanced degrees.

The researcher met with the Director of Curriculum for the district to ask him about the implementation of Differentiated Instruction in their middle school and high school.

The Director indicated that the district made the move toward Differentiated Instruction in light of "No Child Left Behind." He said, "We could see this was the way of the future – we decided to get a head start." Differentiated Instruction was introduced at a workshop in May, 2001 with workshops on Differentiated Classrooms, Team Teaching, Flexible Grouping and Interdisciplinary Teaching, among other topics. Implementation was scheduled to begin in the 2001-2002 school year.

The move toward Differentiated Instruction was a "top down" initiative which was met with initial negativity, resistance and "no excitement" by the teachers. He noted that he would have liked to have

made it a "bottom up" initiative and change the professional focus, but there was no time. He also noted that the younger teachers were more willing to become involved in change, while the older staff were more resistant and "set in their ways."

The district contracted with several providers to develop programming to support Differentiated Instruction. Consultants offered workshops in the areas of assessment, readiness, and Differentiated Instruction practices in subject areas and on grade levels. Initially, there were positive responses by the teaching staff to the sessions, and the programming was made more focused. It started to become "more of the same," so the district decided to back off a bit on the programming and focus on supports for differentiating learning.

When asked what some of the problems the district encountered with the implementation, the Director of Curriculum said that a major problem was the lack of innovative and flexible scheduling.

The participating schools are in the third, and final year of implementation in this 2003-2004 school year. Even though this is described as the final year of implementation, the Director of Curriculum for the district acknowledged that it will take more time to institutionalize Differentiated Instruction. But he said that "Differentiated Instruction is beginning to happen."

The Director credits the successes to changes made at the middle school level in this school year. The middle school staff is more flexible

and open to change, and this year there was a lot of it, beginning with a team and collaborative approach. Teachers on a team share the same students and, with the scheduling of team discussion time, teachers are getting to know their students better. He said that teaming is a “big plus.”

The middle school also recaptured an extra period of instruction by shortening lunch periods. This provides more student contact time and enabled the school to schedule daily, 80 minute Language Arts periods.

As far as curriculum goes, the district is trying to get across the idea that the curriculum is not intended to be a roadmap, only a suggestion.

On the high school level there has not been as much progress. He attributes this to traditional scheduling, traditional instruction and the “high school mindset”: the material has to be finished. The district is trying to turn the focus away from following the curriculum so closely and toward meeting standards. Content as prescribed in the curriculum guide still has to be covered, but they are trying to show the teachers that there are “many ways to get there” and that they need to “get the kids involved in all learning.”

He notes that the high school teachers are not as open to change as are the middle school teachers. He said, “There’s a lot of nodding and winking, then the door shuts and who knows what goes on.”

Still, the district is encouraged by the positive changes at the middle school level and small gains at the high school level. The graduation rate has gone up and more graduates are going to college since Differentiated Instruction was initiated, indicating more student interest. This is a positive sign.

Research Questions

The following research questions will be investigated during the study:

Research Question 1: What is the impact of studying concepts in depth using Differentiated Instruction on the coverage of curriculum content?

Research Question 2: If it was necessary to modify content, did each teacher, independently, decide what content would be eliminated? A related sub question is: If it was necessary to modify content, were the teachers satisfied that the extra depth made up for any loss of content?

Research Question 3: Is there a difference in teacher philosophy about covering content at the middle and high-school levels?

Research Question 4: Did teacher resistance to change affect the implementation of Differentiated Instruction? A related sub question is: What are the factors that contribute to teacher resistance to change?

Research Question 5: To what degree has Differentiated Instruction been implemented in the classroom?

Research Question 6: How has the implementation of Differentiated Instruction affected teaching? Related sub questions are: (a) How important is it to utilize the pedagogic strategies of Differentiated Instruction?; (b) How important are teacher behaviors that relate to Differentiated Instruction?; and (c) How has Differentiated Instruction affected student understanding and outcomes?

Data Analysis

Demographics

Demographic information was collected to be used to control for the independent variables teaching level (middle school or high school), gender, years of teaching experience, years in present district, teaching discipline, teachers' degree status, year of latest degree, post-graduate instruction in Differentiated Instruction, and average class size (see Appendix B).

Of the 110 surveys that were distributed 97 (88%) were returned completed. The frequency distributions of the demographic information is presented below.

The 97 respondents were teachers in the district's middle and high school. As shown Appendix B, 46 respondents (47.4%) were middle school teachers and 51 (52.6%) were high school teachers.

Gender.

Thirty-six respondents (39.6%) were male and 55 (60.4%) were female. It is interesting to note that at the high school level there is almost an equal number of male and female teachers, but at the middle school level only 26.2% of respondents reported being male.

Years Teaching.

Twenty-three and six-tenths percent of respondents have been teaching for 1-5 years, 24.7% for 6-10 years, 9% for 11-15 years, 13.5% for 16-20 years, 9% from 21-25 years, 12.4% for 26-30 years, 7.9 for 31 or more years. It is interesting to note that more than half of all respondents have been teaching for 15 years or less.

Years in present district.

Almost 50% of respondents (49.4%) reported that they have taught in the district for 1-5 years, 13.5% for 5-10 years, 6.7% for 11-15 years, 10.1% for 16-20 years, 4.5% for 21-25 years, 9% for 26-30 years, and 6.7% for 31 or more years. Almost half of all teachers have been in the district for 5 years or less, and only 30% of teachers have been in the district for 15 or more years.

Subjects taught.

Nineteen and one-half percent of respondents reported that they teach English, 10.4% teach Math, 14.3% teach History, 9.1% teach Science, 6.5% teach a foreign language, 19.5% teach in Special Education and 20.8 teach other subjects.

Highest degree held.

Forty-seven and eight-tenths percent of respondents reported that they have a Bachelor Degree and 52.2% have a Master's Degree.

Year of latest degree.

Twenty-five and three-tenths percent of respondents reported that received their latest degree before 1980, 12.7% received their degree from 1980-1989, 32.9% from 1990-1999, and 29.1% from 2000-2003.

Post-graduate courses in DI.

Forty and four-tenths percent of respondents reported that they have had post-graduate courses in Differentiated Instruction, while 59.6% reported that they have not.

Average class size.

Twenty-one and one-tenth percent of respondents reported that they have 15 or less students in an average class, 14.4% reported 16-20 students, 34.3% reported 21-25 students and 30% reported more than 25 students. The vast majority of classes have 21 or more students, with the high school teachers reporting that 36.6% of their classes have 25 or more students.

Research Questions

Research Question 1

What is the impact of studying concepts in depth using Differentiated Instruction on the coverage of curriculum content?

To answer this question responses related to pedagogic strategies associated with Differentiated Instruction and responses to questions which relate to curriculum content were analyzed. Descriptive statistics as shown in Table 3 and Point-Biserial Correlation (see Appendix E) were used in those analyses.

With respect to covering concepts in depth, almost 60% of the high school teachers reported that they could not retain the breadth of curriculum while covering concepts in depth; 60% of middle school teachers reported the opposite, that there was no effect on breadth of curriculum attributed to covering concepts in depth.

Examining the effects of the instructional strategies of Differentiated Instruction on the completion of curricular content, we see that 64% of high school teachers and 54% of middle school teachers reported that the instructional strategies have affected the completion of curricular content and about half of all teachers find it impossible to cover curricular content while studying concepts in depth.

Table 3

Impact of DI on Curricular Content

Forced-choice items:	%	%
Impact of DI on Curricular Content	HS	MS
First Item Set		
Impossible to cover depth & breadth	59.1	40.0
No effect on depth and breadth	40.9	60.0
Second Item Set		
Strategies have affected content	63.6	53.8
No effect on content completion	36.4	46.2

One-way ANOVA was performed to see whether there were significant differences in the means of the variables related to the impact of studying concepts in depth at the middle and high-school levels. No significant differences were found.

Teachers were asked to rate the importance of pedagogic strategies related to Differentiated Instruction on a Likert Scale with 1 being definitely unimportant and 5 being definitely important (see Appendix G for frequencies of responses). Analysis of the answers received will be presented in a later portion of this chapter.

To further investigate the question of the impact of studying concepts in depth on curricular content, a scale based on the questions

in Part B of the Teacher Survey was created and correlated with the responses to forced-choice questions in Table 5 using point biserial correlation to determine the relationship between the pedagogic strategies associated with Differentiated Instruction and the coverage of curricular content. Appendices C and D contain data necessary for the calculations and Appendices E and F show the computation of Point Biserial Correlation for the two questions in Table 4.

In correlating pedagogic strategies and the ability to cover depth and breadth, the calculation of r_{pb} is 0.282 (see Appendix F). Computation of t is 2.662. With $N - 2$, or 82 degrees of freedom a t value of ± 2.64 is significant at the .001 level indicating that there is a significant correlation between the importance of the pedagogic strategies of Differentiated Instruction and the teachers' ability to cover both depth and breadth. This would suggest that the teachers who indicated that the use of the pedagogic strategies had no effect on the ability to cover depth and breadth were also very positive about the importance of using those strategies in instruction.

In correlating pedagogic strategies and the effect on curricular content, the calculation of r_{pb} is 0.071 (see Appendix E). The computation of t is 0.641. With $N - 2$, or 81 degrees of freedom indicating that there is little or no correlation between the importance of the pedagogic strategies of Differentiated Instruction and their effect on the completion of curriculum content.

Table 4

Point Biserial Correlation Results

Variables	r_{pb}	t value	df	Sig
Pedagogic strategies and coverage of depth and breadth	0.282	2.662*	82	> +/- 2.64
Pedagogic strategies and completion of content	0.071	0.641	81	> +/- 1.99

* $p < .001$ *Research Question 2*

If it was necessary to modify content, did the teacher, independently, decide what content would be eliminated?

To answer this question we look at the responses to the survey item which asks if modifications were made to the curriculum and by whom. As shown in Table 5, 65% of high school teachers and 53% of middle school teachers reported that either they, or their department, had modified curriculum; 36% of high school teachers and 47% of middle school teachers reported that no modifications were necessary. These results show that in almost 60% of all classrooms modifications have been made to the curriculum in order to implement Differentiated Instruction.

Table 5

Modification of Content

Forced-choice items: Modifications	%	%
	HS	MS
Department modified curriculum	8.5	13.2
Teacher modified as necessary	56.3	39.5
No modification was necessary	36.2	47.4

Research Question 2a. If it was necessary to modify content, were the teachers satisfied that the extra depth made up for any loss of content?

To answer this question we look at the responses to the survey item which asks whether the study of concepts in depth makes up for any loss of curriculum content. As shown in Table 6, 62% of high school teachers and 68% of middle school teachers reported that the study of concepts in depth does make up for any loss of content. The answers indicate that a majority of teachers on both levels believe that the study of concepts in depth is important; this coincides with the answers to Research Question 2 where the majority of teachers/departments modified content in order to study concepts in depth.

Oneway ANOVA showed no significant differences in the mean for the dependent variable loss of content for the middle and high school levels.

Table 6

Loss of Content

Forced-choice items:	%	%
Modifications	HS	MS
In-depth study makes up for LOC	61.7	68.4
LOC cannot be replaced by depth	38.3	31.6

Research Question 3

Is there a difference in teacher philosophy about covering content at the middle and high-school level?

To answer this question we look at responses to three sets of questions related to teacher philosophy, as shown in Table 7.

Teachers were asked how important knowledge of facts is now that information is so readily accessible; 53% of high school teachers and almost 55% of middle school teachers responded that knowledge of facts is less important than emphasizing concepts.

When asked whether it is more important for students to understand concepts than to learn facts, 60% of high school teachers and 50% of middle school teachers indicated that understanding concepts is more important.

In answer to the question whether it is more important for students to learn a wide range of information or achieve a profound understanding of a topic, 51% of high school teachers and 52% of middle school teachers indicated that students achieving a profound understanding of a topic or concept is more important.

The results indicate that, overall, the majority of teachers believe that studying concepts in depth is more important than learning facts, although the margin between this group and those who still believe facts are more important is small. It is interesting to note that the largest difference occurred in the second set of questions where 60% of high school teachers indicated that concepts are more important and only 40% indicated that facts are as important.

One-way ANOVA was performed to see whether there were significant differences in the means of the variables related to teacher philosophy about covering content at the middle and high-school levels based on the answers to the above questions. No significant differences were found.

Table 7

Teacher Philosophy About Covering Content

Forced-choice items:	%	%
Facts vs. Concepts	HS	MS
First Item Set		
Emphasizing concepts are important	53.2	54.8
Learning facts are important	46.8	45.2
Second Item Set		
Facts are as important as concepts	40.0	50.0
Concepts are more important	60.0	50.0
Third Item Set		
Wide range of information important	48.9	47.7
Depth is more important	51.1	52.3

Research Question 4

Did teacher resistance to change affect the implementation of Differentiated Instruction?

To answer this question the relationship between the variable teacher resistance to change and the variable degree of implementation will be described using descriptive terms, one-way ANOVA is used to determine whether there are significant differences in responses based on teaching level or other factors, and Pearson correlation coefficient are calculated to see whether there is a correlation between the variables

that relate to teacher resistance to change and the variables related to the degree of implementation.

The first set of questions examines teachers' initial reaction to the idea of Differentiated Instruction. Almost 65% of high school teachers were initially resistant and 59% of middle school teachers reported that they were excited by the prospect of differentiating.

The second set examines how the teachers felt as training progressed. Almost 57% of high school teachers indicated that as training progressed they became convinced that Differentiated Instruction was never going to work while 72% of middle school teachers indicated that they became convinced that Differentiated Instruction was worth the trouble.

The third set examines what teachers felt about Differentiated Instruction as a whole. Sixty-eight percent of high school teachers indicated that they felt it was a fad that would soon 'go away' while 58% of middle school teachers indicated that they felt that Differentiated Instruction was a significant advance for improving instruction that would endure.

The fourth set examines what teachers thought about the school administrators' feelings towards Differentiated Instruction. Fifty-four percent of high school teachers and 68% of middle school teachers

indicated that the enthusiasm of school administrators for Differentiated Instruction helped convince them to give it a chance.

The fifth set examines how teachers felt about planning lessons for Differentiated Instruction lessons. Fifty-nine percent of high school teachers indicated that they had trouble planning lessons using Differentiated Instruction, while 52% of middle school teachers indicated that once they used Differentiated Instruction in their classrooms they became excited about planning more lessons.

The results of these five sets of questions can be found in Table 8 and show that, on a whole, high school teachers were more negative about Differentiated Instruction than middle school teachers were. They were initially resistant, felt it was a fad that would “go away”, felt only slightly more positive as training progressed, and had trouble planning lessons. Middle school teachers, on the other hand, were initially excited, felt it was an advance in instruction, became much more convinced that it was “worth the trouble” as training progressed, and were more excited about planning lessons. The majority of teachers on both levels felt that the Administration was enthusiastic about Differentiated Instruction although, again, the middle school teachers were more positive.

Table 8

Teacher Resistance to Change

Forced-choice items:	%	%
Teachers' reactions to DI	HS	MS
First Item Set		
Initially resistant	64.7	40.9
Excited by the prospect	35.3	59.1
Second Item Set		
Convinced/never going to work	56.8	27.9
Convinced/worth the trouble	43.2	72.1
Third Item Set		
A fad	68.0	41.9
A significant advance	32.0	58.1
Fourth Item Set		
Administrators are enthusiastic	54.1	67.5
Administrators don't think it will work	45.9	32.5
Fifth Item Set		
Trouble planning lessons	58.5	47.6
Excited about planning lessons	41.5	52.4

Table 9 shows the results of the forced-choice questions related to the dependent variable degree of implementation. The first set of questions examines whether teachers have implemented Differentiated

Instruction. Nineteen percent of high school teachers and 14% of middle school teachers indicated that they have not been able to implement it in their classrooms, 60% of high school teachers and 48% of middle school teachers indicated that they have implemented Differentiated Instruction on a limited basis, and 21% of high school teachers and 38% of middle school teachers indicated that Differentiated Instruction has been infused into their teaching and plays a significant role in their daily classroom instruction. Overall, the majority of teachers have implemented DI on a limited basis, or not at all, and almost twice as many middle school teachers than high school teachers report full implementation.

In the second set of questions teachers were asked to indicate how much they use Differentiated Instruction in their teaching. Twenty-eight percent of high school teachers and 39% of middle school teachers indicate that they use Differentiated Instruction in 75% or more of their teaching; the majority of teachers (72% HS, 61% MS) indicate that they use it 50% or less.

The results indicate that, in a majority of cases, Differentiated Instruction has only been implemented on a limited basis. It is interesting to note that on this question 10% of high school teachers report that they do not use DI while on the previous question 19% indicated that they had not implemented it. The reason for this inconsistency is not known.

Table 9

Degree of Implementation

Forced-choice items: Implementation	%	%
	HS	MS
 First Item Set		
No Implementation	18.8	14.3
Limited implementation	60.4	47.6
DI infused into teaching	20.8	38.1
 Second Item Set		
Do not use DI	10.0	13.0
Use DI <25%	24.0	8.7
Use DI 25%	10.0	17.4
Use DI 50%	28.0	21.8
Use DI 75%	20.0	17.4
Use DI in all teaching	8.0	21.7

Pearson correlation coefficient was calculated to see whether there is a relationship between the variables that relate to teacher resistance to change and the variables related to the degree of implementation. The results are displayed in Appendix I.

An analysis of the table shows very significant positive correlations between most of the variables associated with teacher resistance to

change and the variables related to degree of implementation. This would suggest that the teachers who were more positive about Differentiated Instruction also had a higher degree of implementation than did the teachers who were more negative. The only relationship that did not show a significant correlation was between the variable related to teacher feelings as training in Differentiated Instruction progressed and teacher implementation. As to this relationship, the more positive feelings felt by some teachers as training progressed does not correlate to increased implementation.

Research Question 4a. What are the factors that contribute to teacher resistance to change?

One-way ANOVA was performed to determine whether there were significant differences in the variables related to teacher resistance to change between middle school teachers and high school teachers. As shown in Table 10 there are significant differences at the middle and high-school levels. The differences appear in the means of the dependent variables that examine teachers' initial feelings about Differentiated Instruction, their feelings as training progressed and their feelings about Differentiated Instruction as a whole.

Comparing the means on Table 11 shows that middle school teachers were much more positive about Differentiated Instruction than high school teachers were.

Table 10

*Analysis of Variance for Independent Variable Teaching Level
and Dependent Variables Related to Teacher Resistance to Change*

Dependent Variable	<i>F</i>	<i>df</i>	<i>Sig</i>
Between Subjects			
Initial resistance to DI	5.583*	1	.020
Feelings as training progressed	7.945**	1	.006
Feelings about DI	6.734*	1	.011

* $p < .05$. ** $p < .01$.

Table 11

*Means for Independent Variable Teaching Level and Dependent Variables
Related to Teacher Resistance to Change*

Dependent Variable	Middle School ^a	High School ^b
Initial resistance to DI	0.64	0.39
Feelings as training progressed	0.77	0.47
Feelings about DI	0.62	0.33

^aN=42 ^bN=44

Oneway ANOVA was also performed for the other independent variables and significant differences in the means were found for some of

the factors concerning teacher resistance to change and the independent variables gender and post-graduate courses in Differentiated Instruction.

As shown in Table 12, significant differences appear according to gender in the means of the dependent variables that examine teachers' initial feelings about Differentiated Instruction, their feelings as training progressed, their feelings about Differentiated Instruction as a whole, and their feelings about school administrators.

Very significant differences also appear in the means of the dependent variable teachers' feelings about Differentiated Instruction and the independent variable post-graduate courses in Differentiated Instruction.

Comparing the means in Table 13 shows that female teachers were more positive than male teachers were about Differentiated Instruction in the beginning, as training progressed, and about Differentiated Instruction as a whole. They also felt, more than the male teachers did, that school administrators were enthusiastic about Differentiated Instruction.

Comparing the means on Table 13 shows that teachers who had post-graduate courses in Differentiated Instruction felt much more positive about the value of Differentiated Instruction than did teachers who had no post-graduate courses.

Table 12

Analysis of Variance for Ind. Variables Gender and Post-Grad Instruction and Dependent Variables Related to Teacher Resistance to Change

Dependent Variable	<i>F</i>	<i>df</i>	<i>Sig</i>
Ind. Variable Gender - Between Subjects			
Initial resistance to DI	4.400*	1	.039
Feelings as training progressed	7.393**	1	.008
Feelings about DI as a whole	3.962*	1	.050
School Administrators' attitude	4.698*	1	.033
Dependent Variable	<i>F</i>	<i>df</i>	<i>Sig</i>
Ind. Variable Post-Grad Courses in DI – Between Subjects			
Feelings about DI as a whole	6.734**	1	.007

* $p < .05$. ** $p < .01$

Table 13

Means for Independent Variables Teaching Level and Post-Graduate Instruction in Differentiated Instruction and the Dependent Variables Related to Teacher Resistance to Change

Independent Variable Gender		
Dependent Variable	Female ^a	Male ^b
Initial resistance to DI	0.66	0.39
Feelings as training progressed	0.81	0.50
Feelings about DI as a whole	0.61	0.39
School Administrators' attitudes	0.76	0.50

Independent Variable Post-Grad Instruction		
Dependent Variable	Yes ^c	No ^d
Feelings about DI as a whole	0.65	0.35

^aN=39 ^bN=36 ^cN=34 ^dN=51

Research Question 5

To what degree has Differentiated Instruction been implemented in the classroom?

This question, which relates to the degree of implementation of Differentiated Instruction, will be described using descriptive statistics

based on responses to questions relating to the degree of implementation and various aspects of Differentiated Instruction as shown in Table 14.

The questions relating to the actual degree of implementation were presented in the section on Research Question 4 (see Table 9, p. 72). As previously stated, the results of the first set of questions indicate that, in a majority of cases (68% HS, 48% MS), Differentiated Instruction has been implemented on a limited basis; only 21% of high school teachers and 38% of middle school teachers report that Differentiated Instruction has been infused into their teaching.

The second set of questions teachers were asked to indicate the degree to which Differentiated Instruction is being used in teaching. Ten percent of high school teachers and 13% of middle school teachers report that they do not use Differentiated Instruction, 62% of high school teachers and 48% of middle school teachers use it 50% or less, and 28% of high school teachers and 39% of middle school teachers use it 75% or more. It is interesting to note that 22% of middle school teachers and only 8% of high school teachers report using Differentiated Instruction in all of their teaching.

As stated in the section on Research Question 4, the majority of teachers reported that Differentiated Instruction has only been implemented on a limited basis in their classrooms, with middle school teachers reporting a much higher degree of implementation than high school teachers.

Other aspects of implementation are examined in six sets of questions (see Table 14). The first set of questions examines teacher planning of lessons; 89% of high school teachers indicated that they don't have enough time to properly plan lessons for Differentiated Instruction while middle school teachers were more evenly split: 53.5% reported not having enough time to plan and 46.5% reported that planning didn't take much more time.

The second set of questions examines the aspect of Differentiated Instruction that involves knowing your students in order to plan lessons for them; 23.5% of respondents indicated that they have not been able to get to know their students well enough while 76.5% indicated that it became easier to plan differentiated lessons as they came to know their students better. The responses are very similar at both levels with the vast majority of teachers feeling they have been able to get to know their students well enough to plan differentiated lessons for them.

The third set of questions examines the importance of pre-tests in planning Differentiated Instruction lessons. Fifty-four percent of respondents indicated that pre-tests are an important tool in planning differentiated lessons and 46% indicate that pre tests do not make it easier to plan differentiated lessons; these results indicate that the teachers are almost evenly split in their attitude towards the importance of pre-tests at both levels.

The fourth and fifth sets of questions examine the value of a hands-on approach to instruction. The vast majority of teachers on both levels (89% HS, 95% MS) indicated that they believe students learn better with a hands-on approach to learning and a slightly smaller percent (79% HS, 91% MS) feel that this approach is easy to incorporate into their teaching.

The sixth set of questions examines the completion of prescribed curriculum due to the implementation of Differentiated Instruction. Twenty-two percent of middle and high school teachers reported that since the implementation of Differentiated Instruction they have not been able to complete the prescribed curriculum while 24% of high school teachers and 46% of middle school teachers report no effect on the curriculum. Fifteen percent of high school teachers and 5% of middle school teachers reported that they had chosen not to implement in order to complete the curriculum and 39% of high school teachers and 27% of middle school teachers reported they had chosen to implement on a limited basis in order to complete the curriculum.

In summary, the responses to questions related to the dependent variable degree of implementation indicate that almost one-quarter of all teachers were not able to complete the curriculum since implementation began; half of the middle school teachers report that implementation has not affected the completion of curriculum while only half as many high school teachers (24%) gave the same response, and almost 55% of high

school teachers and 32% of middle school teachers reported that in order to complete the prescribed curriculum they either implemented Differentiated Instruction only on a limited basis or chose not to implement it at all.

Almost all of the high school teachers indicated that they don't have enough time to plan differentiated lessons; the majority of middle school teachers responded in kind ($N=23$), but almost as many ($N=20$) reported that planning is not a problem. Three-quarters of middle and high school teachers reported that as they got to know their students, planning differentiated lessons became easier. It is interesting to note that almost 78% of high school teachers reported that planning has become easier, while 89% of them still report not being able to properly plan for differentiation.

On both levels, the teachers were divided about the value of pre-tests, but most teachers agreed that hands-on instruction is effective and easy to incorporate into lessons.

As to the degree of implementation, in the majority of classrooms, Differentiated Instruction has only been implemented on a limited basis in 28% of high school teachers and 39% of middle school teachers report that they differentiate 75% or more lessons; this is very close to the 21% of high school teachers and 38% of middle school teachers who report that Differentiated Instruction has been infused into their teaching.

One-way ANOVA was performed to see whether there were significant differences in the means of factors related to the implementation of Differentiated Instruction at the middle and high-school levels. As shown in Table 15 there is a significant difference in the means of the answers of middle and high-school teachers on the subject of planning lessons for differentiation.

Comparing the means on Table 16 shows that middle school teachers were more positive about planning lessons for Differentiated Instruction than high school teachers, who report not having enough time to plan differentiated lessons.

Table 14

Degree of Implementation

Forced-choice items:	%	%
Aspects of Differentiated Instruction	High School	Middle School
First Item Set		
Not enough time to plan	89.1	53.5
Doesn't take much more time	10.9	46.5
Second Item Set		
Can't get to know students	22.5	24.4
Planning has become easier	77.5	75.6
Third Item Set		
Pre-tests don't help	54.3	53.8
Pre-tests are a useful tool	45.7	46.2
Fourth Item Set		
Hands-on – effective	88.0	95.1
Hands-on – not effective	12.0	4.9
Fifth Item Set		
Hands-on – too much time	20.8	9.3
Hands-on – easy to incorporate	79.2	90.7
Sixth Item Set		
Can not complete curriculum	21.7	22.0
Have chosen not to implement	15.2	4.9
Chosen limited implementation	39.1	26.8
No effect on content completion	23.9	46.3

Table 15

*Analysis of Variance for Independent Variable Teaching Level
and Dependent Variable Planning Lessons for DI*

Dependent Variable	<i>F</i>	<i>df</i>	<i>Sig</i>
Between Subjects			
Planning DI lessons	2.823*	1	.000

* $p < .001$

Table 16

*Means for Independent Variable Teaching Level
and Dependent Variable Planning Lessons for DI*

Dependent Variable	Middle School ^a	High School ^b
Planning Lessons for DI	0.47	0.11

^aN=43 ^bN=46

Research Question 6

How has the implementation of Differentiated Instruction affected teaching?

This question will be answered based on teacher responses to three questions. The first set of questions (see Table 17) examines changes in instructional strategies associated with implementing Differentiated Instruction. Fifty-nine percent of respondents indicated that they had to change instructional strategies in order to implement Differentiated Instruction while 41% indicated that they have implemented Differentiated Instruction without changing instructional strategies. The answers were virtually the same for middle and high school teachers and they indicate that the majority of teachers had to change instructional strategies in order to implement Differentiated Instruction.

The second set of questions examines the impact of Differentiated Instruction on teaching skills. Seventeen percent of teachers at both levels indicated that they felt more confident in their teaching skills before they implemented Differentiated Instruction; 51% of high school teachers responded that Differentiated instruction made no difference in their teaching skills and 32% indicated that they felt it helped them become better teachers; the reverse is true of the middle school teachers, 32% say there has been no difference in their teaching skills and 51% feel that they have become better teachers.

The third set of questions examines the effect of Differentiated Instruction on the quality of teaching. Here, too, the patterns are reversed. Sixty-seven percent of high school teachers indicated that teachers do a good job of educating students without Differentiated Instruction and 33% feel that it has helped teachers do a better job educating more students more effectively while 63% of middle school teachers indicated that teachers do a better job educating students with DI and 37% reported that teachers do a good job without it.

In summary, the majority of teachers reported changing instructional strategies in order to differentiate and the majority of high school teachers felt that Differentiated instruction has not made a difference in their teaching skills and that teachers do a good job without it, while answers at the middle school level are the opposite; most teachers feel that they have become better teachers and do a better job educating students using Differentiated Instruction.

One-way ANOVA was performed to describe the differences in the means at the middle and high-school level of the effect of implementing Differentiated Instruction on teaching. As shown in Table 18, there is a significant difference in the means of middle and high-school teachers and the dependent variable Differentiated Instruction effects on teaching.

Table 17

Effects of DI on Teaching

Forced-choice items: Effects	% High School	% Middle School
First Item Set		
Had to change strategies	57.8	60.0
Did not change strategies	42.2	40.0
Second Item Set		
Felt more confident before DI	17.0	17.1
DI has made no difference	51.1	31.7
DI helped me be a better teacher	31.9	51.2
Third Item Set		
Teachers do a better job with DI	32.6	62.8
Teachers do good job without DI	67.4	37.2

Table 18

*Analysis of Variance for Independent Variable Teaching Level
and Dependent Variable DI Effects on Teaching*

Dependent Variable	F	df	Sig
Between Subjects			
DI effects on teaching skills	8.739*	1	.004

*p < .01.

Comparing the means on Table 19 shows that middle school teachers were much more positive about the effects Differentiated Instruction had on their teaching than high school teachers were. This supports the findings reported in the section that discussed the effects of Differentiated Instruction on teaching skills.

Table 19

Means for Independent Variable Teaching Level and Dependent Variable DI Effects on Teaching

Dependent Variable	Middle School ^a	High School ^b
DI effects on teaching skills	0.63	0.33

^aN=43 ^bN=46

Research Question 6a. How important is it to utilize the pedagogic strategies of Differentiated Instruction?

Teachers were asked to rate the importance of the pedagogic strategies on a Likert Scale with 1 being definitely unimportant and 5 being definitely important. The results are shown in Appendix G.

Following are summaries for the responses for each strategy:

Challenging students intellectually. Over 70% of the middle and high school teachers rated this as definitely important; 24% of each group rated this as somewhat important.

Knowing students' interests. Forty-nine percent of high school teachers and 52% of middle school teachers rated this as somewhat important; 35% of middle school teachers and 39% of high school teachers reporting that this was definitely important.

Delivering information to students. Fifty-four percent of high school teachers and 65% of middle school teachers rated this as definitely important; over 25% of all teachers rated this as somewhat important.

Guiding students as they find their own answers. Fifty-one percent of high school teachers and 63% of middle school teachers rated this definitely important; 39% of high school teachers and 26% of middle school teachers rated this as somewhat important.

Knowing students' skill levels. Fifty-eight percent of high school teachers and 67% of middle school teachers rated this as definitely important; 32% of high school teachers and 22% of middle school teachers rated this as somewhat important.

Assessing students' prior knowledge. Thirty-one percent of high school teachers and 41% of middle school teachers reported that this was definitely important; 37% of high school teachers and 33% of middle school teachers rated this as somewhat important.

Varying complexity according to students' needs. Fifty-one percent of high school teachers and 56% of middle school teachers rated this as definitely important; 33% of high school teachers and 31% of middle school teachers rated this as somewhat important.

Varying rates of instruction. Forty-five percent of high school teachers and 54% of middle school teachers rated this as definitely important; 21% of high school teachers and 26% of middle school teachers rated this as somewhat important.

Allowing choice of learning options. Twenty-six percent of high school teachers and 37% of middle school teachers rated this as definitely important; 39% of high school teachers and 30% of middle school teachers rated this as somewhat important.

Transmitting facts for students to memorize. This is not a pedagogic strategy associated with Differentiated Instruction, rather it is associated with traditional, teacher centered, instruction and was included in the survey because the researcher was interested in how the teachers would answer this question. Over 50% of both high school and middle school teachers reported that transmitting facts for memorization was somewhat or definitely important and only 20% of middle school teachers and 24% of high school teachers rated it as definitely/somewhat unimportant.

Overall the responses show that vast majority teachers on both levels believe that the pedagogic strategies related to Differentiated instruction are somewhat or definitely important.

Oneway ANOVA was performed to determine if controlling for any of the independent variables would show significant differences in teachers' beliefs about the importance of the pedagogic strategies associated with Differentiated Instruction; no significant differences were seen between

the middle and high school levels, but very significant differences were found for all strategies and gender, as shown in Table 20.

Table 20

*Analysis of Variance for Independent Variable Gender
and Dependent Variables Related to Pedagogic Strategies*

Dependent Variable	<i>F</i>	<i>df</i>	<i>Sig</i>
Between Subjects			
Challenging students intellectually	8.004*	1	.006
Knowing students' interests	13.428*	1	.000
Delivering information	15.648*	1	.000
Guiding students	17.905*	1	.000
Knowing students' skill levels	14.512*	1	.000
Assessing prior knowledge	28.568*	1	.000
Varying complexity of assignments	11.128*	1	.001
Varying rates of instruction	23.452*	1	.000
Choice of learning options	16.674*	1	.000
Transmitting facts for memorization	7.448*	1	.008

* $p < .01$.

Examining the means for males and females in Table 21 shows that in all cases the female teachers believed that the pedagogic strategies of Differentiated Instruction were more important than did male teachers.

Table 21

Means for Independent Variable Gender and Dependent Variables Related to Pedagogic Strategies

Dependent Variable	Male ^a	Female ^b
Challenging students intellectually	4.42	4.79
Knowing students' interests	3.94	4.42
Delivering information	4.08	4.71
Guiding students	4.06	4.73
Knowing students' skill levels	4.11	4.73
Assessing prior knowledge	3.44	4.44
Varying complexity of assignments	4.06	4.65
Varying rates of instruction	3.69	4.62
Choice of learning options	3.31	4.19
Transmitting facts for memorization	3.17	3.73

^aN = 36 ^bN = 52

Research Question 6b. How important are teacher behaviors that relate to Differentiated Instruction?

Teachers were asked to rate the importance of teacher behaviors related to Differentiated Instruction on a Likert Scale with 1 being definitely unimportant and 5 being definitely important. The results are

shown in Appendix H. Following is a summary for the responses for each behavior.

Understanding and relating to students. Seventy percent of high school teachers and 79% of middle school teachers rated this as definitely important; 22 % of high school teachers and 12% of middle school teachers rated this as somewhat important.

Listening to students. Seventy-two percent of high school teachers and 86% of middle school teachers rated this as definitely important; 22 % of high school teachers and 9% of middle school teachers rated this as somewhat important.

Taking time to talk with students. Fifty-six percent of high school teachers and 74% of middle school teachers rated this as definitely important; 36% of high school teachers and 23% of middle school teachers rated this as somewhat important.

Keeping control of the class. Seventy percent of high school teachers and 83% of middle school teachers rated this as definitely important; 14 % of high school teachers and 12% of middle school teachers rated this as somewhat important.

Being fair to all students. Sixty-four percent of high school teachers and 86% of middle school teachers rated this as definitely important; 14 % of high school teachers and 8% of middle school teachers rated this as somewhat important.

Calling students by name. Fifty-eight percent of high school teachers and 72% of middle school teachers rated this as definitely important; 26 % of high school teachers and 16% of middle school teachers rated this as somewhat important.

Teaching in an interesting manner. Fifty-eight percent of high school teachers and 88% of middle school teachers rated this as definitely important; 30% of high school teachers and 7% of middle school teachers rated this as somewhat important.

Demonstrating care and concern for students. Sixty-six percent of high school teachers and 81% of middle school teachers rated this as definitely important; 20 % of high school teachers and 14% of middle school teachers rated this as somewhat important.

Overall, the majority of teachers on both levels regard these behaviors as being important, with a higher percentage middle school teachers rating all behaviors as definitely important than did the high school teachers.

When oneway ANOVA was performed to determine if controlling for any of the independent variables would show significant differences, differences were found in teachers' beliefs about the importance of some teacher behaviors and teaching level as shown in Table 22.

Significant differences were found for the independent variable teaching level and the behaviors taking time to talk with students and demonstrating care and concern for students. The differences in teaching

in an interesting manner and being fair to all students were significant to the .005 level, indicating very significant differences in the attitudes of middle school teachers and high school teachers toward these behaviors.

Table 22

Analysis of Variance for Independent Variable Teaching Level and Dependent Variables Related to Teacher Behaviors

Dependent Variable	<i>F</i>	<i>df</i>	<i>Sig</i>
Between Subjects			
Taking time to talk	4.250*	1	.042
Being fair to all students	8.097**	1	.005
Teaching in interesting manner	8.402**	1	.005
Care and concern for students	4.028*	1	.048

* $p < .05$. ** $p < .01$.

Examining the means in Table 23 reveals that in all cases the middle school teachers believed that the teacher behaviors: taking time to talk with students, being fair to all students, demonstrating care and concern for students, and teaching in an interesting manner, were more important than high school teachers did.

Table 23

*Means for Independent Variable Teaching Level
and Dependent Variables Related to Teacher Behaviors*

Dependent Variable	Middle School ^a	High School ^b
Taking time to talk	4.72	4.42
Being fair to all students	4.81	4.32
Teaching in interesting manner	4.84	4.40
Care and concern for students	4.77	4.44

^aN = 43 ^bN = 50

Oneway ANOVA also showed very significant differences ($p < .005$) between the independent variable gender, and all of the teacher behaviors as shown in Table 24.

Examining the means for males and females in Table 25 shows that in all cases the female teachers believed that the teacher behaviors were more important than male teachers did.

The fact that there are such significant differences in the beliefs of male and female teachers about the importance of teacher behaviors and pedagogic strategies is very interesting and warrants a closer look.

Table 24

*Analysis of Variance for Independent Variable Gender
and Dependent Variables Related to Teacher Behaviors*

Dependent Variable	<i>F</i>	<i>df</i>	<i>Sig</i>
Between Subjects			
Relating to students	8.993*	1	.004
Listening to students	11.128*	1	.001
Taking time to talk	8.479*	1	.005
Keeping control of class	16.025*	1	.000
Being fair to all students	10.558*	1	.002
Calling students by name	16.870*	1	.000
Teaching in interesting manner	19.046*	1	.000
Care and concern for students	16.073*	1	.000

* $p < .01$.

Table 25

*Means for Independent Variable Gender
and Dependent Variables Related to Teacher Behaviors*

Dependent Variable	Male ^a	Female ^b
Relating to students	4.39	4.83
Listening to students	4.45	4.89
Taking time to talk	4.30	4.74
Keeping control of class	4.33	4.89
Being fair to all students	4.21	4.79
Calling students by name	4.03	4.75
Teaching in interesting manner	4.21	4.87
Care and concern for students	4.21	4.85

^aN = 33 ^bN = 53

Research Question 6c. How has Differentiated Instruction affected student understanding and outcome?

This question will be answered based on teacher responses to two survey questions using descriptive statistics, ANOVA to see if there are any differences in responses at the middle and high school levels, and by examining scores on standardized tests from the year before implementation began to the past school year.

The first set of questions examines whether Differentiated Instruction has affected student achievement on tests or other measures.

Seventy-six percent of high school teachers and 57% of middle school teachers indicated that there has been no effect on student achievement while 24% of high school teachers and 43% of middle school teachers indicated that students have achieved higher scores as shown on Table 26.

The second set of questions examines whether Differentiated Instruction has impacted student understanding. Sixty-five percent of high school teachers indicated that they see no difference in student understanding while middle school teachers reported the opposite; Fifty-nine percent indicated that implementing Differentiated Instruction has impacted positively on student understanding.

Table 26

Impact of DI on Student Understanding and Achievement

Forced-choice items:	%	%
Achievement and Understanding	High School	Middle School
First Item Set		
No effect on student achievement	76.2	57.1
Students achieved higher scores	23.8	42.9
Second Item Set		
No difference in understanding	65.1	41.0
Positive impact on understanding	34.9	59.0

When oneway ANOVA was performed to determine if significant differences were shown for any of the dependent variables and the independent variable teaching level; significant differences were found for the question relating to student understanding and teaching level as shown in Table 27.

Table 27

*Analysis of Variance for Independent Variable Teaching Level
and Dependent Variable Student Understanding*

Dependent Variable	<i>F</i>	<i>df</i>	<i>Sig</i>
Between Subjects			
Student Understanding	4.945*	1	.029

* $p < .05$.

Examining the means in Table 28 reveals that more middle school teachers than high school teachers believed that Differentiated Instruction had impacted positively on student understanding.

Table 28

*Means for Independent Variable Teaching Level
and Dependent Variable Student Understanding*

Dependent Variable	Middle School ^a	High School ^b
Student Understanding	0.59	0.34

^aN=34 ^bN=38

When oneway ANOVA was performed to determine if controlling for any of the other independent variables would show significant differences, significant differences were shown for gender and the question relating to student achievement as shown in Table 29.

Table 29

Analysis of Variance for Independent Variable Gender and Dependent Variable Student Achievement

Dependent Variable	<i>F</i>	<i>df</i>	<i>Sig</i>
Between Subjects			
Student Achievement	4.625*	1	.035

*p < .05.

Examining the means reveals Table 30 shows that more female teachers than male teachers believed that Differentiated Instruction had impacted positively on student achievement.

Table 30

Means for Independent Variable Gender and Dependent Variable Student Achievement

Dependent Variable	Male ^a	Female ^b
Student Achievement	0.19	0.43

^aN=31 ^bN=42

To further analyze student achievement we examined standardized tests from the year before implementation began, the 2000-2001 school year, through the second year of implementation, the 2002-2003 school year. The Grade Eight Proficiency Assessment (GEPA), the High School Proficiency Assessment (HSPA), and SATs were analyzed. The HSPA could only be analyzed for 2 years because for the 2000-2001 school year another measure was used which cannot be compared with the HSPA. The comparisons in this section are only between the district and the DFG because the district's DFG scored above the state in all portions of the tests for all three years.

On the Grade Eight Proficiency Assessment in Language Arts Literacy (see Table 31), in the Proficiency Percentages for the Advanced category, the district scored well below the DFG for each of the three years, decreasing each year, with 1.0% of the district's students scoring Advanced in the 2002-03 school year, compared with 7% for the DFG.

In the category Proficient, the district scored below the DFG for the 2000-01 and 2001-02 school years but above for the 2002-03 school year, with 75.4 % Proficient in the district and 73.9% for the DFG. The district had a drop from 70.3% to 62% in the first year of implementation, but made significant gains in the last school year.

The district had more students scoring only Partially Proficient than the DFG in all 3 years, with a large increase from 28% to 36.8% in

the first year of implementation and a drop to 23.6% in the 2002-03 school year.

Overall, the district has made modest gains in Language Arts Literacy, with a drop of 4.4% overall in the Partially Proficient category, resulting in a gain in the Proficient category over the 2-year period, but it has also seen a loss of students from the Advanced Proficient category.

Table 31

Grade Eight Proficiency Assessment - Language Arts Literacy

District	Year	N	Proficiency Percentages		
			Partial	Proficient	Advanced
	2002-03	191	23.6	75.4	1.0
	2001-02	234	36.8	62.0	1.3
	2000-01	237	28.0	70.3	1.7
DFG	2002-03	13337	19.1	73.9	7.0
	2001-02	12436	18.8	72.8	8.3
	2000-01	n/a	19.1	74.0	6.9
State	2002-03	106479	26.2	67.2	6.6
	2001-02	100543	26.8	64.9	8.3
	2000-01	n/a	26.9	66.1	7.1

On the Mathematics portion of the GEPA (see Table 32), in the category Advanced the district scored well below the DFG for each of the 3 years, decreasing each year, with 15% for the district in 2000-01 and only 9.2% in 2002-03, compared with 17.1% for the DFG.

In the category Proficient, the district scored above the DFG for the 2000-01 school year with 50.4%, decreasing to 43.8% in 2001-02 school year, and increasing to 52.8% 2002-03 school year compared to 47.3% for the DFG.

The district had more students scoring only Partially Proficient than the DFG in all 3 years, with a large increase from 34.6% to 43.8% in the first year of implementation and a drop to 37.9% in the 2002-03 school year.

At first glance, there appears to have been significant gains in the 2002-03 school year, but, considering the negative changes in all categories in the 2001-02 school year, the changes since implementation will be examined. The district has seen a loss in the Advanced Proficient Category, and more students scored only Partially Proficient. Overall, the district has not shown progress in Mathematics; the small increase in the Proficient category is a result of the loss in the Advanced category.

Table 32

Grade Eight Proficiency Assessment - Mathematics

District	Year	N	Proficiency Percentages		
			Partial	Proficient	Advanced
	2002-03	195	37.9	52.8	9.2
	2001-02	235	43.8	43.8	12.3
	2000-01	237	34.6	50.4	15.0
DFG	2002-03	13366	35.6	47.3	17.1
	2001-02	12480	33.6	48.4	17.9
	2000-01	n/a	28.5	49.9	21.6
State	2002-03	106479	43.2	40.8	15.9
	2001-02	100543	41.8	42.2	16.0
	2000-01	n/a	38.2	43.2	18.6

On the Science portion of the GEPA (see Table 33), in the category Advanced the district scored well below the DFG for each of the 3 years, decreasing each year, with 15.2% for the district in 2000-01 and only 11.4% in 2002-03, compared with 22.6% for the DFG.

In the category Proficient, the district scored above the DFG for all three years, with 62.9% in the 2000-01 school year increasing to 69.9% 2002-03 school year compared to 60% for the DFG.

The district had more students scoring only Partially Proficient than the DFG in all 3 years, with a decrease from 22% in 2000-01 to 18.7% in the 2002-03 school year.

Overall, the district has made modest gains in Science, with a drop of 3.3% overall in the Partially Proficient category, resulting in a gain in the Proficient category over the 2-year period, but there has also been a loss of 3.8% in the Advanced Proficient category.

Table 33

Grade Eight Proficiency Assessment - Science

District	Year	N	Proficiency Percentages		
			Partial	Proficient	Advanced
	2002-03	193	18.7	69.9	11.4
	2001-02	235	22.1	63.0	14.9
	2000-01	237	22.0	62.9	15.2
DFG	2002-03	13368	17.4	60.0	22.6
	2001-02	12481	15.5	62.5	22.1
	2000-01	n/a	14.7	62.7	22.8
State	2002-03	107005	27.1	54.3	18.6
	2001-02	100543	25.1	56.0	18.9
	2000-01	n/a	25.5	55.5	19.0

The GEPA scores in the three categories show that in the area of Language and Science, the lower achieving students have made some progress, but the students in the middle and the gifted students have made no gains. Not only are the students in the middle not achieving more, but the gifted students seem to be losing ground. In Math, no gains have been made. The scores for the 2002-03 school year show more students scoring Partial Proficiency and less students scoring Advanced than in the 2000-01 school year.

On the High School Proficiency Assessment (HSPA) in Language Arts Literacy (see Table 34), Proficiency Percentages in the Advanced category for the district were below the DFG for each year, with 6.4% of the district's students scoring Advanced in 2001-02, increasing to 11.8% in 2002-03 compared with 16.8% for the DFG.

In the category Proficient, the district scored above the DFG for each year, with 71.7 % Proficient in 2001-02 and 73.8% in 2002-03, compared with 69.5% for the DFG.

The district had more students scoring only Partially Proficient than the DFG in both years, with a large drop from 21.9% to 14.4% in 2002-03, compared with 13.7% for the DFG.

Overall, the district has made gains in the Language section, with a drop of 7.5% in the Partially Proficient category, and a gain of 5.4% in

the Advanced category, although the district is still 5% below the DFG in this category.

Table 34

High School Proficiency Assessment - Language Arts Literacy

School	Year	N	Proficiency Percentages		
			Partial	Proficient	Advanced
	2002-03	187	14.4	73.8	11.8
	2001-02	187	21.9	71.7	6.4
DFG	2002-03	10385	13.7	69.5	16.8
	2001-02	10064	13.3	71.1	15.6
State	2002-03	88320	19.8	65.0	15.1
	2001-02	84509	18.9	66.3	14.8

On the Mathematics portion of the HSPA (see Table 35), in the category *Advanced*, the district scored below the DFG for both years, with 16% for the district in 2001-02 and 18.4% in 2002-03, compared with 21% for the DFG.

In the category *Proficient*, the district scored above the DFG for the 2001-02 school year with 56.4% compared with 54.8% for the DFG, and

below the DFG in 2002-03 school year with 51.4%, compared to 52.4% for the DFG.

The district had more students scoring only Partially Proficient than the DFG in both years, with 27.7% in 2001-02, increasing to 30.3% in the 2002-03 school year.

Progress in Mathematics is seen in the increase in the Advanced category, which is positive, but there is a similar increase in the Partial Proficiency category, which is negative.

Table 35

High School Proficiency Assessment - Mathematics

School	Year	N	Proficiency Percentages		
			Partial	Proficient	Advanced
	2002-03	185	30.3	51.4	18.4
	2001-02	188	27.7	56.4	16.0
DFG	2002-03	10372	26.6	52.4	21.0
	2001-02	10011	24.1	54.8	21.1
State	2002-03	88123	34.2	46.4	19.5
	2001-02	84030	31.4	49.5	19.1

Overall the results in the district are mixed. In the Language section we see a drop in the Partially Proficient category, and a gain in the Advanced category which indicates that the lower achieving students and the students in the middle are being reached and achieving more. In Mathematics, there are increases in both the Partial Proficiency and Advanced categories. In this area it seems that the lower achieving students are not achieving more, and the students in the middle are losing some ground on one hand – falling into the Partial Proficiency category – and making gains on the other with more students scoring in the Advanced category. We must keep in mind that there is only data for 2 years, so we cannot assume that there is a trend. The district had more students scoring in the Partial Proficiency category, and less students scoring Advanced than the DFG for both years.

For the Scholastic Assessment Test (SAT), the district's students' mean scores in Mathematics were below the DFG for all 3 years. The district scores in Verbal were above the DFG in 2000-01 and below the DFG for the past 2 school years. The district's scores have fallen each year on both sections of the test. Mean scores for the District, DFG and the state are shown in Table 36.

The district's Math scores fell from 514 in 2000-01, to 506 in 2001-02, and to 496 in 2002-03 – a loss of 18 points. The Verbal scores

fell from 517 in 2000-01, to 503 in 2001-02, and to 473 in 2002-03 – a loss of 44 points.

Even though the district seems to have made some progress in Language and small gains on the Math section of the HSPA, these gains have not translated to increased achievement on the SATs, in fact, SAT scores are decreasing.

Table 36

Scholastic Assessment Test (SAT)

School	Year	N	Math	Verbal
	2002-03	107	496	473
	2001-02	97	506	503
	2000-01	108	514	517
DFG	2002-03	7087	522	506
	2001-02	7234	524	506
	2000-01	7701	521	505
State	2002-03	54710	518	500
	2001-02	55417	514	495
	2000-01	60124	514	496

Open-ended questions

Question D1. What would you change about DI in order to make it easier to implement?

Teacher responses to this question included: more planning time, smaller classes, longer periods, teaching assistants in the classrooms, having appropriate materials and ideas available to teachers, changing class set-up, more administrative support; having someone available who could answer questions about DI; more in-depth training in content areas; grouping students more homogenously; and having teaching teams with common prep time.

Question D2. What do you think is the most effective component of DI?

Teacher responses to this question included: increased student involvement and interest, student interactions, teaching students at their own level, having students learn at their own pace, recognizing different learning styles, knowing students' needs, accepting different levels of success, being able to reach all students, the ability to reach slower students, and having a variety of activities for students to choose from.

Teachers seem to be positive about the different components of Differentiated Instruction, but indicate that changes need to be made in the areas of training, scheduling, staffing and support to make it work.

Chapter V

RESULTS, CONCLUSIONS AND RECOMMENDATIONS

Introduction

The past decades have seen many innovations come to the field of educational instruction. Differentiated Instruction has been adopted by many schools as a means to meet the needs of diverse learners in heterogeneous classrooms.

Differentiated Instruction is an amalgam of various brain-based, active-learning strategies that de-emphasize facts and focus on concepts, emphasizing the relationships among ideas. While there are an increasing number of journal articles written on the application of Differentiated Instruction in various settings, there have been no major studies on the effectiveness Differentiated Instruction as a means of reaching all students in heterogeneous classrooms.

Purpose of the Study

The purpose of this study is, first, to explore whether the implementation of Differentiated Instruction in a New Jersey school district's middle and high schools impacts the participants' (teachers') ability to complete the written curriculum as defined by the school's curriculum guide. The second aim is to evaluate the differences in implementing Differentiated Instruction that may have occurred between the middle and high school levels, including the conditions that may have

influenced these differences, that is the independent variables: years of teaching experience, years at present school, teachers' degree status, teaching discipline, gender, and post-graduate courses in Differentiated Instruction.

Identification of District

This study was proposed to investigate the effects of Differentiated Instruction on completion of content at the middle and high school levels. To that end, a school district that had implemented Differentiated Instruction in its middle and high schools needed to be identified. The participating district was in the third year of implementation of Differentiated Instruction; full implementation is expected this year—all teachers are expected to use Differentiated Instruction in classroom instruction this year.

Survey Instrument

As stated earlier, there have been no major studies on the effectiveness of Differentiated Instruction in meeting the needs of all students in mixed-ability classrooms on the middle school and high school levels; therefore there is no established or accepted measure that could be used in this study. The survey used was created by the researcher specifically for this situation in order to investigate whether a narrowing of the curriculum is necessary to achieve depth of study,

teacher understanding of the benefits of depth over breadth in relation to student achievement, and teacher understanding of the viability of across-the-board use of Differentiated Instruction at the middle and high school levels. The demographic information would be used to control for the independent variables gender, years of teaching experience, teachers' degree status, teaching discipline, and teaching level (middle school or high school).

Results

Of the 110 surveys distributed, 97 (88%) were returned completed, although some teachers did not answer all questions. The responses were transferred to SPSS and frequency distributions were constructed, along with oneway ANOVA to determine if there were any significant differences in the responses according to the independent variables gender, years teaching, years in the district, teaching level, subject taught, highest degree held, year of last degree, post-graduate education in Differentiated Instruction and average class size. Not all tables were presented in the data analysis section, only significant differences were shown. Where differences occurred, factorial ANOVA was performed to see where the differences lie. Pearson Correlation Coefficient and Point Biserial Correlation were performed for some questions.

Summary of Results

The data shows that the majority of high school teachers feel they cannot cover concepts in depth while retaining breadth of the curriculum and that the instructional strategies associated with Differentiated Instruction have affected the completion of content. The majority of middle school teachers agree that the instructional strategies have affected the completion of content but maintain that there has been no effect on their ability to cover depth and breadth.

The data also indicate that there is a significant positive correlation between the importance of the pedagogic strategies and teachers' ability to cover depth and breadth, but not between the importance of pedagogic strategies and the effects of those strategies on the completion of curricular content. No statistically significant differences were seen between the middle school teachers and high school teachers.

Analysis of the data suggests that high school teachers are having more trouble covering depth and breadth than middle school teachers are and that teachers who strongly believe in the importance of the pedagogic strategies associated with Differentiated Instruction were more likely to be able to cover concepts in depth while retaining the breadth of the curriculum. It also suggests that the implementation of Differentiated Instruction has definitely affected the completion of curriculum content at both the middle and high school levels.

On the subject of curricular content, the data shows that over a third of teachers reported that no modification of content was necessary, the rest of the teachers reported that either they, or in a small percent of cases, their departments, modified curriculum in order to fully implement Differentiated Instruction. Both middle school and high school teachers agree that the study of concepts in depth makes up for any loss of content.

Analysis of the data suggests that, in the majority of cases, the teachers decided what modifications would be made to the curriculum and that most teachers believe that the study of concepts in depth makes up for any loss of content.

The responses to questions relating to teacher philosophy about covering content indicate that the respondents are virtually evenly split on this subject. About half of the teachers feel understanding concepts is more important than learning facts, partly due to the fact that information is easily obtained in today's world; the rest maintain that learning facts is as important as understanding concepts and that students need to learn a wide range of knowledge.

An analysis of the data suggests that there are no significant differences in teacher philosophy about covering content between the middle and high school levels.

In the area of teacher resistance to change, the data shows that the respondents were, again, almost evenly split. About half felt resistant

to Differentiated Instruction from the beginning, became convinced it would never work, that it was a fad, and planning lessons was difficult. The rest of the respondents were positive about these items. High school teachers were significantly more resistant than middle school teachers were, except in the area of planning lessons.

As to the question of implementation, approximately one-third have “infused” it into their teaching and report using it in 75% or more of their teaching; twice as many middle school teachers as high school teachers rated their implementation as “infused”.

Very significant positive correlations exist between the variables relating to teachers’ feelings toward Differentiated Instruction, toward planning lessons, what they thought administrators felt about it, and the degree of implementation. This would suggest teachers who have a more positive attitude toward Differentiated Instruction will also exhibit a higher degree of implementation, and conversely, the more negative the teacher’s attitude is the lower the degree of implementation will be.

The data shows that the factors that relate to teacher resistance to change include teaching level, gender, and post-graduate instruction in differentiation. High school teachers exhibited more resistance on all aspects of change and implemented Differentiated Instruction on a smaller scale than did middle school teachers, who were more positive about the implementation. Female teachers had a more positive attitude toward Differentiated Instruction as a whole and believed, more than

male teachers did, that the administrators were enthusiastic about Differentiated Instruction; teachers who had post-graduate courses in Differentiated Instruction tended to think, more than other teachers, that it was a significant advance for improving instruction.

Analysis of the data suggests that teacher resistance to change did affect the implementation of Differentiated Instruction and that the factors that contribute to teacher resistance to change are: teaching level, gender and post-graduate instruction in differentiation.

Differentiated Instruction has been implemented on a limited basis at the middle and high school levels; middle school teachers have a much higher level of implementation than do high school teachers, although the differences are not statistically significant; the majority of high school teachers indicate that they have chosen to implement on a limited basis, or not at all, in order to complete the curriculum.

As to various aspects of differentiation, half of middle school teachers and almost all of the high school teachers report not having enough time to plan differentiated lessons, though the vast majority of teachers at both levels indicate that planning has become easier as they have gotten to know their students. Teachers on both levels strongly believe in a hands-on approach to learning, and the teachers are split on the subject of the usefulness of pre-tests.

Analysis of the data suggests that implementation has only been accomplished on a limited basis at both levels and, although teachers at

both levels report that planning differentiated lessons is becoming easier, almost all of the high school teachers reported not having enough time to plan; middle school teachers report more success. Most of the teachers agree that the hands-on approach is effective, but do not see a benefit in pre-testing.

On the subject of instructional strategies and teaching skills, although the majority of teachers on both levels reported changing instructional strategies for implementation, there are significant differences in how teachers see the effects of those changes on their teaching skills. The majority of middle school teachers feel that they have better teaching skills and are more effective teachers since implementation. An almost equal number of high school teachers report that there has been no change in their teaching skills and that they believe teachers do a good job without differentiation.

Analysis of the data suggests that most teachers have changed instructional strategies in order to implement Differentiated Instruction and middle school and high school teachers have opposing views on the impact on their teaching skills or their effectiveness as teachers.

On the subject of teacher behaviors and pedagogic strategies related to Differentiated Instruction, the majority of the teachers surveyed indicated that they believe that teacher behaviors: being able to understand and relate to their students, listening to students, taking time to talk with students, keeping control of the class, being fair to all

students, calling students by name, teaching in an interesting manner and demonstrating care and concern for students, and that the pedagogic strategies: challenging students intellectually, knowing students' interests, delivering information to students, guiding students as they find their own answers, knowing students' skill levels, assessing students' prior knowledge, varying complexity of assignments, varying rates of instruction, and allowing students to choose from learning options, are somewhat or definitely important.

Although not a pedagogic strategy of Differentiated Instruction, transmitting facts for students to memorize was included in the survey; surprisingly, the majority of both middle and high school teachers rated this as somewhat or definitely important, less than one-quarter rated it as somewhat/definitely unimportant.

Significant differences were found in gender and teaching level. Female teachers felt that all of the behaviors and strategies were more important than male teachers did and, by teaching level, significant differences were found in teacher beliefs about the behaviors: taking time to talk with students, being fair to all students, teaching in an interesting manner and demonstrating care and concern for students. In all cases, middle school teachers felt that these behaviors were more important than high school teachers did.

Analysis of the data suggests that teachers on both levels feel that the teacher behaviors associated with Differentiated Instruction are

important, with significant differences seen between teaching levels and gender.

As for the effects of Differentiated Instruction on student understanding and achievement, the majority of teachers reported that they have seen no difference in student achievement, but there was a significant difference in the beliefs of teachers about student understanding according to teaching level. The majority of middle school teachers felt that there was a positive effect on student understanding and the majority of high school teachers felt that there was no effect.

To further investigate student achievement, standardized test scores were analyzed. On the middle school level, the performance of eighth grade students on the GEPA showed gains for lower achieving students in the area of Language Arts Literacy and Science, but the rest of the students have not shown increased achievement and the gifted students seem to be losing ground. In Mathematics, there have not been gains in any category. The district had more students scoring Partial Proficiency and less scoring Advanced Proficiency than the DFG for all three years.

The standardized tests at the high school level show mixed results. On the HSPA, the mean scores for the 2002-03 school year show gains in the area of Language Arts Literacy, with less students scoring Partial Proficiency and more students scoring Advanced. In Mathematics, results are mixed. More students scored Partial Proficiency and a similar

increase was seen in the Advanced category. These results are hard to analyze since the HSPA has only been administered for 2 years, but for both years the district had more students scoring in the Partial Proficiency category and less students scoring Advanced Proficiency than the DFG.

The results on the SATs have been very disappointing, between the 2000-01 and 2002-03 school years there was an 18 point drop in the mean score in Mathematics, and a 44 point drop in the mean score for Language.

Analysis of the data suggests that most teachers feel that there has been no positive effect on student achievement. This seems to be supported by the results of standardized tests which, in fact, seem to indicate a negative effect on student achievement overall.

Many of the middle school and high school teachers had suggestions for making Differentiated Instruction easier to implement. Most were the expected responses: more planning time, smaller classes, longer periods, teaching assistants in the classrooms, having appropriate materials and ideas available to teachers, changing class set-up, more administrative support, and more in-depth training in content areas. Some of the high school teachers had other answers: grouping students more homogenously and having teaching teams with common prep time; a couple of middle school teachers said they wouldn't change anything - it's working well.

The teachers at both levels listed many effective components of Differentiated Instruction: increased student involvement and interest, student interactions, teaching students at their own level, having students learn at their own pace, recognizing different learning styles, knowing students' needs, accepting different levels of success, being able to reach all students, the ability to reach slower students, and a variety of activities for students to choose from.

There were some comments added to the surveys that the researcher found interesting. Several concerned the fact that Differentiated Instruction is not a new idea and "effective" teachers have been doing this for a long time, "since the day of the dinosaur" was the way one put it. Another teacher added that many teachers were "somewhat offended" that anyone thought that they had not been using these methods all along. One middle school teacher added that the most effective component of Differentiated Instruction is the teacher's ability to be a flexible, dedicated and hard worker.

The added comments of the high school teachers were many and mostly negative. When asked, "What would you change..." there were many answers such as: unreasonable expectations for teachers, and nothing could make it easier. When asked "What is the most effective component..." some said, "It will soon be gone."

Other comments added to various parts of the high school teachers' surveys went something like this: "it will go away as all FADS

do”; “I AM resistant to DI”; “we’ve done this before”; “I felt that it was a fad and I still do”; “there are NOT effective methods of instruction – there are effective teachers”, “I was initially resistant and I still **don’t think** it’s the proper direction”; “good teachers are always effective regardless and poor teachers are poor regardless”; “I have SIX classes of 25!”; and, “Are you kidding! This didn’t work 20 years ago!”

The added comments by the high school **teachers** seems representative of their generally negative attitude to **this** initiative.

Discussion of Results

Analysis of the data collected in this study clearly shows that the implementation of Differentiated Instruction in the district has resulted in a loss of curriculum content at both the middle school and high school levels.

At the middle school level this is not necessarily a bad thing, as the Middle School Concept focuses on the developmental and educational needs of the early adolescent; middle school educators strive to provide engaging, relevant learning experiences that would help students with their transition into adolescence and high school. The pedagogic strategies that are so much a part of Differentiated Instruction are well suited to the restructured middle school.

At the high school level, however, a loss of content is not as easily accepted, as the focus of the high school is still on content. Many high

school teachers were opposed to the middle school concept because they felt it was too soft academically (George & McEwin, 1999). There is much debate between those who believe that students are better served by traditional content-driven curriculum and those who believe that high schools should switch to interdisciplinary, student-centered, concept-driven curriculum.

The majority of high school teachers showed more resistance to Differentiated Instruction from the beginning, became more convinced that it wouldn't work as training progressed, and felt it was a "fad" that would go away and. The feelings of the middle school teachers were just the opposite. Middle school teachers also felt that the administrators' enthusiasm for Differentiated Instruction helped convince them to give it a chance. High school teachers, on the other hand, did not believe that the administrators really believed in it. Post-graduate courses in Differentiated Instruction contributed significantly to the belief that it is "an advance for improving instruction that will endure."

Almost one-quarter of all teachers reported not being able to complete the curriculum since implementation of Differentiated Instruction and over half of all high school teachers reported that they had chosen to either limit or forgo implementation in order to be able to complete the curriculum. This would seem to support the idea that high school teachers are still, for the most part, focused on content, except for the fact that over two-thirds of all teachers reported that they believed

that studying concepts in depth makes up for any loss of content. The meaning of this inconsistency is unclear. We can only surmise that their belief in the importance of study in depth does not outweigh their need to complete curriculum content.

There is no inconsistency at the middle school level. One-third of teachers feel that loss of content cannot be replaced by studying concepts in depth and the same percentage chose to implement Differentiated Instruction on a limited basis, or not at all, in order to be able to complete content; half of all middle school teachers reported that there has been no effect on their ability to cover depth and breadth, the same percentage indicated that the curriculum had been modified.

The degree to which Differentiated Instruction has been implemented in the classroom varies. Teachers report that it has been "infused" into their teaching in about one-third of classrooms – twice as many in the middle school as the high school – and is used on a limited basis in about half of all classrooms. The majority of teachers on both levels indicated that they had to change instructional strategies in order to implement Differentiated Instruction, but middle school and high school teachers have opposing views of the effect it had on their teaching skills, with middle school teachers feeling that they had become more effective teachers and high school teachers indicating that teachers do a good job without Differentiated Instruction.

The vast majority of teachers at both levels supported the importance of the teacher behaviors and pedagogic strategies associated with Differentiated Instruction, and the results seem to indicate that believing in the importance of the pedagogic strategies has a positive effect on coverage of depth and breadth, but not on curriculum completion. This is supported by the data on curriculum modification: in almost two-thirds of the classrooms curriculum had been modified in order to implement Differentiated Instruction.

Middle and high school teachers had different opinions about some of the teacher behaviors associated with Differentiated Instruction. Middle school teachers felt that it was more important to take time to talk with students, demonstrate care and concern for them, to be fair to all students and to teach in an interesting manner. This is indicative of the nurturing atmosphere that has become a part of middle school education. There were also significant differences seen based on teacher gender. Female teachers are much more apt to believe strongly in the importance of the teacher behaviors and pedagogic strategies associated with Differentiated Instruction. It is surprising that the overwhelming majority of high school teachers do not feel it is important to be fair to all students.

Most middle school teachers report that the implementation has helped them become better teachers who can educate students more effectively, which they say has impacted positively on student

understanding. Unfortunately, in most cases, student understanding has not impacted positively on the performance of eighth grade students on standardized tests. An analysis of the GEPA for the 2000-01 school year to the 2002-03 school year show mixed results. Lower achieving students have made some gains in the area of Language Arts and Science, but not in Math, the students in the middle are not making headway, and the gifted students are losing ground in all areas.

High school teachers report no change in their teaching skills attributable to differentiation and maintain that teachers do a good job educating students without Differentiated Instruction. The teachers also reported that differentiation has not impacted positively on student understanding or achievement.

The standardized tests at the high school level show mixed results. On the HSPA, the mean scores for the 2002-03 school year show gains in the area of Language Arts Literacy, with less students scoring Partial Proficiency and more students scoring Advanced. In Mathematics, results are mixed. More students scored Partial Proficiency and a similar increase was seen in the Advanced category. These results are hard to analyze since the HSPA has only been administered for 2 years, but for both years the district had more students scoring in the Partial Proficiency category and less students scoring Advanced than the DFG. The results on the SATs have been very disappointing, between the 2000-01 and 2002-03 school years there was an 18 point drop in the

mean score in Language, and a 44 point drop in the mean score for Mathematics. However, with no other study to examine, it would be difficult to attribute the test score changes to the implementation of Differentiated Instruction.

Implications for Further Research

The study should be replicated on a larger scale to see if these results hold true for other districts. The district that participated in this research had instituted many aspects of Middle School Reform, but the high school, for the most part, still depended heavily on traditional, content-driven curriculum. It would be interesting to survey schools that have instituted Middle School and High School Reforms and schools that have not, to see if there are differences in implementation and the teachers' ability to cover depth and breadth, not only between the middle and high school levels, but also between schools with traditional programs and those that have instituted reforms.

Research has shown that changes are more readily implemented when teachers feel 'ownership' of the change. It would be interesting to identify schools in which the teachers have bought into the adoption of Differentiated Instruction to explore whether there are differences in implementation in these schools compared with schools where the initiative was mandated by the district.

Another area that might be explored is teacher gender. Female teachers exhibited less resistance to change, and felt that the teacher behaviors and pedagogic strategies associated with Differentiated Instruction were more important than male teachers did; middle school teachers were significantly more positive about differentiation as a whole, and the positive effects it had on their teaching, than high school teachers were. It is interesting to note that three-quarters of the middle school teachers surveyed were female – only half of the high school teachers were; this might warrant investigating whether results at the high school level would be different if the ratio of female to male teachers was different, and what the implications would be.

Further investigation should also be made into the effects of Differentiated Instruction on standardized tests scores. The mean Verbal SAT scores for students in the participating high school showed a substantial drop in the 2002-03 school year. Although we cannot attribute this drop directly to the implementation of Differentiated Instruction, the Director of Curriculum for the district has acknowledged that no other major pedagogic changes have been made at the high school level.

When this testing occurred, the district was in the second year of implementation. It is possible that the modifications made to the curriculum and the initial attempts at differentiation have had some effect on the student outcomes, but this determination can not be made

with the available information, therefore, further studies should be done to explore the effects of Differentiated Instruction on SAT scores during implementation and in the years following full implementation.

This study focused on differences found between the middle school and high school levels. A future study should be considered that would explore the differences found within the middle schools and high schools.

Conclusion

Many teachers do not feel equipped to differentiate for a class of students of diverse needs and abilities, even with in-service training. This is not surprising because even the most ardent proponents of Differentiated Instruction admit that effective differentiation, though not difficult to understand from staff development meetings, is difficult to translate into consistent classroom practice and “complex to use” (Tomlinson, 2000b). The extent to which Differentiated Instruction has been implemented in this, the last implementation year in the district, seems disappointing, but considering the literature on educational change and in light of the fact that Tomlinson (as cited in Hess, 1999) estimates that to really institutionalize Differentiated Instruction can take 7 to 10 years, it would be unreasonable to expect more.

Differentiated Instruction seems to be more suited to the schools that have instituted the middle school concept, and the middle school teachers in the district feel that Differentiated Instruction is worthwhile.

While there has not been much improvement on standardized tests, there have been some gains made by the lower achieving students in the eighth grade in Language and Science. Obviously, the teachers need to reach all of the students to help them succeed, and for the most part, they seem ready to give it their best shot.

It is obvious that teachers at the high school level do not share the enthusiasm the middle school teachers exhibit for Differentiated Instruction. The modern comprehensive high school is a conservative organization where fundamental change is difficult. Literature suggests that reforms aimed at moving comprehensive high schools toward the vision of the high school that many educators now envision are in place of very few high schools. This is due, in part, to the resistance with which reforms are met and the effort required to initiate and institutionalize them (Lee, 2001).

An issue at the high school level that is impeding the implementation of Differentiated Instruction is teacher resistance to change. Fullan (1991) stated that teachers are often opposed to change that they had no input into because they have no reason to believe the change. The Director of Curriculum recognizes this fact and indicated he would have liked to be able to make this a bottom-up change, but there was no time for them to accomplish this. He is aware of the resistance to differentiation at the high school level; he acknowledges that the

initiative was met with initial negativity, resistance and “no excitement” by the teachers.

The answers to the question regarding the positive aspects of Differentiated Instruction shows that the teachers appreciate the importance of teaching students at their own level and their own pace, increased student involvement and interest, knowing students’ needs, recognizing different learning styles, and having a variety of activities for students to choose from, but many have trouble incorporating them into their teaching. Although most teachers acknowledged that planning lessons has become easier, most do not have time to do it.

There is also much confusion as to what “implementation” means. The teachers do not feel that the training they received has adequately answered their questions about what is actually expected of them. The teachers indicated that accomplishing full implementation of Differentiated Instruction would be easier if the district could reduce class size, supply teaching assistants, increase planning time, have longer periods, offer more in-depth training, and have appropriate materials and ideas available to the teachers. These are the types of changes that literature suggests make implementation of Differentiated Instruction more successful, but most districts do not have the substantial resources necessary to implement these types of changes at their disposal. It is unclear whether these changes can be accomplished with the resources available in this district.

Opinion

At the middle school level in the participating district, there are indicators that change is taking place. There has been progress toward instituting Differentiated Instruction and, on the whole, the middle school teachers are very positive about the change to teaming, the collaborative approach, and the implementation; and there have been better scores on the GEPA for some low achieving students. In light of these facts, it seems possible that Differentiated Instruction can be implemented and show positive results at the middle school level.

However, I do not believe that Differentiated Instruction as it is being implemented in school districts today will work on a large scale at the high school level for many reasons: (a) Top-down initiatives are not well received by teaching staff; (b) These programs are usually phased in over a three-year period when literature indicates that to really institutionalize 7 to 10 years is needed; (c) Although middle schools instituting reforms suggested by the Middle School Concept such as reducing class size, block scheduling, and team teaching, are geared to the types of change necessary to implement Differentiated Instruction, the comprehensive high school is not a good setting for these changes; (d) Unless SATs are modified to reflect concept-driven curricula, students who receive this type of instruction in high school will not score well and will be at a disadvantage in the college-admissions process; (e) Many Colleges still use traditional lecture-format instruction – they do not

differentiate. If students are not exposed to this type of teaching before college they will have no idea of how to succeed in the college environment.

I am not suggesting that there is no value in the concept of Differentiated Instruction, indeed, many of the pedagogic strategies of differentiation such as knowing students' learning styles and interests, have been used by teachers for many years. Effective teachers look at the new innovations in education and use the strategies they recognize as having potential to help their students succeed; various active learning strategies that have been shown to work at the high school level have been employed by teachers for decades.

I do not necessarily agree with the old adage, "If its not broke, don't fix it." Indeed, educators admit there is always room to grow as teachers, but, without changing the whole concept of the comprehensive high school, that is, instituting block scheduling and team teaching, narrowing the range of learners in some classrooms, and reducing class size, the major pedagogic changes associated with Differentiated Instruction – changes that are all encompassing – will very likely not be institutionalized.

It is obvious that this initiative is not being implemented in the participating high school; there is too much resistance to it. If the teachers do not buy into the change it has no hope of working, and the majority of these teachers do not believe it is going to work. In the

meantime, the students' SAT scores are falling at an alarming rate. Maybe the district should rethink the initiative at the high school level.

Other districts that are planning to implement Differentiated Instruction in their high schools might consider an alternate to whole-school implementation. This would be to launch a pilot program in a few classrooms in the high school(s). Use teachers who believe in Differentiated Instruction, give them extra support, additional prep time to plan lessons based on the model, and a phase-in period for implementation in their classrooms – without changing class size or period length – to see if it can succeed without instituting high school reforms. The outcome of this trial would help administrators evaluate what implementation will entail and they can then judge the efficacy of implementation on a large scale.

In Differentiated Instruction teachers plan lessons according to students' readiness (ability). One of the major problems with this is that many teachers find it impossible to do in the heterogeneous high school classroom in which the students have a wide range of ability levels. I believe that administrators who control curriculum and pedagogy should look to research-based methods for improving instruction instead of wasting time, money and talent on fads. The bottom line is, do what is going to work. If differentiation is the way of the future, changes need to be made in order for teachers to implement it in our high schools.

In education, what is old invariably becomes new again. Maybe narrowing the range of student abilities in a classroom should be the next new innovation.

REFERENCES

- Alderman, N. E., Walking Eagle, K. P., & Hargreaves, A., (1997). *Racing with the clock: Making time for teaching and learning in school reform*. New York: Teachers College Press.
- Bateman, B (1993). Learning disabilities: The changing landscape. *Journal of Learning Disabilities*, 25(1), 29-36.
- Bruner, J. (1961). The act of discovery. *Harvard Educational Review*, 31, 21-32.
- Campbell, L., & Campbell, B. (1999). *Multiple intelligences and student achievement: Success stories from six schools*. Alexandria, VA: Association for Supervision and Curriculum Development.
- Connell, R. W. (1985). *Teacher's Work*. Sidney, Australia: George, Allen & Union Australia Pty. Ltd.
- Cromwell, S. (1999). Homogeneous or heterogeneous: which way to go? *Education World [online]*, available: http://www.education-world.com/a_admin/admin095.shtml
- Csikszentmihalyi, M., Rathunde, K., & Whalen, S. (1993). *Talented teenagers: The roots of success and failure*. New York: Cambridge University Press.
- DePardo, A. (1999). *Teaching in common: Challenges to joint work in classrooms and schools*. New York: Teachers College, Columbia University.
- Dewey, J. (1938/1983). Experience in Education. In J. Noll, (Ed.), *Taking sides: Clashing views on controversial educational issues* (2nd ed. pp. 16-22). Guilford, CT: The Dushkin Publishing Group, Inc.
- Felner, R., Jackson, A., Kasak, D., Mulhall, P., Brand, S., & Flowers, (1996, April). *The impact of school reform for the middle years: a longitudinal study of a network engaged in Comprehensive School Transformation*. Paper presented at the Annual Conference of the American Educational Research Association, New York City.
- Fisher, C., Berliner, D., Filby, N., Marliave, R., Cahen, L., & Dishaw, M. (1980) Teaching behaviors, academic learning time, and student achievement: An overview. In C. Denham & A. Lieberman (Eds.), *Time to learn* (p 7-32). Washington, DC: National Institutes of Education.
- Fullan, M. (1991). *The new meaning of educational change* (2nd ed.). New York: Teachers College Press.

- Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences*. New York: Basic Books.
- George, P. S. & McEwin, C. K., (1999). High Schools for a new century: Why is the High School changing? *NASSP Bulletin*. 83(606).
Received from ProQuest Information and Learning Company.
- Gregerson, A. (2003). Change doesn't have to hurt. In R. Stone (Ed.), *What? Another new mandate? What award-winning teachers do when school rules change* (pp. 10-16). Thousand Oaks, CA: Corwin Press
- Grigorenko, E., & Sternberg, R. (1997). Styles of thinking, abilities, and academic performance. *Exceptional Children*, 63, 295-312.
- Guidance for class-size reduction program*. (2000, April). Retrieved November 14, 2002 from the World Wide Web:
http://www.ed.gov/offices/OESE/Class_size/Guidance/A.html
- Hess, M. A. (1999). Teaching in mixed-ability classrooms: teachers guide students down many paths to a common destination. Retrieved May 5, 2003 from Wisconsin Education Association Web site:
<http://www.weac.org/kids/1998-99/march99/differ.htm>
- Holloway, J. H., (2000). Preparing teachers for Differentiated Instruction. *Educational Leadership*. 58(1), 82-83.
- House, E. (1974) *The politics of educational innovation*. Berkeley, CA: McCutchan.
- Hunt, D. (1971). *Matching models in education*. (Monograph No. 10). Ontario, Canada: Institute for Studies in Education.
- Lee, V. E. (2001). *Restructuring High School for Equity and Excellence: What Works*. New York: Teachers College Press
- Long, C. S. (2003). Keeping up with change. In R. Stone (Ed.), *What? Another new mandate? What award-winning teachers do when school rules change* (pp. 1-9). Thousand Oaks, CA: Corwin Press
- Lupton, C. (2001). Ideals vs. reality in the Classroom. *Education Digest*. 67(4), 24-27.
- Miller, B. (1990). A review of the quantitative research on multigrade instruction. *Research in Rural Education*, 1(1), 1-8.

- Montagu, A., (1980). My idea of education. *Today's Education, Journal of the National Education Association*, 69(1), 40-49.
- Murphy, J. (1992). Instructional Leadership: Focus on time to learn. *NAASP Bulletin*, March 1992.
- Murphy, J., Beck, L. G., Crawford, M., Hodges, A., McGaughy, C. L. (2001). *The productive high school: Creating personalized academic communities*. Thousand Oaks, CA: Corwin Press.
- National Research Council. (1999). *How people learn; Brain, mind, experience, and school*. Washington, DC: National Academy Press.
- New Jersey school report card* (2003), New Jersey Department of education. Available: <http://education.state.nj.us/rc/>
- Newmann, F. M. (1988). Can depth replace coverage in the high school curriculum? *Phi Delta Kappan*, 69(4), p 345-388.
- O'Neil, J. (February, 1993). On the new standards project: a conversation with Lauren Resnick and Warren Simmons. (Electronic version). *Educational Leadership*, 50(5).
- Oakes, J. (1985). *Keeping track: How schools structure inequality*. New Haven, CT: Yale University Press.
- Oakes, J. (1992). Detracking Schools: early lessons from the field. *Phi Delta Kappan* 6(1992). 448-54.
- Ohanian. S. (1985). On stir-and-serve recipes for teaching. *Phi Delta Kappan*, 66, 696-701.
- Page, R., & Valli, L. (Eds.). *Curriculum Differentiation. Interpretive studies in U.S. Secondary Schools*. Albany: State University of New York Press.
- Parkay, F. W., & Hass, G. (2000). *Curriculum planning: A contemporary approach* (7th ed.). Needham Heights: A Pearson Education Company.
- Petress, K. C. (2003). An educational philosophy guides the pedagogical process. *College Student Journal*. 37(1), 128-134.
- Pribbenow, C. M., Phelps, L. A., Briggs, D., & Stern, D. (1999). *New College Admission Procedures: Implications for Career-Related Learning in High School* (MDS-1203). Retrieved 8/21/03 from the National Center for Research in Vocational Education, University of

California at Berkeley Web site:

<http://vocserve.berkeley.edu/abstracts/MDS-1203/MDS-1203.html>.

- Pulliam, J. D., VanPatten, J. J (1995). *The history of education in America* (6th ed.). New Jersey: Prentice-Hall.
- Rogers, A. (11/99). *The failure and the promise of technology in education*. Retrieved November 6, 2002 from the World Wide Web: <http://www.gsn.org/teach/articles/promise.html>.
- Scherer, M. (2000). Perspectives / Standardized Instruction – Effects may vary. *Journal of the Association for Supervision and Curriculum Development*. 58(1), 5.
- Share, E., & Rogers, L. (1997). *Practical advice for getting maximum learning out of class projects*. Retrieved November 6, 2002 from the World Wide Web: http://arundel.sancarlos.k12.ca.us/a_staff/garber/advice.html
- Slavin, R. E. (1990). All around the block: The benefits and challenges of a non-traditional school schedule. *Review of Educational Research* 3(1990), 471-99.
- Sullivan, M. (1993). IA meta-analysis of experimental research studies based on the Dunn & Dunn learning styles model and its relationship to academic achievement and performance. Idoctoral dissertation, St. John's University, Jamaica, New York.
- Tate, P. M. (1993). The two worlds of teaching. *Journal of Education*, 175(3), 15-29.
- Tomlinson, C. A. (1999). *The differentiated classroom: Responding to the needs of all learners*. Alexandria, VA: Association for Supervision and Curriculum Development.
- Tomlinson, C. A. (2000a). *Leadership for differentiating schools and classrooms*. Alexandria, VA: Association for Supervision and Curriculum Development.
- Tomlinson, C. A. (2000b). Differentiated instruction: Can it work? *The Education Digest*, 65(4), 25-31.
- Tomlinson, C. A., Callahan, C. M., Tomchin, E. M., Eiss, N., Imbeau, M., & Landrum, M., (1997). Becoming architects of communities of learning: Addressing academic diversity in contemporary classrooms. *Exceptional Children*. 63(2), 169-282.

- Walther-Thomas, C. (2001). An interview with Nancy Waldron and James McLeskey: Helping schools include all learners. *Intervention in School & Clinic*, 36(3), 175-181.
- Westberg, K., Archambault, Fl, Dobyys, S., & Slavin, T. (1993). The classroom practices observational study. *Journal for the Education of the Gifted*, 16, 120-146.
- Wiles, J. & Bondi, J. (1993). *The essential middle school*. NY: Macmillian.
- Windschitl, M. (6/99). The challenges of sustaining a constructivist classroom culture. In *Phi Delta Kappan*. Retrieved from ProQuest online: <http://proquest.umi.com/pqdweb?index=0&did=42309548&SrchMode=1&sid=2&Fmt=3&clientId=31735&RQT=309&VName=PQD>
- Wood, D. (1988). *How children think and learn*. New York: Basil Blackwell.

APPENDIXES

Appendix A
Teacher Survey

Teacher Survey

In order to analyze teachers' understanding of the implementation of Differentiated Instruction in middle school and high school classes, we are asking you to complete this survey. Please answer all questions honestly. Your answers are anonymous. Thank you for your participation.

Please follow the directions at the beginning of each section.

PART A: For each question on this page circle the number of the best answer.

How important are teacher behaviors that relate to Differentiated Instruction?

		Definitely Unimportant	Somewhat Unimportant	Neutral	Somewhat Important	Definitely Important
A1	Being able to understand and relate to their students	1	2	3	4	5
A2	Listening to students	1	2	3	4	5
A3	Taking the time to talk with students	1	2	3	4	5
A4	Keeping control of the class	1	2	3	4	5
A5	Being fair to all students	1	2	3	4	5
A6	Calling students by name	1	2	3	4	5
A7	Teaching in an interesting manner	1	2	3	4	5
A8	Demonstrating care and concern for students	1	2	3	4	5

Please go to the next page.

PART B: For each question on this page circle the number of the best answer.

How important is it to utilize the following pedagogic strategies related to Differentiated Instruction?

		Definitely Unimportant	Somewhat Unimportant	Neutral	Somewhat Important	Definitely Important
B1	Challenging students intellectually	1	2	3	4	5
B2	Knowing your students' interests	1	2	3	4	5
B3	Delivering information to students	1	2	3	4	5
B4	Guiding students as they find their own answers	1	2	3	4	5
B5	Knowing students' skill levels	1	2	3	4	5
B5	Assessing students as to prior knowledge before a new topic is introduced	1	2	3	4	5
B6	Varying complexity of assignments according to student needs	1	2	3	4	5
B8	Varying rates of instruction according to student needs	1	2	3	4	5
B9	Allowing students to choose from learning options	1	2	3	4	5
B10	Transmitting facts for students to memorize	1	2	3	4	5

Please go to the next page.

**PART C: For each of the following pairs of questions,
mark the statement that best describes your feeling or belief.**

- C1. I was initially resistant to the idea of differentiating instruction.
 I was excited by the prospect of implementing Differentiated Instruction to reach my students.
- C2. As training progressed, I became convinced that Differentiated Instruction was worth the trouble.
 As training progressed, I became convinced that Differentiated Instruction was never going to work.
- C3. I felt that Differentiated Instruction was a fad that would soon "go away".
 I felt that Differentiated Instruction was a significant advance for improving instruction that will endure.
- C4. The enthusiasm of the school administrators for Differentiated Instruction helped convince me to give it a chance.
 I don't believe that school administrators felt that Differentiated Instruction would really work.
- C5. Once I used Differentiated Instruction in my classroom, I became excited about planning more lessons using Differentiated Instruction.
 I have had trouble planning lessons using Differentiated Instruction.
- C6. I have not been able to implement Differentiated Instruction in my classroom.
 I have implemented Differentiated Instruction in my classroom on a limited basis.
 Differentiated Instruction has been infused into my teaching and plays a significant role in my daily classroom instruction.
- C7. I don't have enough time to plan properly for Differentiated Instruction lessons.
 It really doesn't take that much more time to plan a Differentiated Instruction lesson.

Please go to the next page.

- C8. _____ As I came to know my students better, it became easier to plan Differentiated Instruction lessons.
 _____ I have not been able to get to know my students well enough to differentiate for them.
- C9. _____ I have found that a pre test is an important tool in planning Differentiated Instruction lessons.
 _____ I don't think that pre tests make it any easier to plan Differentiated Instruction lessons.
- C10. _____ It is important for students to learn facts.
 _____ Knowledge of facts is less important than emphasizing concepts now that information is so readily accessible.
- C11. _____ It is more important that students understand concepts than that they learn facts.
 _____ Learning facts is as important as understanding concepts.
- C12. _____ I believe that students learn better with a "hands-on" approach to learning.
 _____ I don't believe that the "hands-on" approach is very effective.
- C13. _____ I feel that a "hands-on" approach to learning is easy to incorporate into my teaching.
 _____ I feel that the "hands-on" approach uses up too much instructional time.
- C14. _____ The study of concepts in depth makes up for any loss of content.
 _____ Loss of content cannot be replaced by studying concepts in depth.
- C15. _____ I had to change instructional strategies in order to implement Differentiated Instruction.
 _____ I have implemented Differentiated Instruction without changing instructional strategies.
- C16. _____ Implementation of Differentiated Instruction has helped me become a better teacher.
 _____ I felt more confident in my teaching skills before I implemented Differentiated Instruction.
 _____ Differentiated Instruction has made no difference in my teaching.

Please go to the next page.

- C17. _____ Teachers do a good job educating students without using Differentiated Instruction DI.
 _____ Differentiated Instruction has helped teachers do a better job educating more students more effectively.
- C18. _____ Since implementation of Differentiated Instruction, I have not been able to complete the prescribed curriculum as described in the school's curriculum guide.
 _____ Implementation of Differentiated Instruction has not affected my ability to complete the prescribed curriculum.
 _____ In order to complete the prescribed curriculum, I have only implemented Differentiated Instruction on a limited basis.
 _____ In order to complete the prescribed curriculum, I have chosen to forgo the implementation of Differentiated Instruction.
- C19. _____ My department has decided to modify the curriculum in order to fully implement Differentiated Instruction.
 _____ My department has left the decision of whether to modify curriculum for Differentiated Instruction in the hands of the individual teacher.
 _____ No curriculum modification has been necessary as a result of Differentiated Instruction.
- C20. _____ Since the implementation of Differentiated Instruction my students have achieved higher scores on achievement on tests and/or other measures of assessment.
 _____ Implementation of Differentiated Instruction has not affected student achievement on tests and/or other measures of assessment.
- C21. _____ The implementation of Differentiated Instruction has impacted positively on student understanding.
 _____ I see no difference in student understanding since I implemented Differentiated Instruction.
- C22. _____ Differentiated Instruction has not affected my ability to cover a topic completely (breadth – no loss of content) when we study in depth.
 _____ I find it impossible to cover both breadth and depth.

Please go to the next page.

- C23. _____ Students achieving a profound understanding of a topic or concept is more important than covering many topics or concepts more superficially.
_____ It is more important for students to learn a wide range of information than to study a few topics or concepts in depth.
- C24. _____ The instructional strategies necessary for Differentiated Instruction have affected the completion of content.
_____ There has been no effect on completion of content attributable to the instructional strategies necessary for Differentiated Instruction.
- C25. _____ I use Differentiated Instruction in all of my teaching.
_____ I use Differentiated Instruction in about 75% of my teaching.
_____ I use Differentiated Instruction in about 50% of my teaching.
_____ I use Differentiated Instruction in about 25 % of my teaching.
_____ I use Differentiated Instruction in less than 25 % of my teaching.
_____ I do not use Differentiated Instruction in my teaching.

Please go to the next page.

PART D: Please answer the following questions in your own words.

D1. What would you change about DI in order to make it easier to implement?

D2. What do you think is the most effective component of DI?

Demographic Information

Please answer all of the following questions.

1. *What is your gender?* _____ *Male* _____ *Female*

2. *How many years have you been teaching?* _____

3. *How many years have you been teaching in your present district?*

4. *What level do you teach?* _____ *Middle School* _____ *High School*

5. *What subjects do you currently teach?*

6. *What is the highest degree you hold?*
_____ *Bachelor* _____ *Master* _____ *Doctorate*

7. *What year was your latest degree conferred?* _____

8. *Did any of your post-graduate education include courses related to
Differentiated Instruction?* _____ *Yes* _____ *No*

9. *What is your average class size?* _____

Appendix B
Independent Variables

Independent Variable	N	%
Teaching Level		
Middle School	46	47.4
High School	51	52.6
Gender		
Male	36	39.6
Female	55	60.4
Years Teaching		
1 – 5 years	21	23.6
6 – 10 years	22	24.7
11 – 15 years	8	9.0
16 – 20 years	12	13.5
21 – 25 years	8	9.0
26 – 30 years	11	12.4
31 or more years	7	7.9
Years in District		
1 – 5 years	44	49.4
6 – 10 years	12	13.5
11 – 15 years	6	6.7
16 – 20 years	9	10.1
21 – 25 years	4	4.5
26 – 30 years	8	9.0
31 or more years	6	6.7
Subjects Taught		
English	15	19.5
Math	8	10.4
History	11	14.3
Science	7	9.1
Foreign Language	5	6.5
Special Education	15	19.5
Other	16	20.8
Highest Degree Held		
Bachelor	44	47.8
Master	48	52.2
Year of Latest Degree		
Before 1980	20	25.3
1980-1989	10	12.7
1990-1999	26	32.9
2000-2003	23	29.1
Post-graduate Courses in DI		
Yes	36	40.4
No	53	59.6
Average Class Size		
15 and below	19	21.1
16 – 20	13	14.4
21-25	31	34.4
Over 25	27	30.0

Appendix C

Scale of Chart B

	B1	B2	B3	B4	B5	B6	B7	B8	B9	Total
1	5	5	5	4	5	5	5	5	4	43
2	4	4	4	5	4	4	4	4	4	37
3	5	5	5	4	4	4	4	3	3	37
4	5	5	5	5	5	5	5	5	4	44
5	4	5	3	4	4	2	4	3	4	33
6	5	4	4	4	5	3	3	4	3	35
7	5	4	4	5	4	3	5	4	3	37
8	4	4	5	4	4	3	4	4	4	36
9	5	4	4	5	5	4	5	5	4	41
10	5	5	5	5	5	4	5	5	5	44
11	5	5	5	5	5	5	5	5	5	45
12	4	5	5	4	5	5	5	5	2	40
13	4	5	3	4	5	2	4	4	3	34
14	5	4	4	4	5	4	5	5	4	40
15	5	4	5	5	5	5	5	5	5	44
16	5	4	5	4	5	4	5	4	3	39
17	5	4	3	5	4	4	5	4	5	39
18	5	3	3	3	2	1	2	2	1	22
19	5	5	5	5	5	5	5	5	5	45
20	5	5	4	5	5	5	5	5	5	44
21	5	5	5	5	5	5	5	5	5	45
22	5	5	5	5	5	5	5	5	5	45
23	5	4	5	4	4	4	4	5	4	39
24	4	4	1	1	1	3	4	2	4	24
25	4	4	4	5	5	5	4	5	4	40
26	5	5	5	4	0	3	3	3	3	31
27	5	3	3	5	5	5	5	5	3	39
28	4	2	3	4	3	3	4	2	2	27
29	5	3	5	5	4	4	2	2	1	31
30	5	5	5	5	5	4	4	4	4	41
31	5	4	5	5	4	2	3	2	1	31
32	5	5	0	5	5	5	4	4	3	36
33	5	4	5	5	5	4	5	5	4	42
34	3	4	4	5	3	3	3	3	3	31
35	5	4	5	4	5	4	5	4	4	40
36	3	4	4	3	4	5	5	5	5	38
37	4	3	5	3	4	3	4	3	2	31
38	5	5	4	4	3	3	5	5	4	38
39	4	4	4	3	4	4	4	3	4	34
40	4	4	5	5	4	2	2	2	4	25

	B1	B2	B3	B4	B5	B6	B7	B8	B9	Total
51	5	5	5	5	5	5	5	5	5	45
52	5	5	5	5	5	5	5	5	5	45
53	5	4	4	4	5	4	5	4	4	39
54	5	4	4	4	5	4	4	4	3	37
55	5	5	5	5	5	5	5	5	5	45
56	5	5	5	5	5	4	5	4	3	41
57	5	5	5	5	5	5	5	5	5	45
58	5	5	5	5	5	4	.	5	5	39
59	4	4	4	4	2	3	3	3	1	28
60	5	5	5	5	5	5	5	5	5	45
61	5	5	5	5	5	5	5	5	4	44
62	5	4	5	5	5	4	5	5	4	42
63	4	4	5	5	5	5	5	5	3	41
64	5	5	5	5	5	5	5	5	5	45
65	5	5	5	5	5	5	5	5	5	45
66	1	4	2	1	2	2	2	2	1	17
67	5	5	5	5	5	5	5	5	5	45
68	4	4	3	4	4	3	4	4	2	32
69	5	3	5	5	5	3	5	5	3	39
70	5	5	5	4	5	4	4	4	4	40
71	5	3	5	5	5	4	4	3	3	37
72	5	5	5	5	5	5	5	5	5	45
73	4	3	3	5	4	2	2	2	2	27
74	5	4	5	5	5	4	5	5	4	42
75	5	4	5	5	5	4	5	5	3	41
76	4	4	4	4	4	4	3	4	3	34
77	5	4	4	4	3	2	4	3	4	33
78	4	4	5	4	4	4	4	4	4	37
79	4	4	4	3	4	3	4	4	4	34
80	4	4	4	4	4	5	5	5	4	39
81	4	4	5	5	5	5	4	3	3	38
82	5	4	5	5	5	5	5	5	5	44
83	5	5	5	5	5	5	5	5	5	45
84	5	4	5	5	5	5	5	5	5	44
85	4	4	4	5	4	3	4	4	4	36
86	5	4	4	4	5	4	4	4	4	38
87	5	3	5	3	5	3	4	5	4	37
88	5	4	5	5	4	5	5	5	5	43
89	5	3	4	4	5	3	3	3	2	32
90	4	4	4	4	4	4	4	4	5	37
91	5	5	5	5	5	5	5	5	5	45
92	5	4	5	5	4	5	5	5	4	42
93	5	5	5	5	5	4	5	5	5	44
94	5	4	4	3	3	2	4	2	2	29
95	3	3	3	3	3	3	3	3	3	27
96	5	4	5	5	5	4	4	4	4	40
97	5	5	5	5	5	5	5	5	5	45
Tot	450	411	424	429	429	385	417	407	368	3720

Appendix D

Scale of Chart B totals and squares

	Chart B total	C22	0	1	C24	0	1	C22	C22 sq	C24	C24 sq
1	43	0	43		0	43		43	1849	43	1849
2	37	.			.						
3	37	0	37		0	37		37	1369	37	1369
4	44	0	44		0	44		44	1936	44	1936
5	33	0	33		0	33		33	1089	33	1089
6	35	.			1		35			35	1225
7	37	1		37	0	37		37	1369	37	1369
8	36	1		36	1		36	36	1296	36	1296
9	41	0	41		1		41	41	1681	41	1681
10	44	0	44		1		44	44	1936	44	1936
11	45	0	45		1		45	45	2025	45	2025
12	40	0	40		0	40		40	1600	40	1600
13	34	1		34	1		34	34	1156	34	1156
14	40	.			0	40				40	
15	44	0	44		0	44		44	1936	44	1936
16	39	1		39	0	39		39	1521	39	1521
17	39	1		39	0	39		39	1521	39	1521
18	22	0	22		0	22		22	484	22	484
19	45	0	45		1		45	45	2025	45	2025
20	44	1		44	0	44		44	1936	44	1936
21	45	0	45		0	45		45	2025	45	2025
22	45	.			.						
23	39	1		39	0	39		39	1521	39	1521
24	24	0	24		0	24		24	576	24	576
25	40	0	40		0	40		40	1600	40	1600
26	31	.			.						
27	39	1		39	.			39	1521		1521
28	27	0	27		0	27		27	729	27	729
29	31	1		31	1		31	31	961	31	961
30	41	1		41	0	41		41	1681	41	1681
31	31	0	31		.			31	961		961
32	36	1		36	1		36	36	1296	36	1296
33	42	.			.						
34	31	1		31	1		31	31	961	31	961
35	40	1		40	0	40		40	1600	40	1600
36	38	0	38		0	38		38	1444	38	1444
37	31	0	31		1		31	31	961	31	961
38	38	1		38	.			38	1444		1444
39	34	0	34		1		34	34	1156	34	1156
40	35	0	35		0	35		35	1225	35	1225
41	41	1		41	0	41		41	1681	41	1681
42	39	0	39		1		39	39	1521	39	1521
43	38	0	38		0	38		38	1444	38	1444
44	40	1		40	0	40		40	1600	40	1600
45	34	0	34		0	34		34	1156	34	1156
46	34	0	34		0	34		34	1156	34	1156
47	45	.			1		45			45	2025
48	39	0	39		0	39		39	1521	39	1521
49	43	0	43		0	43		43	1849	43	1849

	Total	C22	0	1	C24	0	1	C22	C22 sq	C24	C24 sq
50	36	1		36	1		36	36	1296	36	1296
51	45	1		45	1		45	45	2025	45	2025
52	45	0	45		0	45		45	2025	45	2025
53	39	0	39		0	39		39	1521	39	1521
54	37	0	37		0	37		37	1369	37	1369
55	45	1		45	0	45		45	2025	45	2025
56	41	1		41	0	41		41	1681	41	1681
57	45	1		45	1		45	45	2025	45	2025
58	39	0	39		0	39		39	1521	39	1521
59	28	.			.						
60	45	1		45	.			45	2025		2025
61	44	1		44	1		45	44	1936	44	1936
62	42	1		42	1		42	42	1764	42	1764
63	41	0	41		1		41	41	1681	41	1681
64	45	1		45	0	45		45	2025	45	2025
65	45	1		45	1		45	45	2025	45	2025
66	17	0	17		0	17		17	289	17	289
67	45	1		45	1		45	45	2025	45	2025
68	32	1		32	1		32	32	1024	32	1024
69	39	1		39	1		39	39	1521	39	1521
70	40	0	40		1		40	40	1600	40	1600
71	37	.			.						
72	45	0	45		0	45		45	2025	45	2025
73	27	.			.						
74	42	0	42		0	42		42	1764	42	1764
75	41	1		41	1		41	41	1681	41	1681
76	34	.			.						
77	33	1		33	1		33	33	1089	33	1089
78	37	0	37		1		37	37	1369	37	1369
79	34	0	34		0	34		34	1156	34	1156
80	39	1		39	0	39		39	1521	39	1521
81	38	1		38	1		38	38	1444	38	1444
82	44	1		44	1		44	44	1936	44	1936
83	45	1		45	0	45		45	2025	45	2025
84	44	1		44	0	44		44	1936	44	1936
85	36	0	36		0	36		36	1296	36	1296
86	38	1		38	0	38		38	1444	38	1444
87	37	0	37		1		37	37	1369	37	1369
88	43	1		43	0	43		43	1849	43	1849
89	32	0	32		0	32		32	1024	32	1024
90	37	0	37		0	37		37	1369	37	1369
91	45	1		45	1		45	45	2025	45	2025
92	42	1		42	1		42	42	1764	42	1764
93	44	.			.						
94	29	0	29		0	29		29	841	29	841
95	27	.			.						
96	40	1		40	0	40		40	1600	40	1600
97	45	1		45	1		45	45	2025	45	2025
Tot	3720	42	1557	1691	34	1872	1344	3248	128274	3215	131524

This table contains squares of the scores on Chart B necessary for Point-Biserial Correlation for Research Question 1

Appendix E

Correlation of pedagogic strategies and effect on curriculum

$$r_{pb} = \frac{\bar{Y}_0 - \bar{Y}_1}{s_y} \sqrt{\frac{\sum Y_2}{N-1} - \frac{(\sum Y)^2}{N(N-1)}}$$

$$\bar{Y}_1 = \frac{1691}{42} = 40.262$$

$$\bar{Y}_0 = \frac{1557}{42} = 37.071$$

$$\bar{Y}_1 - \bar{Y}_0 = 40.262 - 37.071 = 3.191$$

$$\sqrt{(N_0 N_1) / [N(N-1)]} = \sqrt{42 \times 42 / 84 \times 83} = \sqrt{1764 / 6972} = \sqrt{0.253} = 0.503$$

$$128,274 \times 84 = 10,775,016$$

$$3248^2 = 10,549,504$$

$$128,775,016 - 10,549,504 = 225,512$$

$$\frac{225,512}{N(N-1)} = \frac{225,512}{6972} = 32.345$$

$$\sqrt{32.345} = 5.687$$

$$\frac{3.191}{5.687} = 0.561$$

$$r_{pb} = 0.561 \times 0.503 = 0.282$$

$$t = r_{pb} \sqrt{n-2} / r_{pb}^2$$

$$t = 0.282 \sqrt{82-2} / (0.082)^2 = 0.282 \sqrt{82/0.080} = 0.282 \sqrt{82/0.920} = 0.282 \sqrt{89.130} = 0.282 \times 9.441$$

$$t = 02.662$$

With $N - 2 = 82$ degrees of freedom, a t value larger than ± 2.64 is significant at the .001 level using a two-tailed test; $t=2.662$ which indicates a significant correlation between the importance of the pedagogic strategies of Differentiated Instruction and the effect on the teachers' ability to cover both depth and breadth.

Appendix F

Correlation of pedagogic strategies and coverage of depth and breadth

$$r_{pb} = \frac{Y_1 - Y_0}{s_y} \sqrt{\frac{\sum Y_2}{N-1}} - \frac{(\sum Y)^2}{N(N-1)}$$

$$\bar{Y}_1 = \frac{1334}{34} = 39.529$$

$$\bar{Y}_0 = \frac{1872}{49} = 38.204$$

$$\bar{Y}_1 - \bar{Y}_0 = 39.529 - 38.204 = 1.325$$

$$\sqrt{(N_0 N_1) / [N(N-1)]} = \sqrt{34 \times 39 / 83 \times 82} = \sqrt{1666 / 6806} = \sqrt{0.245} = 0.495$$

$$131,524 \times 83 = 10,916,492$$

$$3215^2 = 10,336,225$$

$$10,916,492 - 10,336,225 = 580,267$$

$$\frac{580,267}{N(N-1)} = \frac{580,267}{6806} = 85.258$$

$$\sqrt{85.258} = 9.234$$

$$\frac{1.325}{9.234} = 0.144$$

$$r_{pb} = 0.144 \times 0.495 = 0.071$$

$$t = r_{pb} \sqrt{\frac{n-2}{1-r_{pb}^2}}$$

$$t = 0.071 \sqrt{83 - 2 / 1 - (0.071)^2} = 0.071 \sqrt{81 / 0.005} = 0.071 \sqrt{81 / 0.995} = 0.071 \sqrt{81.407} = 0.071 \times 9.023$$

$$t = 0.641$$

With $N - 2 = 81$ degrees of freedom, a t value larger than ± 1.99 is significant at the .05 level using a two-tailed test; $t = 0.641$ which indicates that there is little or no correlation between the importance of the pedagogic strategies of Differentiated Instruction and the effect on the completion of curriculum content.

Appendix G

The importance of pedagogic strategies
related to Differentiated Instruction

Answers of Middle School and High School teachers in percentages.

		Definitely Unimportant	Somewhat Unimportant	Neutral	Somewhat Important	Definitely Important
B1	Challenging students intellectually	HS 0	0	5.9	23.5	70.6
		MS 0	2.2	2.2	23.9	71.7
B2	Knowing your students' interests	HS 0	2	9.8	49	39.2
		MS 0	0	13	52.2	34.8
B3	Delivering information to students	HS 2	2	14	28	54
		MS 0	2.2	6.5	26.1	65.2
B4	Guiding students as they find their own answers	HS 0	2	7.8	39.2	51
		MS 0	2.2	8.7	26.1	63
B5	Knowing students' skill levels	HS 2	2	6	32	58
		MS 0	4.3	6.5	21.7	67.4
B5	Assessing students as to prior knowledge before a new topic is introduced	HS 2	7.8	21.6	37.3	31.4
		MS 0	8.7	17.4	32.6	41.3
B6	Varying complexity of assignments according to student needs	HS 0	3.9	11.8	33.3	51
		MS 0	4.4	8.9	31.1	55.6
B8	Varying rates of instruction according to student needs	HS 0	9.8	13.7	21.4	45.1
		MS 0	6.5	13	26.1	54.3
B9	Allowing students to choose from learning options	HS 5.9	5.9	23.5	39.2	25.5
		MS 4.3	8.7	19.6	30.4	37
B10	Transmitting facts for students to memorize	HS 3.9	19.6	25.5	39.2	11.8
		MS 4.3	15.2	26.1	23.9	30.4

Appendix H

The importance of teacher behaviors
that relate to Differentiated Instruction

Answers of Middle School and High School teachers in percentages.

		Definitely Unimportant	Somewhat Unimportant	Neutral	Somewhat Important	Definitely Important
A1	Being able to understand and relate to their students	HS 0 MS 0	4 0	4 9.3	22 11.6	70 79.1
A2	Listening to students	HS 0 MS 0	4 0	2 4.7	22 9.3	72 86
A3	Taking the time to talk with students	HS 2 MS 2	2 0	4 2.3	36 23.3	56 74.4
A4	Keeping control of the class	HS 0 MS 0	2 0	14 4.8	14 11.9	70 83.3
A5	Being fair to all students	HS 0 MS	10 0	12 4.7	14 8.3	64 86
A6	Calling students by name	HS 2 MS 0	4 2.3	10 9.3	26 16.3	58 72.1
A7	Teaching in an interesting manner	HS 2 MS 0	2 0	8 4.7	30 7	58 88.4
A8	Demonstrating care and concern for students	HS 2 MS 0	4 0	8 4.7	20 14	66 81.4

Appendix I

Correlations of dependent variables associated with resistance to change
and the implementation of Differentiated Instruction

		Resistan ce to DI	As training progress ed	I felt that DI was	School administ rators	Planning lessons	Impleme ntation of DI	Percent DI is used in teaching
Resistance to DI	Pearson Correlation	1	.571(**)	.586(**)	.490(**)	.614(**)	.316(**)	.382(**)
	Sig. (2-tailed)	.	.000	.000	.000	.000	.003	.000
	N	95	87	92	77	82	88	93
As training progressed	Pearson Correlation	.571(**)	1	.678(**)	.529(**)	.497(**)	.203	.440(**)
	Sig. (2-tailed)	.000	.	.000	.000	.000	.067	.000
	N	87	87	86	76	80	82	86
I felt that DI was	Pearson Correlation	.586(**)	.678(**)	1	.440(**)	.463(**)	.244(*)	.395(**)
	Sig. (2-tailed)	.000	.000	.	.000	.000	.022	.000
	N	92	86	93	76	82	88	92
School admins	Pearson Correlation	.490(**)	.529(**)	.440(**)	1	.321(**)	.361(**)	.396(**)
	Sig. (2-tailed)	.000	.000	.000	.	.006	.002	.000
	N	77	76	76	77	72	72	76
Planning lessons	Pearson Correlation	.614(**)	.497(**)	.463(**)	.321(**)	1	.494(**)	.514(**)
	Sig. (2-tailed)	.000	.000	.000	.006	.	.000	.000
	N	82	80	82	72	83	81	83
Implementati on of DI	Pearson Correlation	.316(**)	.203	.244(*)	.361(**)	.494(**)	1	.602(**)
	Sig. (2-tailed)	.003	.067	.022	.002	.000	.	.000
	N	88	82	88	72	81	90	90
Percent DI is used in teaching	Pearson Correlation	.382(**)	.440(**)	.395(**)	.396(**)	.514(**)	.602(**)	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.
	N	93	86	92	76	83	90	95

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).